

Total No. of Questions : 10]

SEAT No. :

P5107

[Total No. of Pages : 3

[5561]-501

B.E. (Civil)

ENVIRONMENTAL ENGINEERING - II
(2015 Pattern) (Semester - II)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.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) Write Streeter-Phelps equation and explain the meaning each term involved in it. [5]
- b) Find min velocity and gradient required to carry coarse sand particles of size 0.5 mm and specific gravity is 2.65 through a sewer of diameter 0.9 m. Assume constants beta = 0.04, f = 0.03 and N = 0.013. The sewer may be assumed to run half full. [5]

OR

- Q2)** a) Write a short note on pumping of sewage. [5]
- b) Explain in brief Self-purification of natural stream. [5]

- Q3)** a) Design a grit chamber with proportioning flow weir using the following data: [6]
- i) Sewage flow = 10MLD
 - ii) Grit size = 0.2mm. sp.gr. = 2.65
 - iii) Temperature of sewage = 10
 - iv) Desired removal efficiency = 80%
 - v) Constant n = 1/4

Determine:

- I. Required surface overflow rate.
- II. Number and dimensions of grit channels.
- III. Dimensions of proportioning flow weir

P.T.O.

- b) Draw the flow diagram for primary settlement of sewage. State the type of impurities removed in each unit. [4]

OR

- Q4)** a) Write working principle of rotating biological contactor. Also write the advantages and disadvantages. [5]
- b) State modifications in ASP and hence differentiate between completely mixed ASP and extended processes. [5]

- Q5)** a) Write a note on phytoremediation for waste water treatment. [8]
- b) Design an oxidation pond for treating sewage from a residential colony having population of 10,000 with sewage flow rate of 120 lpcd with the following data. [8]

BOD₅ of raw sewage = 300 mg/l

Desired effluent BODs = 30 mg/l

Location - 28° N

Elevation - 200 m above sea level

Temperature - 25°C

Sky clearance factor - 60%

BOD removal rate constant for the pond at 20° C as 0. 1/d

Assume permissible organic loading at 28°N as 200 kg/ha.d

OR

- Q6)** a) Explain aerated lagoon with respect to its working principle, design parameters and applications. [8]
- b) Explain the Algal-Bacterial symbiosis in oxidation ponds. Discuss the design criteria of Oxidation Pond. [8]
- Q7)** a) Write a detailed note on Sludge digester. [8]

- b) Explain in brief working principle, advantages and disadvantages of Packaged sewage treatment plant. [8]

OR

- Q8)** a) Discuss different methods of sludge treatment and disposal. [8]
b) Write principle and stages of anaerobic digestion. Explain factors affecting digestion process. [8]

- Q9)** a) Explain the following points related to Distillery industry. [9]
i) Flow sheet of manufacturing process and wastewater generation
ii) Characteristics of waste water.
iii) Flow sheet of wastewater treatment.
b) Explain methods of waste water sampling. [5]
c) Write characteristics of Sugar industry wastewater. [4]

OR

- Q10)**a) Explain the following points related to dairy industry. [9]
i) Flow sheet of manufacturing process and wastewater generation
ii) Characteristics of waste water.
iii) Flow sheet of wastewater treatment
b) Explain equalization and neutralization unit process with respect to its working principle, need, factors affecting the process and application.[9]



Total No. of Questions : 10]

SEAT No. :

P5138

[Total No. of Pages : 2

[5561]-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, Mollies 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) Define Alignment. Enlist the basic requirements of an ideal alignment between two terminal stations. [5]
b) What are the objectives of carrying out spot speed studies? [5]

OR

- Q2)** a) With the help of a neat sketch explain the Macadam method of road construction. [5]
b) The radius of a horizontal circular curve is 100 m. The design speed is 80 kmph and the design coefficient of lateral friction is 0.15. Calculate the Superelevation required if full friction is assumed to develop. [5]

- Q3)** a) Enumerate the salient features of Third Road Development Plan. [5]
b) What do you mean by camber? Discuss the factors on which the amount of camber to be provided depends. [5]

OR

- Q4)** a) Explain any two important pavement surface characteristics with respect to highway geometric design. [5]
b) With neat sketches, explain the various types of regulatory signs. [5]

- Q5)** a) What are the desirable properties of the sub grade soil? [5]
b) What is Foamed Bitumen? How foamed bitumen is prepared and where it is used. [5]
c) Describe briefly the Marshall Method of preparing the mix design. [7]

P.T.O.

OR

Q6) a) Explain cutbacks and its types. What are its advantages over conventional bitumen? [6]

b) Explain how Impact Test on aggregates is done in the laboratory. How are the results of the test interpreted? [7]

c) Write a note on Crumb Rubber Modified Bitumen (CRMB). [4]

Q7) a) What are the factors to be considered for the design of flexible pavements? Discuss significance of each. [7]

b) Explain the importance of dowel and tie bars in rigid pavements. [5]

c) How is the design traffic computed during the design of flexible pavements? [5]

OR

Q8) a) Differentiate between a flexible and rigid pavement. [6]

b) Define 'Vehicle Damage Factor' and explain its importance. [6]

c) Explain the concept of ESWL. [5]

Q9) a) Mention the specifications of material used and construction steps for WBM course. [8]

b) Explain in brief wheel load stresses and Temperature stresses in rigid pavement. [8]

OR

Q10)a) Enlist the advantages of Recycled Asphalt Pavements (RAP). [5]

b) Describe the importance of prime coat, tack coat and seal coat during the road construction process. [6]

c) Write a note on Built Up Spray Grout.(BUSG) [5]



Total No. of Questions : 12]

SEAT No. :

P3859

[5561]-505

[Total No. of Pages : 4

B.E.(Civil)

**SYSTEMS APPROACH IN CIVIL ENGINEERING
(2015 Course) (Semester - I) (Elective - I) (401004B)**

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) Differentiate between Linear Programming and Non Liner Programming. [3]

b) Formulate LPP: A person wants to decide the constituents of a diet which will fulfil his daily requirement of protein, fats & carbohydrates at minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in table: [3]

Food Type	Yield Per Unit			Cost Per Unit
	Protein	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Min.requirement	800	200	700	

OR

Q2) a) Solve graphically [3]

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

subject to,

$$X_1 + 2X_2 \leq 10,$$

$$X_1 + X_2 \leq 6,$$

$$X_1 - X_2 \leq 2,$$

$$X_1 - 2X_2 \leq 1,$$

$$X_1, X_2 \geq 0$$

b) What type of Civil Engineering problems may be optimized using system approach models? [3]

P.T.O.

- Q3)** a) If average arrival time (rate) is 3 per hour, average service rate is 4 per hour. Calculate queue length and system length. [2]
- b) Time jobs are to be processed on 2 machines M_1 & M_2 in order M_1 - M_2 . processing time is in hours. Find the sequence of total elapsed & idle time for both machines. [6]

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

OR

- Q4)** a) What are assumptions for queuing model? [2]
- b) Find the optimum sequence to get minimum time and sequence of operation A-B-C [6]

Job	Time required (hour)		
	A	B	C
1	13	9	14
2	12	8	9
3	11	7	12
4	15	10	13
5	16	11	15

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

- Q5)** Solve the following transportation problem using Least Cost Method. [6]

	A	B	C	D	
I	1	2	1	4	30
II	3	3	2	1	50
III	4	2	9	9	20
	20	40	30	10	

OR

Q6) Solve by Row Minima & Column Minima

[6]

	1	2	3	4	
1	2	3	11	7	15
2	1	2	5	6	25
3	5	8	15	9	20
	20	20	5	15	

Q7) a) Solve using simplex method

[8]

$$\text{Max, } Z = 3X_1 + 4X_2$$

$$\text{Subject to, } X_1 + X_2 \leq 450$$

$$2X_1 + X_2 \leq 600$$

$$X_1, X_2 \geq 0$$

b) Explain the rules for forming the dual.

[8]

Construct dual of the problem :

$$\text{Mini. } Z = 3X_1 - 2X_2 + 4X_3$$

$$\text{Subject to, } 3X_1 + 5X_2 + 4X_3 \geq 7$$

$$6X_1 + X_2 + 3X_3 \geq 4$$

$$7X_1 - 2X_2 - X_3 \leq 10$$

$$X_1 - 2X_2 + 5X_3 \geq 3$$

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

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

OR

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

[8]

$$\text{Mini. } Z = 600X_1 + 500X_2$$

$$\text{Subject to, } 2X_1 + X_2 \geq 80$$

$$X_1 + 2X_2 \geq 60$$

$$X_1, X_2 \geq 0$$

b) Use two phase method to solve the problem :

[8]

$$\text{Max. } Z = 4X_1 + 5X_2$$

$$\text{Subject to, } 2X_1 + 3X_2 \leq 6$$

$$3X_1 + X_2 \geq 3$$

$$X_1, X_2 \geq 0$$

- Q9)** a) Use Fibonacci Method to Max. $F_x = X^3 (12 - X)$ in the interval (0,12) within 10% accuracy. [9]
 b) Use Golden section Method to Max. $F_x = X^3 (12 - X)$ in the interval (0,12) within 10% accuracy. [9]

OR

- Q10)** a) What is uni-modal and multimodal function with diagram? Explain procedure for Lagrangian Multiplier technique. [9]
 b) Lagrangian Multiplier technique to solve [9]

$$\text{Minimize. } Z = 3X_1^2 + 2X_2 + 3X_3^2 + 10X_1 + 9X_2 + 16X_3 - 50$$

$$\text{Subject to, } 2X_1 + X_2 + 2X_3 = 40$$

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

- Q11)** a) It is proposed to develop hydropower project on reservoir across 3 possible river sites. The total financial resource available is 400 cores rupees. The return fuctions for each of the possible investment are given below. The available resources is to be allocated optimally to these developments using dynamic programming the maximum return and give the allocation to various sites. [8]

Allocated	Returns from site		
	A	B	C
0	0	0	0
100	120	140	300
200	750	550	500
300	910	700	700
400	980	800	750

- b) What are applications of Dynamic programming in Civil Engineering? State advantages and disadvantages of dynamic programming. [8]

OR

- Q12)** a) The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7000 is given below : [8]

Year	1	2	3	4	5	6	7	8
Maintenance cost	900	1200	1600	2100	2800	3700	4700	5900
Resale value	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

- b) Explain the types of Games. What are characteristics of two person zero sum game? [8]



Total No. of Questions : 10]

SEAT No. :

P3860

[5561]-506
B.E.(Civil)

[Total No. of Pages : 3

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

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 a short note on Self curing concrete. [4]
b) Explain grading curves of aggregate. How grading of aggregates affect on properties of concrete. [6]

OR

- Q2)** a) What are the factors affecting strength of concrete? Describe the influence of gel space ratio on strength of concrete. [4]
b) Write a short note on-
i) Jet cement concrete (Ultra Rapid Hardening Concrete).
ii) Ultra Light weight concrete.

- Q3)** a) Write a short note on green concrete. [4]
b) Write a short notes on nondestructive testing methods [6]
i) Stress wave propagation method
ii) Nuclear methods

OR

- Q4)** a) Write a short note on Geo polymer concrete. [4]
b) Write a short note on nondestructive testing method. [6]
i) Break off maturity method
ii) Ground penetration radar.

P.T.O.

- Q5)** a) What are the factors affecting the fiber interaction with matrix? [4]
- b) Explain the basic concept of using fibers in the concrete composite. Explain the role of fibers improving the mechanical properties under tension and bending. [6]
- c) What are the different types of fibers used in the construction industry? Write the properties and application. [6]

OR

- Q6)** a) Explain the historical development of fiber reinforced concrete composite. Explain the role of fibers improving the properties of concrete. [4]
- b) Enlist different metallic fibers. Explain their any two properties in brief. [6]
- c) Define the fiber reinforced concrete composite? Enlist different naturally occurring fibers. Explain any two in brief. [6]

- Q7)** a) Explain the behavior of hardened polymeric fiber reinforced concrete under flexure? [4]
- b) What precautions should be taken during mixing and casting for fiber reinforced concrete composite? [6]
- c) Describe the SIFCON material with reference to definition, structure properties and its application. [6]

OR

- Q8)** a) Explain stress strain property and compressive strength properties of FRC. [4]
- b) Explain the behavior of hardened steel fiber reinforced concrete under compression? [6]
- c) Which are the quality control tests conducted for steel fiber reinforced concrete composites. [6]

- Q9)** a) What are the different tests conducted on cement mortar as a ferrocement material? Explain any one in detail. [6]
- b) Explain closed mould technique for ferrocement with merits and demerits. [6]
- c) Explain how ferrocement differs than concrete? Write about tensile property of ferrocement. [6]

OR

- Q10)**a) Explain the properties and specifications of ferrocement material. [6]
- b) Enlist factors affecting ferrocement material in fresh and hardened state, Explain the effect of water cement ratio on properties of ferrocement material? [6]
- c) Explain skeletal armature method of ferrocement along with merits and demerits. [6]



Total No. of Questions : 8]

SEAT No. :

P3861

[5561]-507

[Total No. of Pages : 2

B.E.(Civil Engg.)

**ARCHITECTURE AND TOWN PLANNING
(2015 Course) (Semester - I) (Elective - I) (401004)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) While planning an area what are the responsibilities of an architect for observing [7]

- i) health
- ii) beauty
- iii) aesthetics
- iv) safety

b) What is “quality of life”? Mention the parameters involved in. [7]

c) Explain in detail how planned growth of town is observed? [6]

OR

Q2) a) Elaborate the following qualities of Architecture, giving appropriate examples : user friendly, contextual. [8]

b) Elaborate “meaning and need of Urban Conservation”. [6]

c) Write a note on levels of town planning and explain any one. [6]

Q3) a) What is the need and importance of Civic Surveys for D. P.? Explain how these are carried out for fulfilling water supply and drainage system requirement for new town. [9]

b) Enlist various Traffic and Transportation systems in town planning and write a note on importance of road hierarchy. [8]

OR

Q4) a) Enlist different planning agencies and explain organizational hierarchy and assigned duties for smooth functioning of any one town planning agency. [9]

b) Elaborate ,“ITS” in depth. [8]

P.T.O.

- Q5)** a) Write a short note on LARR Act. [8]
b) Elaborate the contents of URDPFI Guidelines for land use and infrastructure. [9]

OR

- Q6)** a) Describe the importance of MAHARERA. [8]
b) Write a note on: Benefits of LARR Act. [9]

- Q7)** a) Write a short note on Special Township. [8]
b) Write a note on: Application of GIS and GPS in town planning. [8]

OR

- Q8)** a) Elaborate: Salient features of smart city guidelines. [8]
b) Explain the importance of new techniques such as GPS and Remote sensing in planning and design of town area. [8]



Total No. of Questions : 6]

SEAT No. :

P3862

[5561]-508

[Total No. of Pages : 2

B.E.(Civil Engg.)

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Describe the Varieties of Deccan Trap Basalt. [6]
OR

b) Describe the physiographic divisions of India. [6]

Q2) a) Enlist various parameters of morphometric analysis of river basin. [7]
OR

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

Q3) a) Describe various Seismic zones of India. [7]
OR

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

Q4) a) What are various physical properties of rocks. [8]
b) Calculate RQD recovery and Core recovery from following table. [8]

Run in m	Piece No.	Length in cm.	Nature of fracture
3-6m	1	10	J
	2	11	J
	3	100	M
	4	45	M
	5	55	M
	6	13	J
	7	50	J
	8	6	J
	9	8	J
6-9m	10	90	M
	11	80	M
	12	120	M
	13	10	M

OR

P.T.O.

- a) Explain in detail Bieniawski's Geomechanical classification. [8]
 b) Calculate Apparent resistivity values at different depth zones. [8]

Sr.No	R	a	$2\pi a R$
1	1.87	1	
2	1.66	2	
3	1.47	3	
4	1.32	4	
5	1.19	5	
6	1.09	10	

- Q5)** a) Discuss relationship between local Geology and location of Spillway in Deccan Trap. [10]
 b) Write a note on Engineering significance of Tachytic Basalt. [7]

OR

- a) Write a note on Engineering significance of fracture from dam foundation point of view Give case history. [10]
 b) What treatment is to be given to a dyke occurring at a Dam site. [7]

- Q6)** a) Explain in brief safe bearing capacity during bridge construction. [10]
 b) Describe various unfavorable field characters of rocks during tunneling. [7]

OR

- a) Discuss with suitable examples suitability of compact basalts from tunneling point of view. [10]
 b) Whether the tunnels are suitable through limestone and quartzite. [7]



Total No. of Questions : 8]

SEAT No. :

P3863

[5561]-509

[Total No. of Pages : 4

B.E. (Civil Engineering)

MATRIX METHODS OF STRUCTURAL ANALYSIS

(2015 Pattern) (Semester-I) (Elective-II) (401005A)

Time : 2½ Hours]

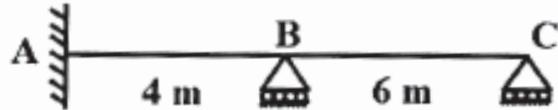
[Max. Marks : 70

Instructions to the candidates:

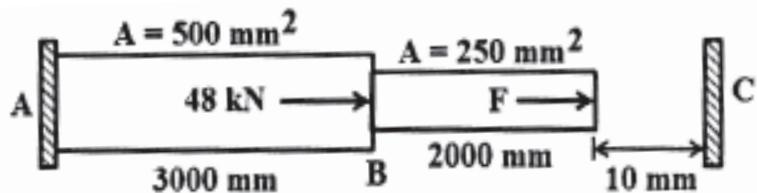
- 1) Answer Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) Explain in brief Gauss-Elimination Method and draw computer flowchart. [6]

b) Determine support reactions of continuous beam ABC as shown in figure using flexibility matrix method if supports B and C sink by 25 mm and 35 mm respectively. Take $EI = 3000 \text{ kN.m}^2$. [8]



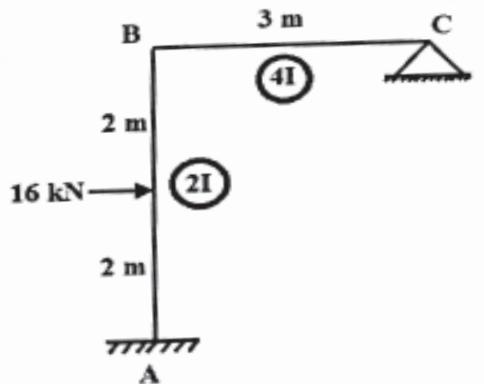
c) Determine displacement at joint B and force F in the bar structure as shown in figure using stiffness matrix method. Take $E = 210 \text{ GPa}$. [6]



OR

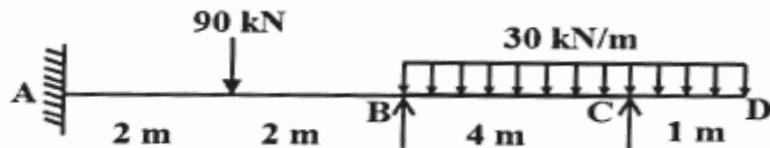
P.T.O.

- Q2)** a) Explain in brief Gauss Jordon Method and write its computer algorithm. [6]
 b) Determine support reactions of the portal frame ABC as shown in figure using flexibility matrix method. Take EI constant. [8]



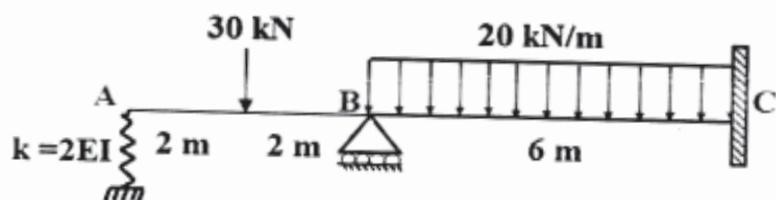
- c) Derive the transformation matrix and stiffness matrix of a truss member with four degrees of freedom. [6]

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

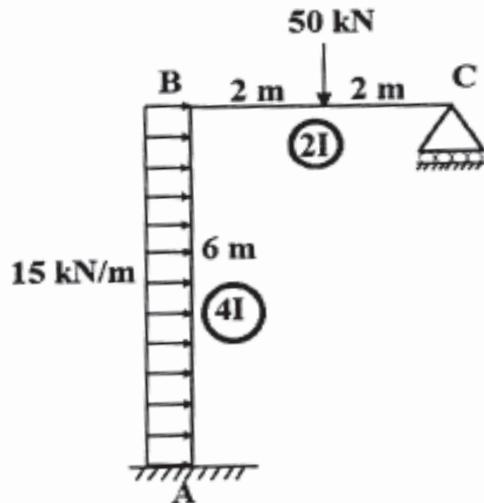


OR

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

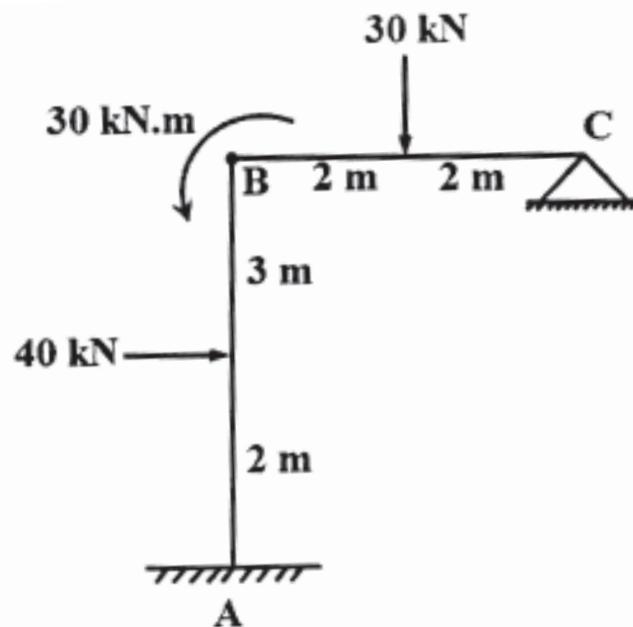


- Q5)** Analyze the portal frame ABC as shown in figure using structure approach of stiffness matrix method. Neglect axial deformation. Take EI constant. Draw BMD. [16]

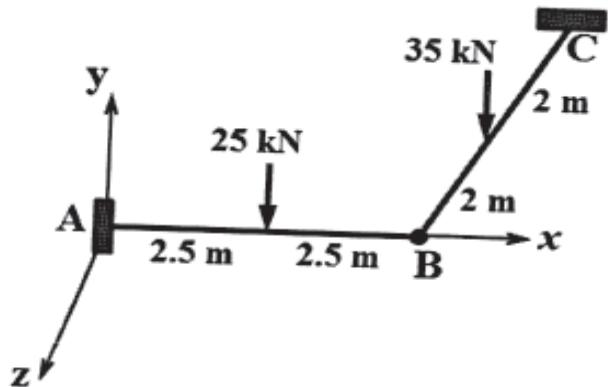


OR

- 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]

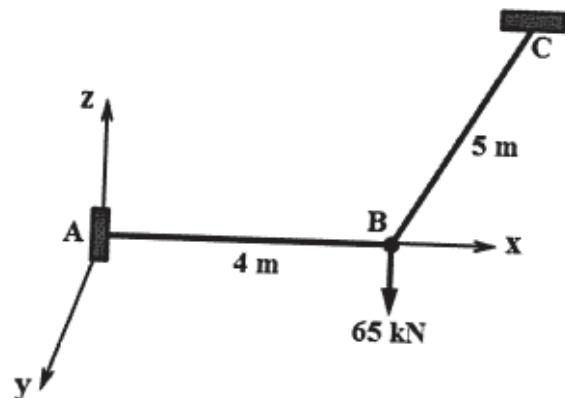


- Q7)** Determine moments and reactions of the two member grid structure as shown in figure using structure approach of stiffness matrix method. Take $EI = 3800 \text{ kNm}^2$ and $GJ = 1900 \text{ kNm}^2$. [16]



OR

- Q8)** Determine unknown joint displacements of the two member grid structure as shown in figure using member approach of stiffness matrix method. $EI = 2000 \text{ kNm}^2$ and $GJ = 0.5 EI$. [16]



Total No. of Questions : 12]

SEAT No. :

P3864

[5561]-510

[Total No. of Pages : 2

B.E. (Civil)

INTEGRATED WATER RESOURCES PLANNING AND MANAGEMENT

(2015 Course) (Semester-I) (Elective-II) (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: Water resources in India. [3]
b) What is meant by permit system? [3]

OR

- Q2)** a) Write any two water infrastructures in supply of water. [3]
b) What is meant by Ground water ownership? [3]

- Q3)** a) Write a note on: Principles of water pricing. [3]
b) Write a note on: Sustainability principles for water management. [3]

OR

- Q4)** a) How the benefit cost analysis is carried out in IWRP explain? [3]
b) What are the Global perspectives of water crisis? [3]

- Q5)** a) Write a note on: Estimation of ground water draft. [4]
b) What is the use of geo-informatics for drought management? [4]

OR

P.T.O.

- Q6)** a) How the recycling and reuse and storage of water can be done? [4]
b) How the Flood & Drought can be managed? [4]

- Q7)** a) What are consumptive and non-consumptive demands? Explain in detail. [8]
b) What is thermal and nuclear water demand? Explain how it is estimated. [8]

OR

- Q8)** a) Explain in detail necessity of water management in irrigation sector. [8]
b) How the irrigation demand estimated? What is mean by irrigation efficiency? [8]

- Q9)** a) Write a note on: Social impact of water resources development on co-operative movement. [8]
b) Social impact of water resources development on industrial growth to enhance living Standards. [8]

OR

- Q10)a)** Explain Direct/Indirect benefits of water resource development on employment generation. [8]
b) Write a note on Aquaculture. [8]

OR

- Q12)a)** How the management of IWRM is carried out by use of data driven techniques like Artificial Neural networks is done? [8]

b) Define Watershed. How the watersheds are classified? Explain integrated approach for watershed management. [10]



Total No. of Questions : 10]

SEAT No. :

P3865

[5561]-511

[Total No. of Pages : 2

B.E. (Civil)

TQM AND MIS IN CIVIL ENGINEERING
(2015 Course) (Semester-I) (Elective-II)

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.
- 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 any two definitions of quality with example. [6]

b) What are the various barriers in implementation of TQM in construction industry? [6]

OR

Q2) a) What are benefits of applying TQM on construction site. [6]

b) Explain DMAIC & DMADV in brief. [6]

Q3) a) What are the types of construction defect? Explain any two with examples. [6]

b) Explain the historical evolution of TQM. [6]

OR

Q4) a) Enlist the principles of ISO 9001 and explain any two. [6]

b) Prepare a checklist for RCC work for column. [6]

P.T.O.

Q5) a) What are the contests of quality manual? Describe in brief. [8]

b) Write a short note on: Conformity & Non-Conformity. [6]

OR

Q6) a) Explain CONQAS with suitable example. [8]

b) Explain 5s campaign of KAIZEN. [6]

Q7) a) Explain CIDC-CQRA certifications. [8]

b) Explain in brief Benchmarking in TQM? Explain the benefits & limitations of the same. [8]

OR

Q8) a) Explain in brief “Failure Mode Effect Analysis (FMEA)”. [8]

b) Differentiate data & Information with suitable example. [8]

Q9) a) Define MIS? Explain benefits and limitations of MIS. [8]

b) Explain in brief Deming Prize & Malcolm baldrige award. [8]

OR

Q10)a) Explain subsystems of MIS in brief. [8]

b) Explain zero defects with suitable example. [8]



Total No. of Questions : 12]

SEAT No. :

P3866

[5561]-512

[Total No. of Pages : 3

B.E. (Civil)

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

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, Q.11 or Q.12.
- 2) Use of IS 456, IS 1893 and non programmable calculator is allowed.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) 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) What do you understand by magnitude and size of earthquake? Classify the earthquake based on magnitude. [6]

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

OR

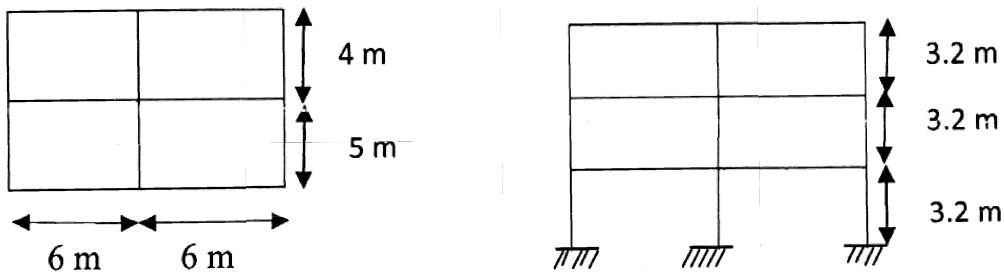
Q4) A weightless steel cantilever beam 0.6 m long has cross section of 40 mm deep and 15 mm wide. It supports a load of 750 N at the tip. Determine the natural frequency of vibration, natural period and derive formula used. [6]

Q5) Summarized philosophy of Seismic Design. [6]

OR

P.T.O.

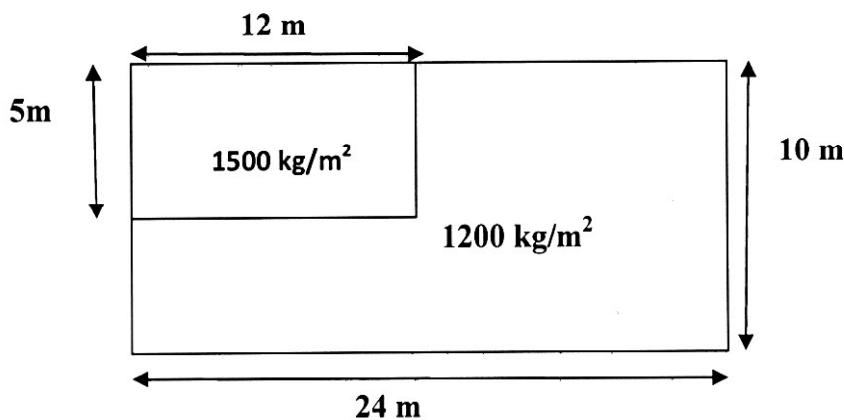
- Q6)** The plan and elevation of three story RC building located in Pune is shown in fig. The building consist of OMRF and rests on hard soil. Seismic weight on roof 865 kN and each floor 1190 kN. Calculate base shear. [6]



- Q7)** Explain in details the effect of irregularities of the building on the performance in an earthquake. [16]

OR

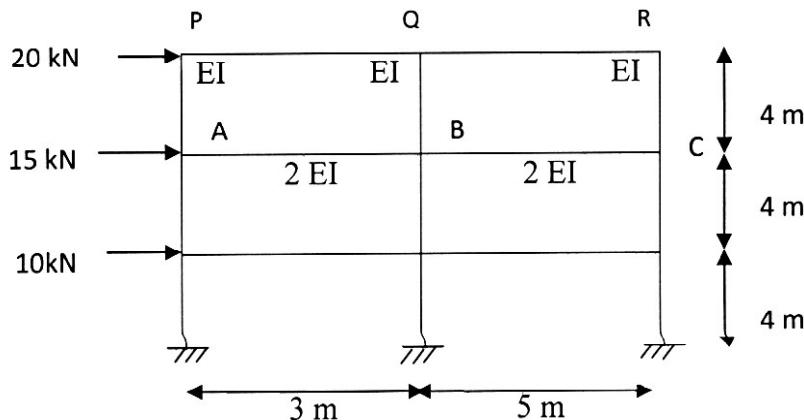
- Q8)** a) Write short note on ‘Response Spectra’ and ‘effect of shear wall’. [8]
 b) A building having non-uniform distribution of mass is shown in figure. Locate its center of mass. [8]



- 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) Analyze the multistoried building frame as shown in figure 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 Active and Passive control. Write different types of the passive control system and explain any one. [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 any three retrofitting technique used for masonry building? [8]



Total No. of Questions : 10]

SEAT No. :

P3867

[5561]-513

[Total No. of Pages : 2

B.E. (Civil)

**ADVANCED GEOTECHNICAL ENGINEERING
(2015 Pattern) (Semester-I) (Elective-II) (401005 E)**

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 in detail clay particle interaction and granular soil fabric. [5]
b) Explain with suitable diagram. Structure of (i) Montmorillonite
(ii) Kaolinite. [5]

OR

- Q2)** a) Find the depth of embedment required for a factor of safety one in the case of cantilever sheet piling which required to support 4m of cohesionless backfill with following properties, $C = 0$, $\phi = 33^\circ$, $\gamma = 1.7\text{t/cub.m}$. [5]
b) Write a note on anchored sheet pile wall. [5]

- Q3)** a) Note down difference between the assumptions made in theory of earth pressure by Rankine & Coulomb. [5]
b) Write a note on application of geosynthetics in geo environment. [5]

OR

- Q4)** a) Explain in detail Culmans graphical method for active earth pressure.[5]
b) Write down a note on open excavation and slope stabilization using soil nails. [5]

P.T.O.

Q5) a) Discuss the following in detail. [2×4=8]

- i) Cyclic loading and Impact loading
- ii) Soil properties relevant to dynamic loading

b) Explain the following methods. [2×4=8]

- i) Elastic half space method
- ii) Linear elastic weightless spring method

OR

Q6) a) Explain different types of machine foundations with suitable sketch. [8]

b) Explain in detail soil properties relevant for dynamic loading & its determination. [8]

Q7) Discuss following terms in detail. [3×6=18]

- a) Compaction pile.
- b) Ground improvement by sand drains.
- c) Various grouting techniques with their suitability.

OR

Q8) a) Explain the steps for vibrofloatation with inserting reinforcement with neat sketch.

- b) Discuss any three methods of soil improvement.
- c) Explain in detail technique of deep mixing.

[3×6=18]

Q9) a) Explain following terms in detail.

- i) Composite Rheological model. [4]
- ii) Saint Venants model. [4]

b) Discuss following terms in detail.

- i) Secondary consolidation. [4]
- ii) Creep. [4]

OR

Q10) a) Explain the utility of Rheological model. [8]

b) Explain in detail viscous models with spring and dashpot. [8]



Total No. of Questions : 12]

SEAT No. :

P5572

[Total No. of Pages : 3

[5561] - 514

B.E. (Civil) (Semester - II)

DAMS AND HYDRAULIC STRUCTURES

(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, Q.11 or Q.12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic non-programmable calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) Discuss the impact of climate change on a water resource project. [6]

OR

Q2) Differentiate between Large Dam and Small Dam. What will be your choice and why? [6]

Q3) a) Discuss various methods to reduce uplift pressure at the base of gravity dam. [6]

b) What are the factors affecting selection of arch dam? [2]

OR

Q4) a) What is elementary profile of a gravity dam? How it is modified to get practical profile? [6]

b) Enlist any four Load Combinations considered for design of gravity dam. [2]

P.T.O.

Q5) Draw a labeled sketch of ogee spillway showing all components. [6]

OR

Q6) Enlist types of spillway gates and explain anyone. [6]

Q7) a) State different corrections suggested by Khosla. Explain in detail the correction for mutual interference of piles. [6]

b) Determine the factor of safety of downstream slope of homogenous earth dam section drawn to a scale of 1 : 500 [8]

i) Length of slip circle arc = 15 cm

ii) Total area of N-Rectangles = 16.5 cm²

iii) Total area of T Rectangles = 7 cm²

iv) Total area of U - Rectangles = 5 cm²

v) Angle of Internal friction = 26°

vi) Cohesion = 0.2 kg/cm²

vii) Specific weight of soil = 1.8 kg/cm³

c) Explain seepage failure of earthen dam. [4]

OR

Q8) a) Briefly explain different causes of failure of earthen dams. [8]

b) Differentiate between weir and barrage. [4]

c) With the help of expression explain '*Exit Gradient*'. Also give permissible values of it for various soils. [6]

Q9) a) What is a canal? Explain three types of canals based on function. [8]

b) Design an unlined alluvial canal section to carry a discharge of 10 m³/s. The longitudinal slope is 1 in 4000 and the side slope is 0.5 H : 1 V. Use Lacey's theory and take silt factor f = 0.9. [8]

OR

- Q10)** a) Design an irrigation channel section to carry a discharge of $5 \text{ m}^3/\text{s}$. Assume $N = 0.0225$ and $m = 1$, Consider trial depth $D = 1.0 \text{ m}$ and channel bed slope as 0.0002. [8]
- b) What is a Canal Fall? Discuss the necessity of it. [4]
- c) Write a short note on : [4]
- Canal Escape.
 - Ogee Fall.

- Q11)** a) Explain necessity of cross drainage work. Explain Syphon Aqueduct in detail with neat sketch. [4 + 4]
- b) What do you understand by river training work? What are the functions of marginal bunds? [8]

OR

- Q12)** a) Write a short note on : [8]
- Super passage.
 - Level crossing.
- b) Explain in brief: [8]
- Attracting groyne.
 - Deflecting groyne.



Total No. of Questions : 12]

SEAT No. :

P5139

[Total No. of Pages : 5

[5561]-515

B.E. (Civil)

**QUANTITY SURVEYING CONTRACTS AND TENDERS
(2015 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.No.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.*
- 2) *Answer to the two sections must be written in separate answer book.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagram wherever necessary.*
- 5) *Use of logarithmic table, slide rule and electronic pocket calculator are allowed.*
- 6) *Assume suitable data if necessary, stating it clearly.*

- Q1)** a) Explain estimation, quantity surveying and requirements of an estimator. [3]
b) What is Bill of quantity and prepare a standard format for billing. [3]

OR

- Q2)** An five storied office building is to be constructed to have a total carpet area of 2500 m². The following detail may be assumed to prepare a preliminary estimate. [6]

- a) Area occupied by wall = 10%
- b) Area occupied by corridor, water closet staircase etc which are used for general utility = 30%.
- c) Additional cost for water supply and sanitary connection = 8%
- d) Additional cost for electrical connection & fitting = 10%
- e) Additional cost for architectural finishes = 1%
- f) Work charge establishment & contingency = 8.5%

- Q3)** A small RCC framed building is shown in fig 1. Work out the following quantity by detailed estimate.
a) Earthwork excavation for column footing and panel wall. [3]
b) Column footing. [2]
c) Brick wall in super structure. [3]

OR

P.T.O.

Q4) Conduct the detailed estimate for the RCC roof slab shown in fig 2 and draw the bar bending schedule. [8]

Q5) Work out the rate per unit of the following item of work. [6]

- a) First class brick work for super structure in cm 1:6
- b) Cement plastering to wall in cm 1:4

OR

Q6) a) Explain how specification is necessary to maintain quality in construction. What are the different types of specification? [3]

- b) Explain the terms Standard specification and manufacturer specification. State the advantage and disadvantage of manufacturer specification. [3]

Q7) a) Explain various factors affecting value of a property consisting of land and building. [4]

- b) Explain how depreciation affects the value of a property. Explain the percentage method or declining balance method of calculating depreciation. [6]

- c) A building is constructed at a cost of 5 Lakhs. The life of building may be assumed to be 80 years. and the scrap value of building to be 10% of building cost. Determine the depreciation in 40th year. Use straight line method, constant percentage method and sinking fund method assuming 8% compound interest. [8]

OR

Q8) a) Explain concept of free hold and lease hold property. What are the reasons under which the property is leased and what are the liabilities of lessor and lessee? [6]

- b) Explain with example [6]
 - i) Earned value,
 - ii) Dual rate Y. P &
 - iii) Obsolescence

- c) A plot of land is situated along a highway. The plot has an area of 20,000 sq-m with a single frontage of width 40m along highway. The front 30m along the plot from the edge of highway is kept reserved for providing gardening and other green purpose, also the remaining 3 sides of the plot is prohibited from any sort of construction under law. Assuming that the prevailing rate of land varies between Rs 20/ sq-m to Rs 25/sq-m. Find the value of the property. [6]

- Q9)** a) Draft a brief tender notification to execute the construction of public building worth 50 lakh to be completed in 24 calendar months involving prequalification of tenders. [6]
b) What is comparative statement and its necessity?. Explain the procedure for preparing the comparative statement. [4]
c) Before working out a tender and submitting it, what information and data needs to be collected and ascertained. [6]

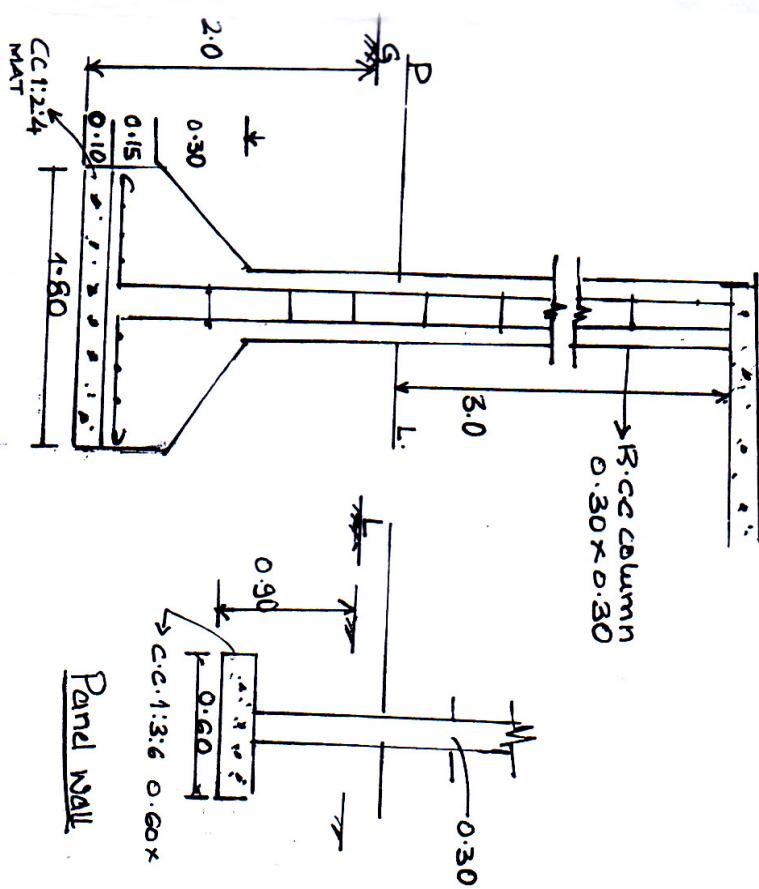
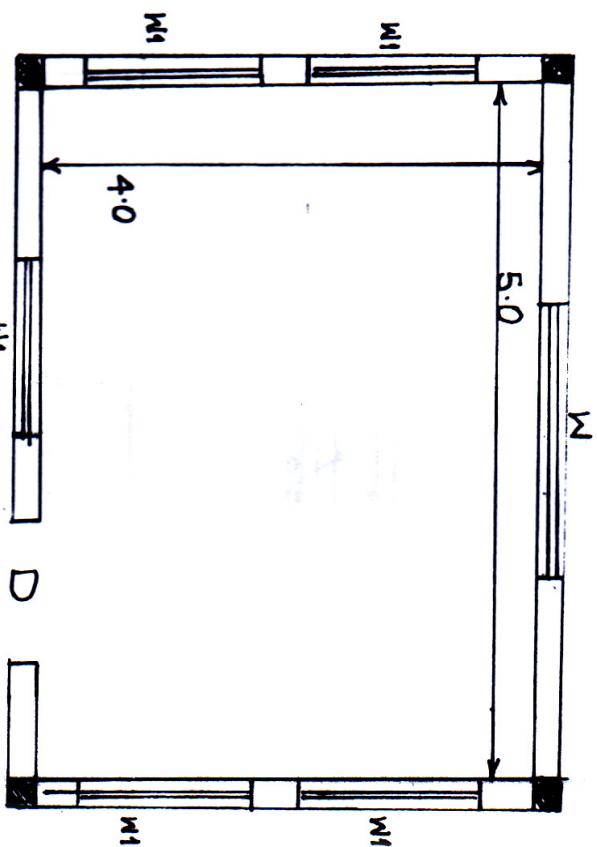
OR

- Q10)** a) Explain the terms earnest money deposit and security deposit with respect to [8]
i) Meaning/definition
ii) Reason to collect it from contractor
iii) Mode of collection and approximate amount in terms of percentage of estimated cost
iv) Refund to contractor
b) Explain the following : [8]
i) Prequalification of tender,
ii) 3 Bid system of tender,
iii) Unblanaced tender with suitable example,
iv) Administrative approval and Technical sanction for any PWD work

- Q11)** a) What are the essential requirements of valid contract and explain any one. [4]
b) Explain percentage contract and Item rate contract giving their advantages and disadvantages. [6]
c) Can a contract be terminated or discharged, if so what are the reason for termination. Explain any two ways in which the contract can be terminated. [6]

- Q12)** a) Explain the term arbitration, its objective and advantages. Which are the matter that can be and cannot be referred to arbitration under thee provision of Arbitration act. [6]
b) Explain the process of arbitration and award by an arbitrator. Explain powers of court to modify the arbitration award. [4]
c) Explain any two of the following : [6]
i) Important factors influencing the value of building
ii) Procedures to be followed in opening of tender and security of tender
iii) Departmental method of execution of work

Q.NQ 3



Door - D = 0.90×2.10
 Window - w = 1.80×1.50
 $w_1 = 1.40 \times 1.50$
 R.C.C column = 0.30×0.30

Fig 1

Q.N04

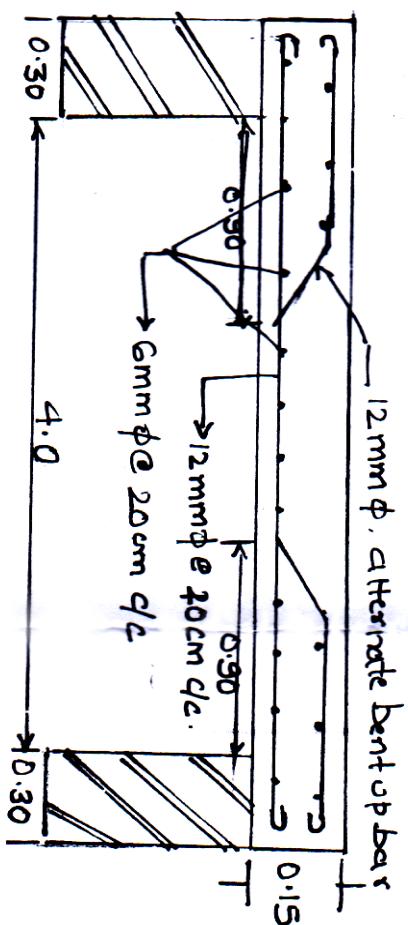


Fig 2

(All Dimensions in meter)



Total No. of Questions : 10]

SEAT No. :

P3868

[5561]-516

[Total No. of Pages : 2

B.E. (Civil)

**ADVANCED STRUCTURAL DESIGN
(2015 Course) (Semester - II) (Elective -III)**

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 in bold to the right indicate full marks.
- 3) Latest revisions of IS 801, IS 811, IS 1893 (Part 1 and 2), IS 13920, IS 456 codes are allowed in the examination.
- 4) Non-programmable calculators are allowed in the examination.
- 5) If necessary, assume suitable data and indicate clearly.

Q1) A column of length 4m is subjected to a concentric load of 75kN. Design the column using cold from section. [10]

OR

Q2) What do you understand by the term mechanism in a steel frame? How is it formed and how are they identified? [10]

Q3) Obtain the plastic moment for frame shown in Fig. 1. [10]

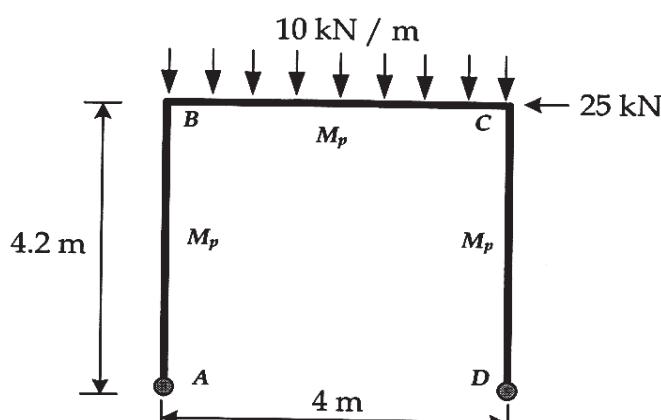


Fig. 1

OR

P.T.O.

Q4) What are composite slabs? Explain how shear studs are designed. [10]

Q5) Derive from the fundamentals the collapse load for a restrained circular slab of diameter D. The load may be considered to be uniformly distributed. [16]

OR

Q6) A two - way restrained slab is of size L×B. Derive the equation of collapse load. Consider the load to be uniformly distributed. [16]

Q7) An elevated square water tank is 3 m in size and 3m high. It is supported on a concrete staging of 4 columns. The height of the staging is 10m. Bracings are provided at a vertical spacing of 2.5m. The circular columns of the staging are 500mm in diameter. The structure is located in Zone III. Assume suitable dimensions for various elements and mention them clearly. Analyze the tank for tank full condition. [18]

OR

Q8) For the problem in Q.7, analyze the tank for tank empty condition. [18]

Q9) Explain the design procedure for RC shear wall. [16]

OR

Q10) What is the function of shear wall? How is the reinforcement calculated? Sketch typical reinforcement details. [16]



Total No. of Questions : 10]

SEAT No. :

P3869

[5561]-517

[Total No. of Pages : 4

B.E. (Civil)

**STATISTICAL ANALYSIS AND COMPUTATIONAL
METHODS IN CIVIL ENGINEERING
(2015 Course) (Semester-II) (401009 B)**

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) Use of cell phone is prohibited in the examination hall.

- Q1)** a) Explain Secant Method with an example. [4]
b) Find a real root of $\sqrt{30}$, using Secant Method, correct up to three decimal places. [6]

OR

- Q2)** a) Evaluate $\int_0^4 1+x^4 \ dx$ using Gauss 2 point and 3 point formulae. [4]
b) Evaluate $\int_0^1 x^3 \ dx$ by Trapezoidal Rule, Simpson's 1/3rd and 3/8th Rule, given that, [6]

X	0	0.2	0.4	0.6	0.8	1
$Y = f(x)$	0	0.008	0.064	0.216	0.512	1

- Q3)** a) Solve using Gauss Jordan Method : [4]
 $10x - 7y + 3z + 5u = 6; -6x + 8y - z - 4u = 5; 3x + y + 4z + 11u = 2; 5x - 9y - 2z + 4u = 7$
b) Solve using Gauss siedel method, following set of equations: [6]
 $5a + b + c + d = 4; a + 7b + c + d = 12; a + b + 6c + d = -5; 2a + b + c + 4d = -6$

OR

P.T.O.

Q4) a) Explain Gauss Siedel Method with an example. [4]

b) Solve using Gauss Elimination Method: [6]

$$x+4y-z = -5, \quad x+y-6z = -12, \quad 3x-y-z = 4$$

Q5) a) Explain role of statistics in Civil Engineering. [4]

b) Calculate mean, median, mode, mean deviation and standard deviation from following data: [5]

Class interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	10	25	30	20	10

c) Calculate coefficient of quartile deviation and quartile deviation from the following data: [7]

Wages per day	Less than 35	35-37	38-40	41-43	Greater than 43
No. of Workers	14	62	99	18	7

OR

Q6) a) Explain three types of means, mode and median. [4]

b) Following table gives the length of life of 400 excavators Y: [7]

Length of life (hours)	No.of Excavators
1000-1199	12
1200-1399	30
1400-1599	65
1600-1799	78
1800-1999	90
2000-2199	55
2200-2399	36
2400-2599	25
2600-2799	9

Calculate:

- i) The average length of life of an excavator.
 - ii) Standard Deviation of the length of life of an excavator.
 - iii) % no. of excavators where length of life of an excavator falls within $\bar{X} \pm 2\sigma$
 - iv)
- c) Following are the marks (out of 100) scored by two companies A and B for quality ratings for 10 projects. Find (using coefficient of variation) which of the two companies is more consistent with marks. [5]

A	35	22	43	65	71	42	13	56	92	20
B	25	27	52	53	61	85	16	55	47	84

- Q7)** a) A person is known to hit the target in 3 out of 4 shots, whereas another person is known to hit the target in 2 out of 3 shots. Find the probability of the target being hit at all when they both try. [4]
- b) A box contains 3 red and 7 white balls. One ball is drawn at random and in its place a ball of the other colour is put in the box. Now one ball is drawn at random from the box. Find the probability that it is red. [6]
- c) Five men in a group of 20 are graduates. If 3 men are picked out of 20 at random.
i) What is the probability that all are graduates, and
ii) What is the probability of at least one being graduate?

OR

- Q8)** a) Explain Hypothesis testing. [4]
- b) How would you use the normal distribution to find approximately the frequency of exactly 5 successes in 100 trials, the probability of success in each trial being $P = 0.1$ [6]
- c) The probabilities of X, Y and Z becoming managers are $4/9$, $2/9$ and $1/3$ respectively. The probabilities that the bonus scheme will be introduced if X, Y and Z become managers are $3/10$, $1/2$ and $4/5$ respectively. [7]

- i) What is the probability that the bonus scheme will be introduced?
- ii) If the bonus scheme has been introduced, what is the probability that the manager appointed was X

- Q9)** a) Explain correlation analysis, its importance and types with suitable examples. [4]
- b) The following data relates to age of employees and the number of days they were reported sick in a month. [6]

Employees	1	2	3	4	5	6	7	8	9	10
Age (X)	30	32	35	40	48	50	52	55	57	61
Sick Days (Y)	1	0	2	5	2	4	6	5	7	8

Calculate Karl Pearson's Coefficient of Correlation and its interpretation.

- c) Compute Spearman's Rank Correlation for the following observations: [7]

Candidate	1	2	3	4	5	6	7	8
Judge (X)	20	22	28	23	30	30	23	24
Judge (Y)	28	24	24	25	26	27	32	30

OR

- Q10)** a) Explain regression analysis, types and applications with suitable examples. [4]
- b) From the data given below, find : [7]
- i) Two regression equations.
 - ii) Coefficient of correlation

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

- c) By using the following data, find out the two lines of regression and from them, compute the Karl Pearson's coefficient of correlation. [6]

$$\Sigma X = 250, \Sigma Y = 300; \Sigma XY = 7900; \Sigma X^2 = 6500; \Sigma Y^2 = 10000 \text{ and } N = 10$$



Total No. of Questions : 12]

SEAT No. :

P3870

[5561]-518

[Total No. of Pages : 3

B.E. (Civil)

HYDRO POWER ENGINEERING
(2015 Pattern) (Elective-III) (Semester-II)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Assume suitable data if necessary.*

Q1) Discuss the impact of hydro power plant on land use air, water and green house gas emission. [7]

OR

Q2) Explain merits, demerits and constraints in hydro power development in India. [7]

Q3) Draw a neat sketch, explain pumped storage hydro power plant. Why is it not economically beneficial. State two examples. [7]

OR

Q4) Discuss with a neat sketch hydro power plant classification on hydraulic characteristic. [7]

Q5) A load on hydro power plant varies from minimum 12,500 kW to maximum 44,500 kW. Three generators of 17,000 kW capacity each have been installed. Determine: [6]

- a) Load factor.
- b) Capacity factor.
- c) Utilization factor.

OR

P.T.O.

Q6) R/O plant operating as a peak plant having all its capacity as a firm capacity with a weekly L.F. of 35%. What should be minimum flow in the river so that the station may serve as a load plant. The installed capacity of generator is 10,000 kW the operating under the head of '25 m' and the plant efficiency is 85%. [6]

Q7) a) Explain different types of intake structure in hydro power plant. [6]

b) Discuss function types and installation of penstock for surface type of hydro power plant. [5]

c) Explain overall safety measures in under ground hydro power plant during and after construction. [5]

QR

Q8) a) Explain with a neat sketch: [6]

b) Draw typical layout of power house and explain in brief. [5]

c) Discuss different methods of designing penstock. What is meant by economical diameter. [5]

Q9) a) Distinguish between reaction and impulse turbine. [5]

b) A pelton wheel turbine is to be designed for following specifications:
 Shaft power = 11772 kW, head = 380 m, speed = 750 rpm, overall efficiency = 86%, Jet diameter is not exceed $\frac{1}{6}$ the wheel diameter. [8]

c) Discuss Surge tank-function, classification, examples. [5]

OR

- Q10)a**) Write a explanatory note on ‘Draft tube’. [5]
- b) Design a pelton wheel turbine for given data: [8]
- i) Power to be generated = 14000 kW
 - ii) Design head =900 m
 - iii) Coefficient of velocity = 0.98
 - iv) Speed ratio (ku) = 0.46
 - v) Overall efficiency= 0.90
- c) What is a ‘cavitation’ in turbine? How do you minimise cavitation? [5]

- Q11)a**) Discuss tariffing for electric energy. What are different types. State merits & demerits of it. [8]
- b) Explain ‘Private’ participation in hydro power sector. What are government policies in India. Give two examples of ‘Private’ participants. [8]

OR

- Q12)a**) Discuss salient features of Electricity Act 2003. [8]
- b) What is carbon credit? Explain history significance and sustainability in development of country. [8]



Total No. of Questions : 10]

SEAT No. :

P6090

[Total No. of Pages : 2

[5561]-519

B.E. (Civil)

Air Pollution and Control (Elective - III)
(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 indicates 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 features of Gaussian plume model and give the limitations of Gaussian plume models. [5]
b) Explain the plume rise and how it is estimated? [5]

OR

- Q2)** a) What are the effects of stack height? Enlist various formulae used to calculate minimum stack height as per CPCB? [5]
b) Write in a tabular form National Ambient Air Quality Standards (NAAQS) specified by Central Pollution Control Board (CPCB). [5]

- Q3)** a) Explain sick building syndrome. [5]
b) Write methods measurement of odour and explain any one method. [5]

OR

- Q4)** a) Explain air cleaning systems for indoor air pollution control. [5]
b) Write a short note on High volume sampler. [5]

- Q5)** a) Explain with sketches the mechanism, working principle, application of air pollution control by Electrostatic precipitator. [8]
b) Write advantages, disadvantages and applications of following [8]
i) Settling Chamber
ii) Cyclones

OR

P.T.O.

- Q6)** a) Explain in brief about : [8]
i) Control of air pollution by process modification.
ii) Control of air pollution by change of raw materials.
b) Write methods to control of air pollution from automobiles and explain any one method. [8]

- Q7)** a) Write note on economics of air pollution control. [8]
b) Explain the important provisions made in Environment (Protection) Act 1986. [8]

OR

- Q8)** a) Explain powers, functions and penalties under Air Act 1981. [8]
b) Write note on Emission standards for stationary sources. [8]

- Q9)** a) Write role of regulatory agencies and control boards in obtaining environmental clearance for project. [6]
b) Write a note on public hearing for EIA. [6]
c) Explain Components of EIA. [6]

OR

- Q10)** a) Write the environmental rules 1999 (siting of industries) as per the notification of Ministry of Environment and Forests. [9]
b) Write and explain environmental impacts of sugar and cement industry. [9]



Total No. of Questions : 8]

SEAT No. :

P5573

[Total No. of Pages : 3

[5561] - 520

B.E. (Civil Engineering) (Semester - II)
Finite Element Method in Civil Engineering
(2015 Pattern) (Elective - III)

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) Derive equations of equilibrium for 3D elasticity problems. [6]

- b)** What is aspect ratio of an element? How it affect accuracy of the FEM solution explain with suitable example? [8]
- c)** Derive shape functions for three nodded CST element in which coordinates of nodes are node 1 (2, 3), node 2 (4, 5), node 3 (3, 7)? [6]

OR

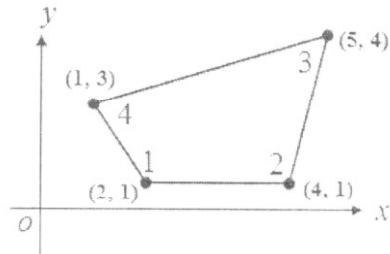
Q2) a) Derive strain-displacement relations for 3D elasticity problems. [6]

- b)** Coordinates of nodes of CST element are node 1 (1, 1), node 2 (4, 3), node 3 (3, 5). At interior point P if $x = 3.0$ and $N_2 = 0.4$. Find coordinate of point P and values of N_1 and N_3 . [8]
- c)** Enlist the various types elements used in finite element analysis with their applications. [6]

P.T.O.

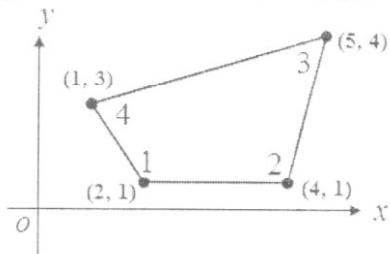
Q3) a) What are isoparametric, subparametric and superparametric elements? [6]

b) Obtain Jacobian matrix for the isoparametric quadrilateral element as shown in Figure [10]

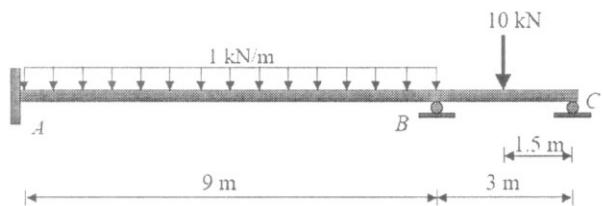


OR

Q4) Obtain strain-displacement matrix for the isoparametric quadrilateral element as shown in Figure [16]

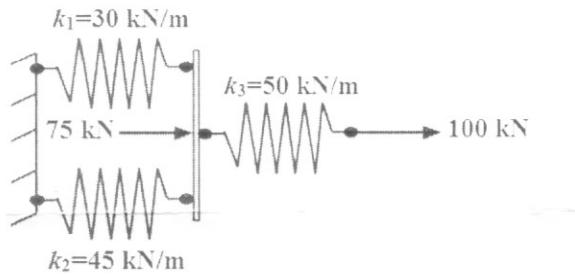


Q5) Analyze the continuous beam ABC as shown in figure using finite element method. Take EI constant. [16]



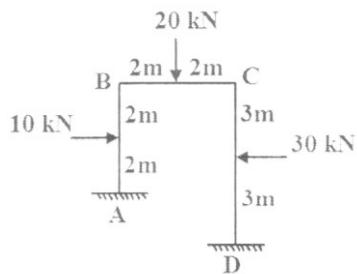
OR

- Q6) a)** Determine elongations at each node of the spring assembly as shown in figure. [10]



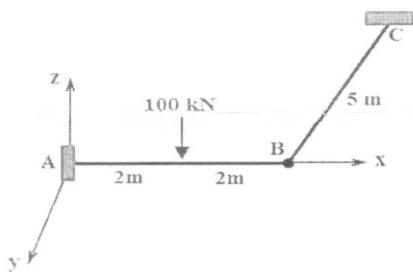
- b) Derive stiffness matrix of two nodded bar element using principle of virtual work. [6]

- Q7)** Analyze the portal frame ABCD as shown in figure using finite element method. Neglect axial deformation. Take EI constant. [18]



OR

- Q8)** Determine unknown joint displacements of the grid structure as shown in figure using finite element method. $EI = 700 \text{ kNm}^2$ and $GJ = 350 \text{ kNm}^2$. [18]



Total No. of Questions : 10]

SEAT No. :

P4773

[Total No. of Pages : 2

[5561]-521

B.E. (Civil)

AIRPORT & BRIDGE ENGINEERING (Elective - III)
(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, Q.9 or Q.10.
- 2) Figures to the right side indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume suitable data if necessary.
- 5) Use of non-programmable scientific calculators is allowed.

Q1) a) With a neat sketch explain the rolling and pitching movement of an aircraft. [5]

b) Differentiate between minimum circling radius and minimum turning radius. [5]

OR

Q2) a) Highlight the importance of ATC in an airport. [5]
b) How is orientation of runway done using Type I Wind rose Diagram? [5]

Q3) a) What are the factors that influence the site location of an airport? [5]
b) Describe any two design factors which are considered while determining the thickness of airport pavement. [5]

OR

Q4) a) At an airport site at sea level with standard atmospheric conditions, the basic runway length is 2200m. The proposed airport is situated at an altitude of 150m. If the airport reference temperature is 25 degree Celsius, calculate the length of the runway to be provided after [5]
i) Correction for elevation and
ii) Correction for temperature.
b) Write a note on Airport Drainage. [5]

P.T.O.

- Q5)** a) Write a note on the obstruction clearance requirements of a heliport. [5]
b) write a note on the characteristics of a helicopter. [5]
c) What is the purpose of providing marking in heliports? Explain with a sketch briefly how it is done. [8]

OR

- Q6)** a) What are the two minimum requirements with respect to lighting of heliports? [5]
b) What are the factors to be considered while selecting a site for the proposed heliport in an urban area? [5]
c) With a sketch describe a typical layout of a heliport of the multi-engine helicopter. [8]

- Q7)** a) A bridge is proposed to be constructed across an alluvium stream carrying a discharge of $350 \text{ m}^3/\text{sec}$. Assuming the value of silt factor $f = 1.00$, determine the maximum scour depth when the bridge consists of 5 spans, each of 20 m. [6]
b) Write a note on requirements of traffic in the design of highway bridges. [5]
c) Define an 'abutment'. With a neat sketch, describe an abutment with wing walls. [5]

OR

- Q8)** a) What do you mean by afflux? State why it is necessary to calculate the afflux while designing a bridge. [5]
b) Explain the significance of buoyancy pressure and dead load for the design of the bridge. [5]
c) How is maximum flood discharged of a river determined by direct method? [6]

- Q9)** a) Discuss the importance of three types of movable bridges justifying their use under certain conditions. [6]
b) State the purposes of providing bearing in bridges. [5]
c) Explain in brief the procedure for erection of bridges. [5]

OR

- Q10)** a) Differentiate between temporary and permanent bridges with the help of an example. [5]
b) Describe with the help of neat sketches : [6]
i) Bascule Bridge
ii) Suspension Bridge
c) Define a 'culvert'. Describe any one type of culvert in brief. [5]



Total No. of Questions : 10]

SEAT No. :

P3871

[5561]-522

[Total No. of Pages : 2

B.E. (Civil)

CONSTRUCTION MANAGEMENT

(2015 Pattern) (End Semester) (Semester - II) (Elective - IV) (401010A)

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.
- 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 Selection and appointment process of Project Management Consultant. [5]

b) Explain Line of balance technique with suitable example. [5]

OR

Q2) a) Explain the role of Infrastructure development in Employment generation. [5]

b) Explain Importance and Difficulties in Capital Investments. [5]

Q3) a) Explain the need and importance of labour laws in construction industry. [5]

b) Explain Building and other construction workers act 1996. [5]

OR

Q4) a) Explain the Objectives of Work measurement and Work Study. [5]

b) Explain the Profit loss statement with suitable example. [5]

Q5) a) Explain Sensitivity analysis and Decision tree analysis. [8]

b) Explain the Energy cost escalation and its impacts. [8]

OR

Q6) a) Explain Value engineering and Value management. [8]

b) How mathematical model will be useful in risk management. [8]

P.T.O.

- Q7)** a) Write short note on: Buyers supply relationship, EOQ Model. [10]
b) Explain the Importance of Human Resource management in Construction industry. [8]

OR

- Q8)** a) Explain the role of ERP in Material Management. [8]
b) Explain Job Evaluation and Performance appraisal. [10]

- Q9)** a) Explain with example “Artificial Neural Network”. [8]
b) What do you mean by Fuzzy Logic? State its applications in civil engineering. [8]

OR

- Q10)** a) Explain ANN & applications in civil engineering. [8]
b) Explain Genetic Algorithm with suitable example. [8]

X X X

Total No. of Questions : 10]

SEAT No. :

P3872

[5561]-523

[Total No. of Pages : 5

B.E. (Civil)

**ADVANCED TRANSPORTATION ENGINEERING
(2015 Pattern) (Semester - II) (Elective - IV) (401010 B) (Theory)**

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) Differentiate between growth factor models and synthetic models of trip distribution. [5]

b) Discuss how the road side interview method is conducted. Mention the informations that are collected during the survey. [5]

OR

Q2) a) Write a note on the concept of Hyperloop. [5]

b) State the need and objectives of Traffic System Management. [5]

Q3) a) Suggest any two transport policies that will increase the use of public transportation. [6]

b) Explain the concept of congestion pricing. [4]

OR

Q4) a) How does Intelligent Transportation System (ITS) help in traffic management of the city. [5]

b) Explain the First Year Rate of Return (FYRR) method of economic evaluation. Also mention the criteria for deciding the priority of projects based on FYRR. [5]

P.T.O.

- Q5)** a) What are the various steps involved in traffic accident studies? What is the outcome of such a study? [8]
- b) What do you mean by PCU? During a traffic survey the following data was recorded on a road network: [8]
- i) Two wheelers - 1000
 - ii) Cars - 600
 - iii) Buses - 300
 - iv) Auto - 250
 - v) and Cycle -50
- 1) Work out PCU using IRC 106-1990.
 - 2) How would you use the obtained data in planning of the road network?

OR

- Q6)** a) With a help of a neat sketch, explain the significance of Level of Service 'A' and 'F' of a road. [5]
- b) Enumerate the various factors to be considered while designing a bicycle network? [5]
- c) Explain the process of carrying out traffic volume count using any two modern sensing techniques. [6]

- Q7)** a) How is Pavement Management System useful for the maintenance of roads? [5]
- b) Design a flexible pavement as per IRC 37-2012 for the construction of a new road on following data. Draw a typical cross-section showing all the basic layers. [12]
- i) Dual two lane carriageway.
 - ii) Initial traffic in the year of completion of construction = 2600 CVPD in one direction
 - iii) Traffic growth rate per annum = 6%.
 - iv) Design life = 10 years.
 - v) CBR of soil below the 500 mm of subgrade = 2.5%
 - vi) CBR of the 500 mm of the subgrade from the borrow pits = 20%
 - vii) VDF = 4.5

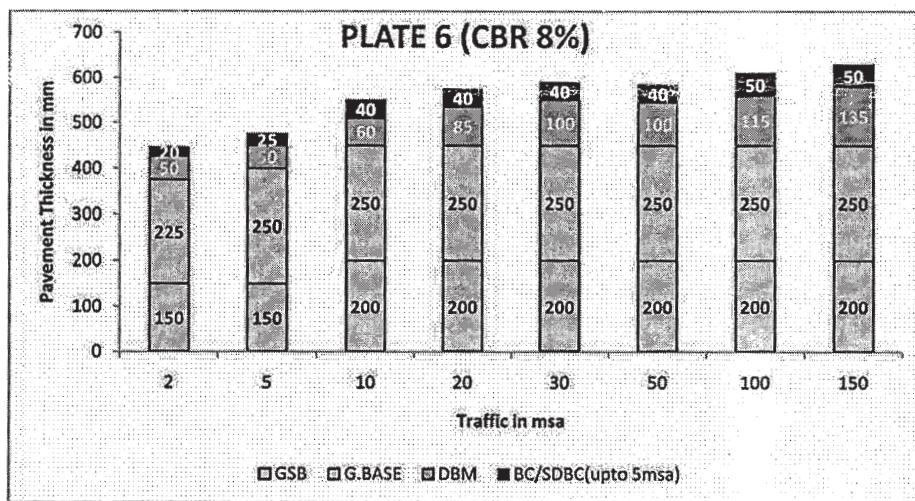
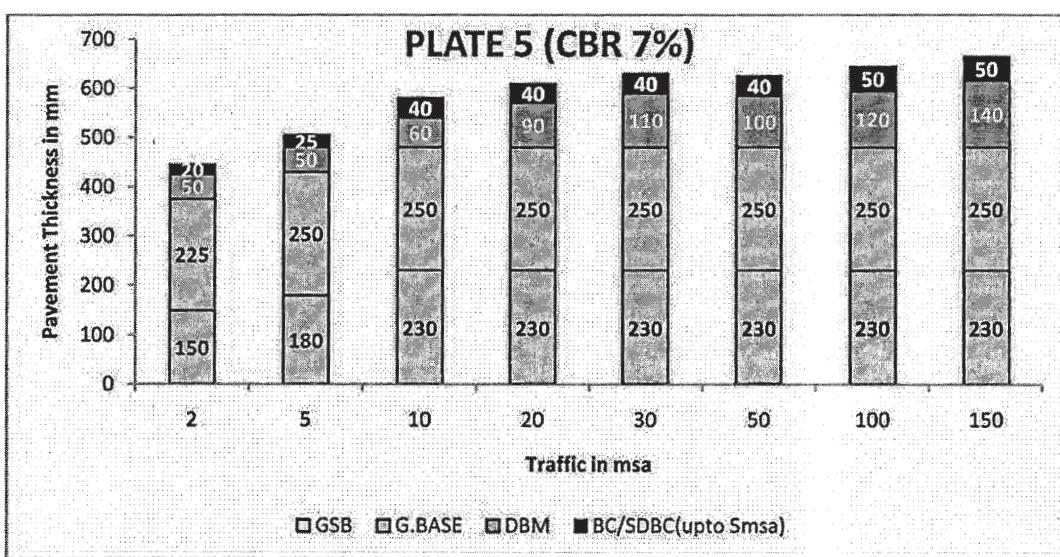
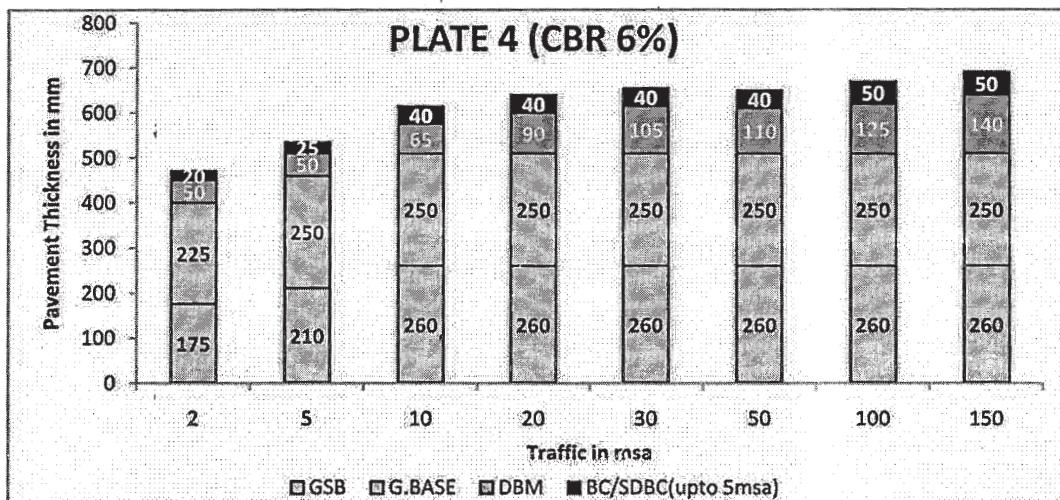
OR

- Q8)** a) With reference to Benkelman beam deflection study, explain. [6]
- i) Correction for pavement temperature.
 - ii) Correction for seasonal variation in subgrade moisture content.
- b) With neat sketches, define [6]
- i) Rutting
 - ii) Block Cracking and
 - iii) Patching
- c) Write a note on ‘Vehicle Damage Factor’. [5]

- Q9)** a) Design the tie bars considering deformed bars for the following data:[10]
- i) Slab thickness = 0.32 m
 - ii) Lane width = 3.5 m
 - iii) Coefficient of friction = 1.5
 - iv) Density of concrete = 25kN/m³
 - v) Allowable tensile stress in deformed bars = 200 MPa
 - vi) Allowable bond stress in deformed bars = 2.5MPa
 - vii) Diameter of tie bar = 14 mm
- b) Explain the role of dowel bars in cement concrete pavements. [7]

OR

- Q10)**a) Enumerate the design steps for estimating the thickness of the overlay as per IRC 81. [10]
- b) Explain the severity levels and extent level of distress in rigid pavements with the help of an example. [7]



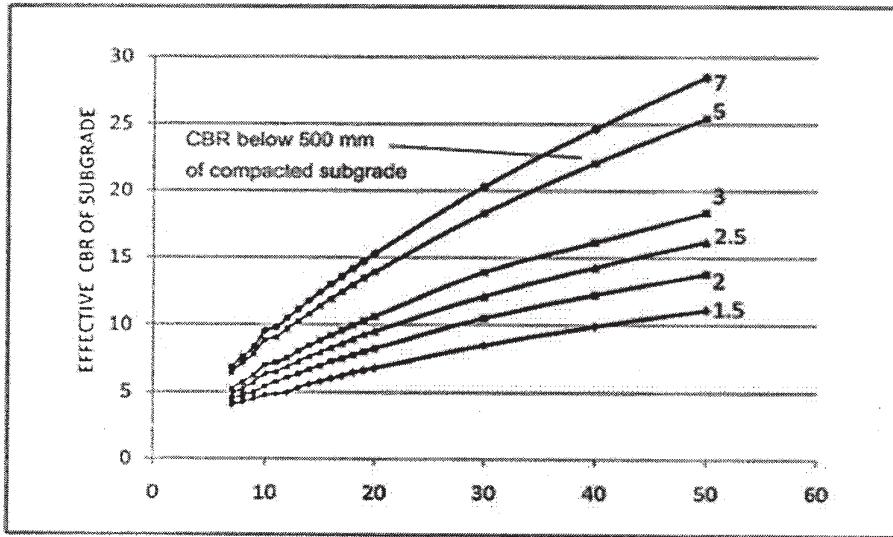
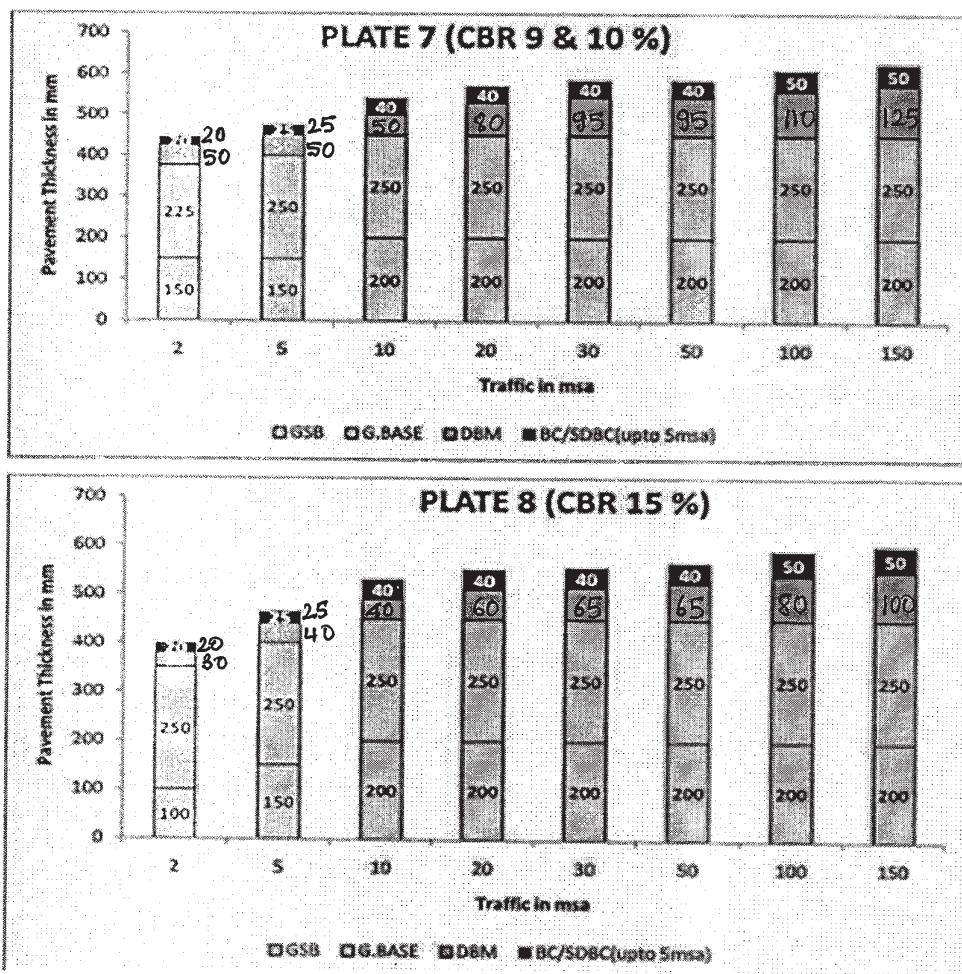


Fig. 5.1 CBR of Compacted Borrow Material 500 mm Thick



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Total No. of Questions : 8]

SEAT No. :

P5574

[Total No. of Pages : 3

[5561]-524

B.E. (Civil)

**ADVANCED FOUNDATION ENGINEERING
(2015 Pattern) (Semester - II) (Elective - IV)**

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.

Q1) a) Draw a typical layout of canal with all technical details and explain the functions of each component. Also state the IS code provisions for the construction of canals. [6]

- b) Draw a neat sketch of cyclic load test and explain how bearing load and frictional resistance is evaluated by this test. [7]
- c) Draw a typical layout of under reamed pile foundation with two bulbs. Also, write a formula to estimate load carrying capacity of under reamed pile foundation and write the meaning of each term in the formula. [7]

OR

Q2) a) Explain spacing and depth of bore holes as per IS standards for exploration of dams, Highways and bridges with proper justification of each. [6]

- b) What are the situations where tensile piles are used. Explain the design guidelines for piles subjected to tensile loads. [7]

P.T.O.

- c) Explain any one field method for estimation of load carrying capacity of under reamed pile foundation with suitable sketch. Also explain the test result and interpretation of data from the field test. [7]

Q3) a) Explain effect of eccentric and inclined loadings on shallow foundation. How it is accounted. [8]

- b) Explain the term “raft foundation” is called a floating foundation. Also, elaborate the design of raft foundation on Sandy Soil from the data obtained by SPT test. [9]

OR

Q4) a) Write and explain the equations proposed by Terrraghi for estimation of safe bearing pressure for strip footing, square footing circular footing and rectangular footings. [8]

- b) Explain various components of total settlement. Also explain how immediate settlement and settlement due to primary consolidation is evaluated. [9]

Q5) a) Explain the design parameters of rockfill dam with respect to (i) Top width (ii) Side slope (iii) Base width and (iv) Settlement with suitable sketch and proper justification [8]

- b) Explain Terraghis analysis for estimation of depth of well foundation and ultimate bearing capacity. [9]

OR

Q6) a) What is tilt and shifts in case of well foundation? What are the tolerable limits of tilt and shift. Also, explain the corrective measures adopted to counter-act tilt and shift. [8]

- b) What are the various types of coffer dams. Explain typical situations where coffer dam is constructed. [9]

- Q7)** a) Explain the stress distribution in the vicinity of vertical shaft in an elastic equilibrium with respect to (i) vertical stress (ii) horizontal radial stress and (iii) horizontal circumferential stress. [8]
- b) Write a short note on Imperfect ditch conduit and situations where it is used. [8]

OR

- Q8)** a) What is positive projecting conduit. Explain the various types of positive projecting conduit. Explain any one in detail. [8]
- b) Explain the stress distribution around tunnels situated at a great depth below the ground surface for (i) Elastic case and (ii) plastic case. [8]



Total No. of Questions : 12]

SEAT No. :

P5575

[Total No. of Pages : 3

[5561]-525

B.E. (Civil)

COASTAL ENGINEERING (Elective - IV)
(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 side indicate full marks.*
- 3) *Use of calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) Short note on Stokes wave theory. [3]

b) Enlist assumptions made in wave theories. [4]

OR

Q2) a) Derive expression for group wave velocity. [3]

b) Define celerity, group velocity, dynamic free surface boundary condition. [4]

Q3) a) Explain the process of tidal power generation in short. [3]

b) Derive expression of generation of tide using Dynamic theory. [4]

OR

Q4) a) Distinguish between tides in rivers -estuaries and tides in shallow sea.[3]

b) Write assumptions in tidal theory. [4]

Q5) a) Enlist different factors affecting the littoral process. [3]

b) What are different bed forms and their characteristics? [3]

P.T.O.

OR

Q6) a) What is wave induced sediment? Enlist any two effects of such sediment on shoreline. [3]

b) What are the effects of high tides on stability of inlets? [3]

Q7) a) Draw neat diagram of stepped face sea wall and explain in depth. [5]

b) What are revetments? Why the revetments are provided? Classify the revetments on functional basis. [5]

c) Write a note on Rubble mound jetties. Draw neat diagram. [6]

OR

Q8) a) Draw neat diagram of curved face sea wall and explain in depth. [5]

b) Write a note on Rubble mound jetties. Draw neat diagram. [5]

c) Explain the designing aspects of three structural types of bulkheads (concrete, steel and timber). [6]

Q9) a) Enlist different feasibility criteria of dumping ground for dredged materials. [5]

b) What are the causative parameters which affect a lot on dredging of material in different coastal zones? [5]

c) Elaborate in detail different types of dredges and their applicability in different situations. [6]

OR

Q10) a) Explain the necessity of dredging in coastal zones. [5]

b) Explain any one method of disposal of dredged materials. [5]

c) Explain various environmental aspects of dredging with good effects and bad effects. [6]

- 11)** a) Write a detail note on “pollution in Coastal zone”. [6]
b) What are the different methods for disposal of waste (dredged spoils) in coastal zone. [6]
c) What are the design criteria for coastal outfall systems. [6]

OR

- Q12)** a) Explain in detail any case study of oil spill to quantify its effects on coastal ecosystem. [6]
b) What are the different factors affecting the growth of coastal zone considering to regulate the space as criterion and pollution as criterion. [6]
c) Explain the necessity to regulate the coastal zone. How coastal area is regulated in different zones? [6]



Total No. of Questions : 10]

SEAT No. :

P3873

[5561]-526

[Total No. of Pages : 2

B.E. (Civil)

**PLUMBING ENGINEERING
(2015 Course) (Semester - II) (Open Elective - IV)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or Q.8 and 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) Translate the role of Plumber. [6]

b) State Components of Plumbing required for rain water harvesting. [4]

OR

Q2) a) Define Plumbing and state the job of Plumbing Consultant. [5]

b) Explain Principles of Plumbing. [5]

Q3) a) Discuss the types of water supply pipes. [5]

b) Relate CPVC and Rigid PVC Pipes. [5]

OR

Q4) a) Explain Stainless steel pipes in plumbing Industry and State its Advantages. [5]

b) How does solar water heater works? [5]

Q5) a) Explain horizontal wet vent and vertical wet vent with neat sketches. [8]

b) State the trap requirements as per uniform plumbing code for [10]

- i) Design of Trap
- ii) Trap Seal and Trap Seal Protection
- iii) Trap Setting and Protection

OR

P.T.O.

- Q6)** a) Explain Purpose of trap and State its types with Suitability. [10]
b) Write a note on following. [8]
i) Grease Interceptors
ii) Sand Interceptors

- Q7)** a) Explain sizing of house drain and sizing of its vent pipe. [8]
b) Write a note on following. [8]
i) Septic tank
ii) Manholes

OR

- Q8)** a) Explain drainage air test and drainage water test procedure. [8]
b) Explain types of building sewer pipes with its suitability. [8]

- Q9)** a) Explain design of Plumbing system for multi- story Building. [8]
b) Explain basic guide to calculate falls and gradients for drainage. [8]

OR

- Q10)** a) Explain High rise building and Multi-story tanks [8]
b) Write a note on following. [8]
i) Centralized hot water supply.
ii) Pressure Reducing valves.

X X X

Total No. of Questions : 9]

SEAT No. :

P3874

[5561]-527

[Total No. of Pages : 2

B.E. (Civil Engineering)

GREEN BUILDING TECHNOLOGY

(2015 Course) (Semester - II) (End Semester) (Elective - IV)

(Open Elective) (401010B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any 7 questions
- 2) Figures to the right indicate full marks.
- 3) Your answers will be valued as a whole.
- 4) Assume suitable data, if necessary.

Q1) a) Enlist the Eco Friendly building materials and give their advantages. [6]

b) Discuss in details about Resource Economics. [4]

Q2) a) What is Sustainable Site planning? Explain in details. [6]

b) What are Thermal comfort indices? Discuss. [4]

Q3) a) Differentiate with example the active and passive architecture. [6]

b) Discuss about Climate Responsive Architecture. [4]

Q4) a) Discuss about Thermal comfort indices. [5]

b) What is mechanical ventilation? Give its merits and demerits. [5]

Q5) a) Discuss the followings [6]

- i) Life Cycle assessment of materials
- ii) Energy Management

b) Explain in short about Environmental Impact Assessment. [4]

P.T.O.

Q6) a) What is mean by embodied energy of construction materials? [5]

b) Give the procedure for Energy Audit. [5]

Q7) a) Give note on the followings [6]

i) Water Conservation

ii) Photovoltaic Cells

iii) Biogas plant

b) Discuss in detail the orientation aspects in site planning. [4]

Q8) a) What is clean development mechanism? [4]

b) Discuss how the Kyoto protocol is beneficial for sustainable environment. [6]

Q9) a) Explain how conservation of energy in building is useful? [4]

b) Discuss the following in detail [6]

i) LEED India.

ii) CASBEE.

X X X

Total No. of Questions : 8]

SEAT No. :

P5576

[Total No. of Pages : 2

[5561]-528

B.E. (Civil)

**FERROCEMENT TECHNOLOGY
(2015 Pattern) (Open Elective - IV)**

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.*

Q1) a) Define ferrocement and discuss “Ferrocement” as substitute for conventional bids material? [7]

b) Explain in detail the various properties of ferrocrete under dynamic loading condition? [7]

c) Discuss following forms in nature which can be used in ferrocement technology, i) Petal of a rose flower ii) Raindrop [6]

OR

Q2) a) Write note on properties of raw materials used for ferrocement technology? [7]

b) What are the protective surface treatments used for ferrocrete structures? [7]

c) What are the differences in the analysis/design of ferrocement with conventional reinforced concrete? [6]

Q3) a) What are the specifications for a ferrocrete water tank and ferrocrete double wall? [8]

b) Explain in detail the various types of ferrocrete roofs used in construction industry? [9]

P.T.O.

OR

- Q4)** a) Explain the various factors governing for cost analysis of ferrocement? [8]
b) Explain various applications of ferrocement in building construction with examples? [9]

- Q5)** a) Write a short note on fabrication and casting of cylindrical water storage tanks along with the special hints of construction? [8]

- b) Explain in detail the different types of retaining walls? [9]

OR

- Q6)** a) Explain in detail use of ferrocement for waterproofing treatment and out coating. [8]

- b) Explain in detail with a neat sketch arch shaped ferrocement counterfort retaining wall? [9]

- Q7)** a) Explain in detail about large size domes, conical domes and large size hemispherical thermally insulated dome? [8]

- b) Discuss factors which affect the choice of casting between precast and cast in-situ construction? [8]

OR

- Q8)** a) Discuss the suitability of ferrocement for pyramids and large size pipes? [8]

- b) What are the benefits of ferrocement for precasting? Explain with a neat sketch various ferrocement precast elements. [8]



Total No. of Questions : 10]

SEAT No. :

P3875

[5561]-529

[Total No. of Pages : 2

B.E. (Civil)

**SUBSEA ENGINEERING
(2015 Course) (Semester - II) (End Sem) (Open Elective - IV)**

Time : 3 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 sketches must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of non-programmable calculator.
- 5) Assume suitable data, if necessary.

Q1) Differentiate and Explain subsea oil and non subsea oil extraction. [10]

OR

Q2) a) Sketch engineering components of typical subsea establishment for oil exploration. [4]

b) Explain the over view of oil and gas industry Internationally and Nationally. [6]

Q3) a) Explain role of Civil Engineer in constructing sub sea oil establishment.[6]

b) Differentiate technical aspects of shallow and deep water oil exploration. [6]

OR

Q4) a) Explain relation between major components of subsea production system with the help of suitable flow chart. [6]

b) State effect of shallow water and deep water oil exploration on production system. [6]

Q5) a) Enlist subsea systems with purpose/function of each in oil exploration process. [8]

b) Explain role of unmanned and manned intervention method for subsea oil exploration. [7]

OR

P.T.O.

- Q6)** a) Explain forces acting on deep sea, and shallow subsea pipe line system. [9]
b) Explain ROV and its application in subsea engineering. [6]

- Q7)** a) Explain with suitable illustration economic decision in field development. [8]
b) Explain civil engineering risks at field development. [9]

OR

- Q8)** a) Classify foundations required at subsea establishments. [9]
b) State typical load considerations for subsea foundation design. [8]

- Q9)** a) Sketch typical FBD of charismas tree structures and typical loads acting on it. [8]
b) Discuss typical design options available for deep water pipe riser design. [8]

OR

- Q10)** a) Explain design steps, for pipe line under subsea to carry multi-phase fluid. [8]
b) Explain the charismas tree and its functioning in subsea system. [8]

X X X

Total No. of Questions : 10]

SEAT No. :

P4763

[Total No. of Pages : 2

[5561]-530

B.E. (Civil) (Semester - II)
GEOINFORMATICS
(2015 Pattern) (Open Elective)

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) Write short note on segments and errors in GPS. [4]

b) What is remote sensing? What are the stages of Remote Sensing? [6]

OR

Q2) a) Explain why raster model is well suited for spatially continuous variables giving suitable examples. [4]

b) What is GIS? Explain in detail its components. [6]

Q3) a) Explain in brief, Hardware and Software requirement in GIS. [4]

b) Write short note on : [6]

- i) Thermal Remote Sensing
- ii) Microwave Remote Sensing

OR

Q4) a) Explain in detail the supervised classification technique employed in Digital Image Processing (DIP). [4]

b) Write short note on : [6]

- i) image enhancement
- ii) image classification
- iii) object recognition

P.T.O.

- Q5)** a) Write short note on Raster handling and Image analysis. [6]
b) Comment on, GRASS as an open source GIS. [6]
c) Write short note on Intersecting and clipping vector maps. [6]

OR

- Q6)** a) Explain Raster data transformation and interpolation using GRASS. [6]
b) Comment on, QGIS as an open source GIS. [6]
c) Write short note on WEB Mapping Architecture and components. [6]

- Q7)** a) What is a Map? Explain different types of Map Projection systems and its need. [6]
b) Write short note on Map Resolutions. [6]
c) Write short note Map co-ordinate systems. [4]

OR

- Q8)** a) Write notes on : [6]
i) Map Features.
ii) Map scale and its importance.
b) Describe various geometric characteristics of an aerial photograph and explain the methods of measurement of scale and height on an aerial photograph. [6]
c) Comment on projections for hemispheres and the world maps. [4]

- Q9)** a) Define Geodesy, explain Problem and purpose of Geodesy. [6]
b) Write short note on Historical development and Organization of Geodesy. [6]
c) Write short note on Reference Surfaces and their relationship. [4]

OR

- Q10)**a) Differentiate between Three-dimensional geodesy and Four-dimensional geodesy. [6]
b) Explain the Relationship between Radius of curvature in the meridian & prime vertical. [6]
c) Write properties of Geodesy. [4]



Total No. of Questions : 8]

SEAT No. :

P3876

[5561]-531

[Total No. of Pages : 4

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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Draw ISO symbols for the following components: [6]

- i) 3x2 pneumatically double pilot operated DCV
 - ii) Double acting hydraulic Intensifier
 - iii) Counterbalance valve with bypass & check valve
 - iv) Twin Pressure valve
 - v) Quick Exhaust valve
 - vi) Bi-directional variable displacement hydraulic motor
- b) A hydraulic pump delivers 12 L of fluid per minute against a pressure of 200 bar. [8]

- i) Calculate the hydraulic power.
- ii) If the overall pump efficiency is 60%, what size of electric motor would be needed to drive the pump?

OR

Q2) a) What are the functions of reservoirs? Draw a neat sketch of standard reservoir showing its Internal and External features. [6]

b) What is cushioning of a cylinder? Explain the cushioning mechanism using integral bypass circuit. [8]

P.T.O.

- Q3)** a) Explain with neat sketch working of sequence valve. Draw an ISO symbol of it. [6]
- b) Explain features of different centre positions of DCV with ISO symbols [8]
- c) Explain pressure compensated flow control valve with neat sketch. [6]

OR

- Q4)** a) Draw a hydraulic circuit for cylinder synchronization with two cylinders connected in series. State, if it will give perfect synchronization. [8]
- b) What is filter rating? Explain Beta rating and efficiency of the filters. [6]
- c) What is contamination? Explain the sources of contamination. [6]

- Q5)** a) Differentiate between Pneumatic and hydraulic power transmission. [4]
- b) Draw and explain pneumatic circuit for quick exhaust. [6]
- c) Give the classification of air compressors. Why multistage compression is needed? [8]

OR

- Q6)** a) Explain the working of air lubricator with suitable diagram. [4]
- b) Draw a typical circuit showing the application of Shuttle Valve. [6]
- c) Draw pneumatic circuit to explain two hand operation of Single acting cylinder using twin pressure valve. [8]

- Q7)** a) A machine tool cross slide is powered by means of a hydraulic system. The motion of the cylinder is as follows: [12]
- Initially it moves through a distance of 200mm against an effective load of 20000N in about 5 seconds.
 - It is followed by a working stroke of another 200mm against an effective load of 30000N. The feed rate during this part of the stroke is required to 1.2 m/min.
 - The load during the return stroke is 20000N.

A meter in type circuit is used. Draw and design hydraulic circuit which will fulfill the requirements.

- b) Analyze the following circuit by naming the components used. [6]

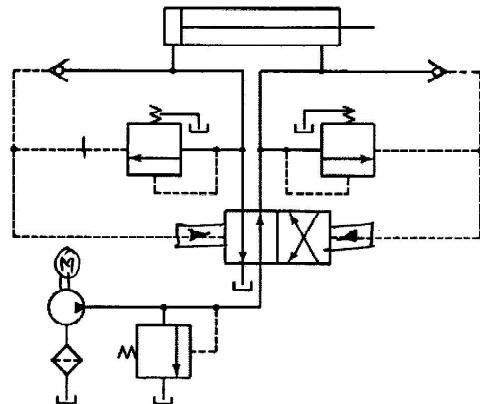


Fig. 7 (b)

OR

- Q8) a)** A plastic component is to be embossed by using a die which is powered by a double acting cylinder. The return of the die is to be effected when the cylinder rod has fully extended to the embossing position and the preset pressure is reached. A roller lever valve is to be used to confirm full extension. The signal for retracting must only be generated when the piston rod has reached the embossing position. The pressure in the piston chamber is indicated by a pressure gauge. Develop pneumatic circuit using sequence valve, 3/2 roller valve, 3/2 push button valve and 5/3 DCV. [10]

- b) Analyze the following circuit and label the components. [8]

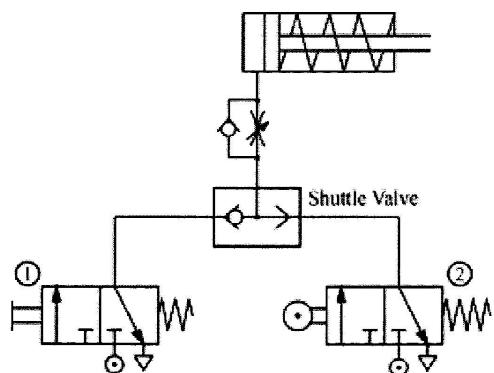


Fig. 8 (b)

DATA

1. Suction Strainer :

Model	Flow Capacity (lpm)
S ₁	38
S ₂	76
S ₃	152

2. Pressure Gauge :

Model	Range (bar)
PG ₁	0 - 25
PG ₂	0 - 40
PG ₃	0 - 100
PG ₄	0 - 160

3. Vane Pump :

Model	Delivery in l / pm		
	at 0 bar	at 35 bar	at 70 bar
P ₁	8.5	7.1	5.3
P ₂	12.9	11.4	9.5
P ₃	17.6	16.1	14.3
P ₄	25.1	23.8	22.4
P ₅	39.0	37.5	35.5

4. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (lpm)
F ₁	70	0-4.1
F ₂	105	0-4.9
F ₃	105	0-16.3
F ₄	70	0-24.6

5. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (lpm)
C ₁	210	15.2
C ₂	210	30.4
C ₃	210	76

9. Cylinder (Max Working Pressure-210 bar)

Model	Bore dia. (mm)	Rod dia. (mm)
A ₁	25	12.5
A ₂	40	16
A ₃	50	35
A ₄	75	45
A ₅	100	60

2. Relief Valve :

Model	Flow capacity (lpm)	Max Working Pressure & bar
R ₁	11.4	70
R ₂	19	210
R ₃	30.4	70
R ₄	57	105

6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (lpm)
D ₁	350	19
D ₂	210	38
D ₃	210	76

8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (lpm)
PO ₁	210	19
PO ₂	210	38
PO ₃	210	76

10. Oil Reservoirs :

Model	Capacity (litres)
T ₁	40
T ₂	100
T ₃	250
T ₄	400
T ₅	600

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Total No. of Questions : 10]

SEAT No. :

P3877

[Total No. of Pages : 3

[5561]-532

B.E. (Mechanical)

REFRIGERATION AND AIR-CONDITIONING
(2015 Course) (Semester-I) (302049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer three questions out of 6.
- 2) Solve Q1 or 2, Q3 or 4, Q5 or 6.
- 3) All the three questions should be solved in one answer book and attach extra supplements if required.
- 4) Draw Diagrams wherever necessary.
- 5) Use of steam table and scientific calculator is allowed.
- 6) Assume suitable data wherever necessary.

Q1) a) State desirable properties of refrigerants. [5]

b) Write a short note on “Concept of Cold chain”. [5]

OR

Q2) An ammonia refrigeration machine operated between the temperature limits - 15°C and 30°C. The machine circulates 4.5 kg/min. There is no undercooling. The temperature after isentropic compression is 75°C. Determine [10]

- i) COP
- ii) ice produced in kg/hr from water at 20°C and ice at -5°C
- iii) Quality of refrigerant entering the compressor.

Assume $C_{pv} = 2.85 \text{ kJ/kg/K}$ for ammonia. C_p of ice = 2.1 kJ/kgK. Also find displacement volume required for compressor in m^3/min .

Ts(°C)	h _f (kJ/kg)	h _g (kJ/kg)	S _f (kJ/kgK)	S _g (kJ/kgK)	v _f (m ³ /kg)	v _g (m ³ /kg)
-15	112.3	1426	457	5.549	0.00152	0.509
30	323.1	1469	1.204	4.984	0.00158	0.111

P.T.O.

Q3) a) Explain the working of simple vapour absorption system. [5]

b) Explain the need of multipressure systems. [5]

OR

Q4) Explain single compressor with multiple evaporator and multiple expansion valves system with ph- and Ts diagram. [10]

Q5) a) Describe the process of adiabatic mixing of two streams of air. [6]

b) Explain the term [10]

- i) relative humidity
- ii) specific humidity,
- iii) absolute humidity
- iv) degree of saturation
- v) dew-point temperature

OR

Q6) a) In a laboratory test a psychrometer recorded 36°C DBT and 30°C WBT calculate [12]

- i) vapor pressure
- ii) relative humidity
- iii) specific humidity
- iv) degree of saturation
- v) dew point temperature
- vi) enthalpy of the mixture.

b) Explain “Thermodynamics of human body” [4]

- Q7)** a) Explain all water air-conditioning system with neat sketch. [8]
b) Explain the construction working of DX-type evaporator. [8]

OR

- Q8)** a) Discuss classification of air-conditioning. [4]
b) Explain construction working of electronic expansion valve. [6]
c) Explain construction working of scroll compressors. [6]

- Q9)** a) A circular duct of 250 mm is selected to carry air in an air conditioned space at a velocity of 240m/min to keep the noise at desired level. If this duct is to be replaced by rectangular duct of aspect ratio of 1.4, find the size of the duct for equal friction method when [12]
i) Velocity of air in two ducts is same and
ii) Discharge of air in two ducts is same if $f = 0.015$, find pressure loss per 100m length of duct. Take air density as 1.15 kg/m^3 .
b) What are the desirable properties of ideal duct materials? [6]

OR

- Q10)** a) Write a note on classification of duct and explain air flow through simple duct system. [10]
b) Explain Equal Friction Method of Duct Design. List its advantages and disadvantages. [8]

X X X

[5561]-533**B.E. (Mechanical)****CAD CAM AND AUTOMATION****(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 side indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of calculators is allowed.*

- Q1)** a) Discuss the necessity of mapping geometric models. [5]
 b) Discuss Perspective projection of 3D model on 2D plane. [5]

OR

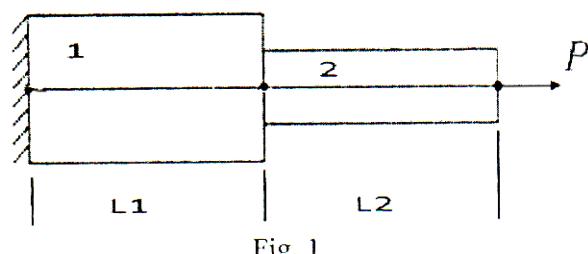
- Q2)** a) A line PQ with vertices P (2,5), Q (6, 7) is rotated by 40° in counter clockwise direction about a point P (2, 2) determine the new coordinates. [5]
 b) Discuss Boundary Representation for solid modeling. [5]

- Q3)** a) Discuss types of synthetic surface modeling techniques. [5]
 b) A line is represented by the endpoints P (4, 6) and Q (-3, 12). If the value of Parameter u at P and Q is 0 and 1 respectively, determine the equation of the line. Also determine the coordinate of point on the line at $u = 0.2$, 0.4 and 0.6 . [5]

OR

- Q4)** A step bar as shown in fig. 1, The loading is initially done at 20°C . The temperature then rises to 60°C . Determine the nodal displacements and the elemental stresses developed using 1D elements. [10]

$$\begin{aligned} E_1 &= 72 \text{ GPa}, E_2 = 210 \text{ GPa}, \alpha_1 = 23 \times 10^{-6} \text{ per } {}^\circ\text{C}, \alpha_2 = 12 \times 10^{-6} \text{ per } {}^\circ\text{C}. \\ A_1 &= 300 \text{ mm}^2, A_2 = 200 \text{ mm}^2, L_1 = L_2 = 150 \text{ mm}, P = 10 \text{ kN}. \end{aligned}$$



- Q5)** a) Discuss use of subroutine and looping in CNC programing. [8]
 b) Write CNC program using G and M codes to turn the component shown in fig. 2 having Stock size is \varnothing 40mm. Use canned cycles wherever applicable. Assume suitable data for speed and feed. [10]

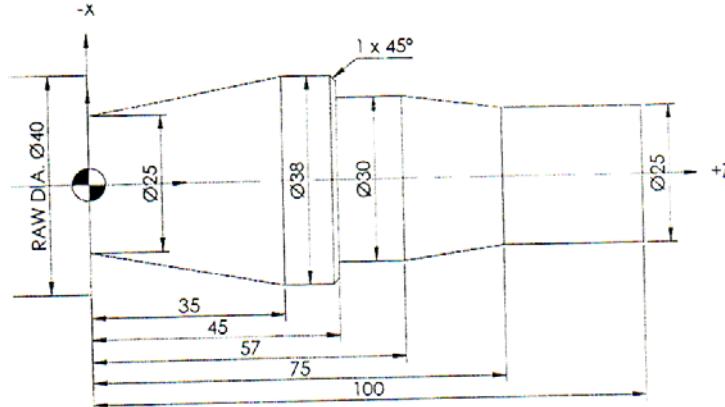


Fig. 2

OR

- Q6)** a) Write CNC program using G and M codes to contour, face and drill the component shown in fig. 3. Use canned cycles wherever applicable. Thickness of blank is 7mm. Assume suitable data for speed and feed.[10]

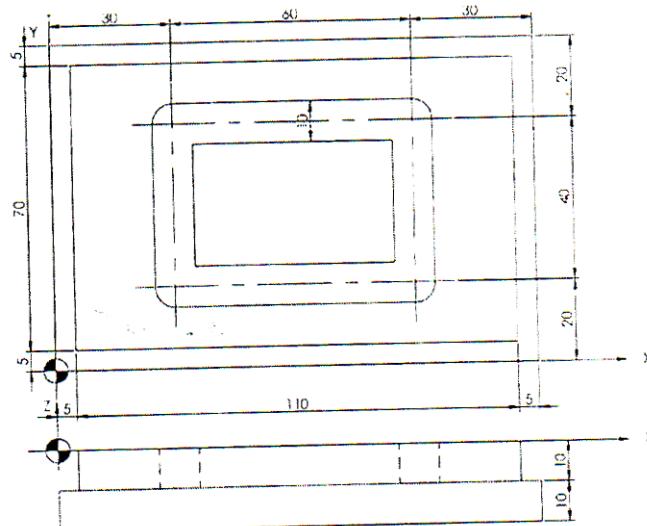


Fig. 3

- b) Discuss coordinate system of Vertical Machining Center and Horizontal Machining Center. [8]

- Q7)** a) Discuss the elements of Product Life Cycle. [8]
b) Discuss the application, advantages and disadvantages of Stereo Lithography. [8]

OR

- Q8)** a) Explain working principle of Fused Deposition method for rapid prototyping. [8]
b) Discuss Collaborative Engineering with suitable example. [8]

- Q9)** a) Discuss hard and soft automation. [8]
b) Discuss robot anatomy with neat sketch. [8]

OR

- Q10)** a) Discuss Concepts of Computer Integrated Manufacturing in brief. [8]
b) Discuss need and application of Automated guided vehicle. [8]



Total No. of Questions : 10]

SEAT No. :

P3879

[5561]-535

[Total No. of Pages : 4

B.E.(Mechanical)

FINITE ELEMENT ANALYSIS

(2015Pattern) (Semester - I) (End Sem.) (Elective - I) (402044A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

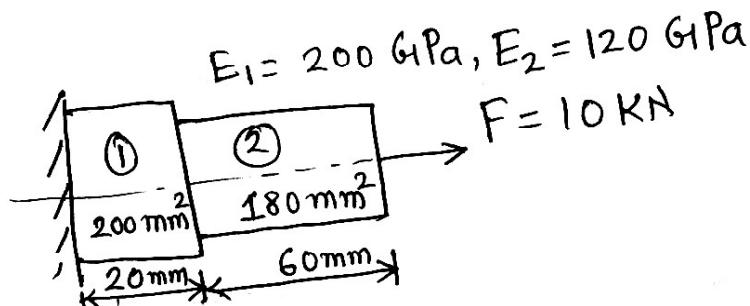
- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain the concept of FEM briefly and outline the procedure. [6]
b) Explain the properties of stiffness matrix. [4]

OR

- Q2)** a) Write short note on [4]
i) Essential Boundary Conditions
ii) Natural Boundary Conditions
b) Derive element stiffness matrix for two noded (linear) bar element using Principle of Minimum Potential Energy Method. [6]

- Q3)** a) A stepped bar is made of two materials joined together as shown in fig. The bar is subjected to an axial pull of 10kN. Determine the displacements of each of the section using 1D spar element. [6]



- b) Explain the term geometric isotropy. Why polynomial shape functions should satisfy these requirements? [4]

OR

P.T.O.

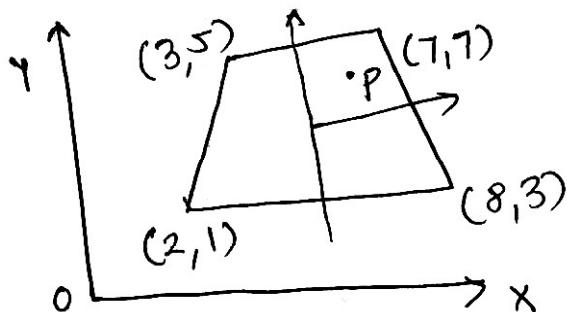
Q4) a) The triangular element has nodal co-ordinates (13,1), (25,6) and (13,3) for nodes 1,2 and 3 respectively. The x-co-ordinate of interior point P is 20 and y - co-ordinate is 6. Determine the shape functions at nodes 1,2 and 3. [6]

b) Write a note on plane stress formulations. [4]

Q5) a) Explain the terms isoparametric, subparametric and superparametric elements. [6]

b) State and explain the three basic laws on which isoparametric concept is developed. [6]

c) Determine the cartesian co-ordinate of the point P ($\zeta = 0.5$, $\eta = 0.6$) show in fig. [6]



OR

Q6) a) Write short note on [8]

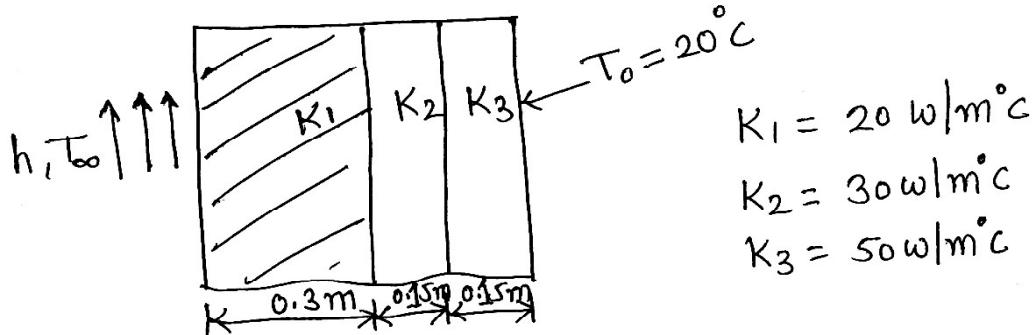
- i) Substructuring
- ii) Sub-modeling

b) Evaluate the following integrals. Use three point Gaussian quadrature method [10]

$$\text{i)} \quad \int_{-1}^1 [3^x - 4x] dx$$

$$\text{ii)} \quad \int_{-1}^1 [2 + x + x^2] dx$$

- Q7) a)** A composite wall consists of three materials as shown in fig. The outer temperature is $T_0 = 20^\circ\text{C}$. Convection heat transfer takes place on the inner surface of the wall with $T_\infty = 800^\circ\text{C}$ and $h = 25 \text{ W/m}^2 \text{ }^\circ\text{C}$. Determine the temperature distribution in the wall. [10]



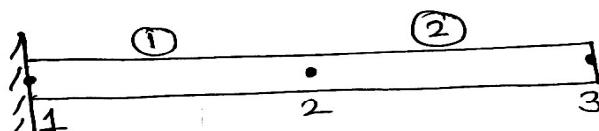
- b) Derive elements stiffness matrix formulation for one dimensional steady state Heat Conduction problems. [6]

OR

- Q8) a)** A metallic fin, with thermal conductivity $360 \text{ W/m}^\circ\text{C}$, 0.1 cm thick and 10 cm long extends from a plane wall whose temperature is 235°C . Determine the temperature distribution and amount of heat transferred from the fin to the air at 20°C with heat transfer coefficient of $9 \text{ W/m}^2 \text{ }^\circ\text{C}$. Take the width of the fin to be 1m. [10]
- b) Derive FEA stiffness matrix for pin fin heat transfer problem. [6]

- Q9) a)** Write down consistent and lumped mass matrices for following elements [6]

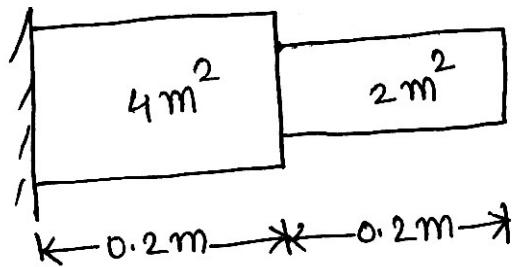
- i) Bar Element
 - ii) Beam Element
- b) Consider a uniform cross-sectional bar of length L made up of a material whose Young's modulus and density are given by E and ρ . Estimate the natural frequencies of axial vibration of the bar using lumped mass matrix. Use two element mesh. [10]



OR

Q10)a What is meant by Eigen Values and Eigen Vector? How it is related to Modal analysis of structures? [6]

b) Find the natural frequencies of longitudinal vibrations of the stepped shaft of areas 2 m^2 and 4 m^2 and of equal lengths 0.2m , when it is constrained at one end as shown in fig. $E = 2.1 \times 10^{11} \text{ N/m}^2$ and density $= 7.8 \times 10^3 \text{ kg/m}^3$. [10]



Total No. of Questions : 10]

SEAT No. :

P3880

[Total No. of Pages : 2

[5561]-536

B.E.(Mechanical)

COMPUTATIONAL FLUID DYNAMICS

(2015 Course) (Semester - I) (Elective - I) (402044B)

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) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain the mathematical nature of hyperbolic equation and their physical boundary conditions. [4]
- b) Find the divergence of $\nabla = V(u,v,w) = (3x, 2xy, 4z)$. [6]

OR

- Q2)** a) Difference between Substantial and Local Derivative. [5]
- b) Explain the significance of the mass conservation equation in fluid mechanics and derive an expression for the same. [5]

- Q3)** a) Explain the difference between explicit and implicit methods with its significance. [4]
- b) Solve a 2D unsteady state heat conduction problem by explicit method. [6]

OR

- Q4)** a) Short note on central difference scheme. [4]
- b) Write a solution methodology to solve two dimensional steady heat advection equation using Neumann boundary condition. [6]

- Q5)** a) Write two dimensional heat convection-diffusion equation and discretize it with finite volume method. [10]
- b) Define Peclet number and state its importance? [4]
- c) Write the demerits of FEM over FVM. [4]

OR

P.T.O.

Q6) a) Consider steady 1 -D convection diffusion equation of a property φ ,

$$\frac{d(\rho u \varphi)}{dx} = \frac{d}{dx} \left\{ \Gamma \left(\frac{d\varphi}{dx} \right) \right\}$$

Using control volume approach discretizes the above equation and obtain the neighboring coefficients by using Central difference scheme. [10]

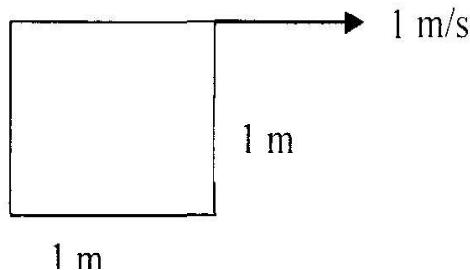
b) Explain the significance of 1-D transient convection-diffusion system. [8]

Q7) a) Explain use of SIMPLE algorithm for solution of 2-D Navier Stokes equations. [10]

b) Importance of Pressure correction method in SIMPLE algorithm. [6]

OR

Q8) a) Using SIMPLE algorithm to solve a two dimensional Lid driven cavity flow. [10]



b) Explain and significance of the external flow simulation. [6]

Q9) a) What is turbulence modeling? Classify turbulence modeling and its advantages and disadvantages. [10]

b) Write a note on $k-\epsilon$ turbulence modeling. [6]

OR

Q10)a) Explain Reynolds average Navier Stokes (RANS) in details. [10]

b) Write in details necessity of the turbulence modeling. [6]



Total No. of Questions : 10]

SEAT No. :

P3881

[5561]-537

[Total No. of Pages : 3

B.E.(Mechanical)

**HEATING, VENTILATION, AIR-CONDITIONING AND
REFRIGERATION**

(2015 Course) (Semester - I) (Elective - I) (402044C)

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) Assume suitable data wherever necessary.
- 3) Use of non-programmable pocket calculator is allowed.
- 4) Draw neat diagrams wherever necessary.
- 5) Figures to the right indicate full marks.

Q1) a) Explain ejector expansion trans-critical refrigeration cycle. [3]

b) A Freon 12 vapor compression system at a condenser temperature of 40°C an evaporative temperature of 0°C develops 15 tons of refrigeration. Determine - [7]

- i) The discharge temperature and mass flow rate of the refrigerant circulated
- ii) The theoretical piston displacement of the compressor and displacement per ton of refrigeration.
- iii) The theoretical horse power of the compressor and horse power per ton of refrigeration.
- iv) The heat rejected in the condenser
- v) The Carnot COP and actual COP of the cycle

Use the following values with standard notations

$$h_1 = 187.5 \text{ kJ/kg}, h_2 = 213.96 \text{ kJ/kg}, h_3 = 74.6 \text{ kJ/kg} = h_4$$

$$v_1 = 0.055 \text{ m}^3/\text{kg}, s_1 = s_2 = 0.6966 \text{ kJ/kg.K}$$

OR

Q2) a) Explain the performance characteristic curves of centrifugal compressor. [4]

b) Discuss the classification of cooling tower. [6]

P.T.O.

Q3) A two-cylinder single acting reciprocating compressor with 5% clearance is used in a R22 refrigeration cycle to take refrigeration capacity of 7.2 TR at 5°C (3.6 bar) refrigeration temperature and 40°C (9.6 bar) condensing temperature. The compressor index is 1.15. The speed of piston is limited to 3 m/s. Take L/D 0.8. specific volume as 0.0525 m³/kg. Determine - [10]

- a) Power
- b) Volumetric efficiency
- c) Bore and stroke
- d) RPM

Temp. (°C)	Pressure (Bar)	h_f (kJ/kg)	h_g (kj/kg)
5	3.6	40.69	189.65
40	9.6	74.59	203.2

OR

Q4) a) Discuss the advantages and disadvantages of centrifugal compressor over reciprocating compressor. [6]
 b) Discuss the Capacity and safety controls and their types of reciprocating refrigeration system. [4]

Q5) a) Which are the factors affecting thermal comfort of human being? Explain in detail. [8]
 b) What is CLTD method? How it connects with Time lag and Decrement factor? [8]

OR

Q6) a) Discuss types of air distribution devices. [4]
 b) What is Wind effect and Stack effect? Explain in detail. [12]

Q7) a) Explainin detail: [8]
 i) Air Spaces and
 ii) Sol Air temperature
 b) A building has U-value of 0.5 W/m²K and total exposed surface area of 384 m². The building is subjected to an external load (only sensible) of 2 kW and an internal load of 1.2 kW(sensible). If the required internal temperature is 25°C, state whether a cooling system is required or heating system is required when the external temperature is 3°C. How the result will change, if the U-value of the building is reduced to 0.36 W/m K?[10]

OR

- Q8)** a) Explain the energy conservation building code. [10]
b) How do one achieve energy conservation in the air conditioning in the building? Explain in detail. [8]

- Q9)** a) Explain the Rotary Desiccant Dehumidifier with diagram. [8]
b) Write a note on Liquid Spray Tower. [8]

OR

- Q10)** a) Explain the use of “Heat Pump” for heating and cooling cycle. [8]
b) Explain thermal storage air conditioning system. [8]



Total No. of Questions : 10]

SEAT No. :

P3882

[5561]-538

[Total No. of Pages : 3

B.E. (Mechanical)

AUTOMOBILE ENGINEERING

(2015 Course) (Semester-I) (Elective-II) (402045 A)

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) Describe the classification of Automobile. [5]

b) What are the functions of frame? List three types of chassis construction. [5]

OR

Q2) a) What is an over drive? Explain the working of it. [5]

b) What is the function of clutch? Discuss various factors affecting the torque transmission in a clutch. [5]

Q3) a) Sketch the construction of front axle of automobile. Describe with neat sketch front wheel-stub axle assembly. [5]

b) State the requirements of an automobile wheel. Explain with neat sketch construction of Disc type wheel. [5]

OR

Q4) a) Describe with neat sketch concept of toe in and toe out. What is purpose of it? [5]

b) Explain various considerations for the design of tyre treads. [5]

P.T.O.

Q5) a) What is purpose of independent suspension? Explain with neat sketch McPherson strut front independent suspension system. [8]

b) Describe construction and working of disc brakes and compare with conventional drum brake system. [8]

OR

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

- a) Mechanical Brake.
- b) Leaf Spring construction and Types.
- c) Hydro gas Suspension.
- d) Power assisted brakes.

Q7) a) For a Car, the road resistance if given by $23 \text{ N per } 1000 \text{ N}$, the air resistance is $0.0827 V^2$, transmission efficiency is 88 percent in top speed, Car weight 19934 N when fully loaded. Calculate: [8]

- i) The engine power required for a top speed of 144 km/hr.
- ii) The acceleration in m/s^2 at 48 Km/h, assuming the torque at 48 km/hr in the top gear 25% more than at 144 km/h.
- iii) The power required to drive the car up to a gradient of 1 in 5 at 48 km/h, transmission efficiency 80% in bottom gear.

Consider $g = 9.81 \text{ m/s}^2$

b) List and discuss ergonomic consideration in design of interior of automobile. [8]

OR

Q8) a) What is purpose of servicing of vehicle? What are advantages of it? Discuss servicing schedule of a light motor vehicle. [8]

b) What are the type of drive motor used in Electric vehicle? Which is the best one? Why? Explain. [8]

Q9) a) Describe various tests carried out to check battery condition. [9]

b) What sensors are used on engine of automobiles? Describe the purpose of each. [9]

OR

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

a) Battery for electric vehicles.

b) Oil and Temperature gauges.

c) Maintenance of Clutch.

d) Layout of HEV.



Total No. of Questions : 10]

SEAT No. :

P3883

[5561]-539

[Total No. of Pages : 7

B.E. (Mechanical)

OPERATION RESEARCH

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

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) Answers in One answer Books.
- 3) Figures to the right indicates full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Discuss the scientific method in operation research. [4]

b) A department of a company has five employees with five jobs to be performed. The time (in hrs.) that each man takes to perform each job is given in the effectiveness matrix.

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man hours? [6]

OR

P.T.O.

Q2) a) Solve the game whose payoff matrix is given below: [6]

		Player B				
		B1	B2	B3	B4	
Player A		A1	3	2	4	0
		A2	3	4	2	4
		A3	4	2	4	0
		A4	0	4	0	8

b) Discuss different types of Decision making environments. [4]

Q3) a) Find the initial basic feasible solution using Vogel's approximation method. [6]

	W ₁	W ₂	W ₃	W ₄	Availability
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Requirement	5	8	7	14	

b) What do you mean by the term Pure strategies and mixed strategies in the game theory. [4]

OR

Q4) A pharmaceutical company is producing a single product and it selling it through five agencies situated in different cities. All of a sudden, there is a demand for the product in another five cities not having any agency of the company. The company placed with a problem of deciding on how to assign the existing agencies to dispatch the product to needy cities in such a way that the travelling distance in minimized. The distance between the surplus and deficit cities in km is given below. [10]

		Deficit Cities				
		P	Q	R	S	T
A	11	17	8	16	20	
	9	7	12	6	15	
C	13	16	15	12	16	
D	21	24	17	28	26	
E	14	10	12	11	13	

Q5) a) A small project involved 7 activities and their times estimates are listed in the following table. Activities are identified by their beginning (i) and ending (j) node numbers. [12]

Activities (i-j)	Estimated Duration (Weeks)		
	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- i) Draw the network diagram of the activities in the projects.
- ii) Find expected duration and variance for each activity. What is the expected project length.
- iii) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed:
 - 1) At least 4 weeks earlier than expected time.
 - 2) No more than 4 weeks later than expected time.

Given:

Z (0-Z)	1.33
Probability	0.4082

- b) What is looping and Dangling errors in the network. [4]

OR

- Q6)** a) A dentist scheduled all his patients for 30 minute appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probability and time actually needed to complete the work: [12]

Category of service	Time required in Minute	Probability
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check up	15	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8:00 a.m. Use the following sequence of random numbers to simulate the above problem.

Random Numbers: 40, 82, 11, 34, 25, 66, 17, 79.

- b) Explain the significance of CPM and PERT. [4]

- Q7) a)** A book binder has one printing press, one binding machine and manuscripts of 7 different books. The times required for performing printing and binding operations for different books are shown below:[10]

Book	1	2	3	4	5	6	7
Printing Press (Hours)	20	90	80	20	120	15	65
Binding time (Hours)	25	60	75	30	90	35	50

Decide the optimum sequence of processing book in order to minimize the total time required to bring out all the books.

- b) Draw the sketch of queuing system and explain various components of it. [6]

OR

- Q8) a)** Arrivals at telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone calls is assumed to be distributed exponentially, with a mean of 3 minutes. [10]

- i) What is the probability that a person arriving at the booth will have to wait?
 - ii) The telephone department will install a second booth when convinced that an arrival would expect waiting time at least 3 minutes for phone call. By how much should the flow of arrivals increase in order to justify a second booth?
 - iii) What is the average length of the queue that forms from time to time?
 - iv) What is the probability that it will take a customer more than 10 minutes altogether to wait for the phone and complete his call?
- b) Explain Johnson's procedure for scheduling "n" jobs on two machines M1 and M2. [6]

Q9) a) Solve the following integer LP problem using branch and bound method:
[12]

$$\text{Minimize } Z = 3X_1 + 2.5 X_2$$

Subject to constrain

i) $X_1 + 2X_2 \geq 20$

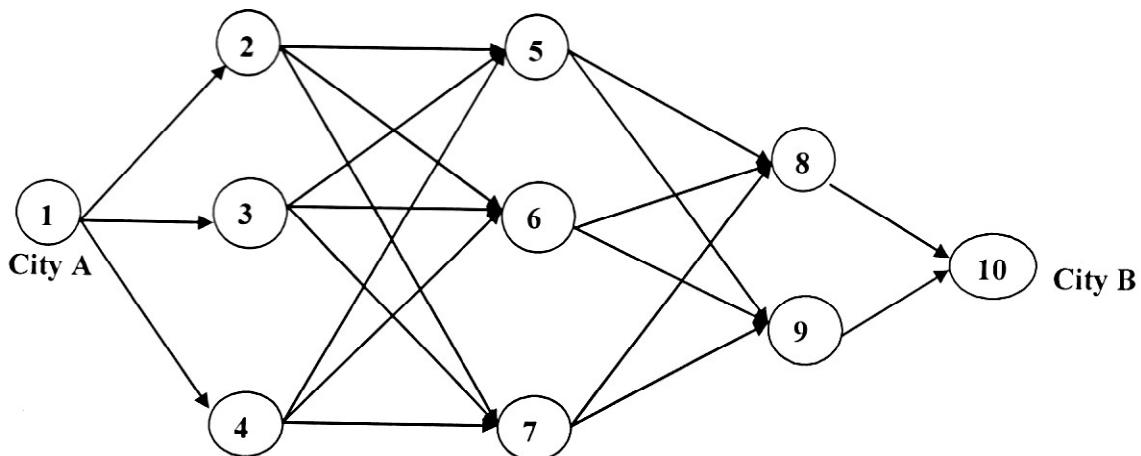
ii) $3X_1 + 2X_2 \geq 50$

iii) $X_1, X_2 \geq 0$ and integers

b) Explain in brief Dynamic programming (DP) model. [6]

OR

Q10)a) A salesman located in a city A decided to travel to city B. He knew the distances of alternative routes from city A to city B. He then drew a highway network map as shown in following figure. The city of origin A, is city 1. The destination city B is city 10. Other cities through which the salesman will have to pass through are numbered 2 to 9. The arrow representing routes between cities and distance in kilometers are located on each route. The salesman problem is to find the shortest route that covers all the selected cities from A to B. The time for each activity is given in the table. (Solve by using Dynamic programming). [12]



Activity	Duration	Activity	Duration
1-2	4	4-5	6
1-3	6	4-5	10
1-4	3	4-7	5
2-5	7	5-8	4
2-6	10	5-9	8
2-7	5	6-8	3
3-5	3	6-9	7
3-6	8	7-8	8
3-7	4	7-9	4
		8-10	7
		9-10	9

- b) Explain methodology used in cutting plane method. [6]



Total No. of Questions : 10]

SEAT No. :

P3884

[5561]-540

[Total No. of Pages : 3

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 Q9 or Q10.
- 2) Draw a neat diagram wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator, steam tables is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Define with an example in each: [4]

- i) Primary and secondary energy
- ii) Commercial and non-commercial energy.

b) What are Energy Efficiency, Energy Conservation and Energy Benchmarking? [6]

OR

Q2) a) Explain any four strategies for better energy security of the nation? [4]

b) How do an industry, nation and globe would benefit from energy efficiency programs? [6]

Q3) a) What are the key features of Energy Audit Software? [4]

b) Distinguish between ‘preliminary energy audit’ and ‘detailed energy audit’. How does a preliminary energy audit help conduct detailed energy audit? [6]

OR

Q4) a) What are the principles of energy management? [5]

b) Briefly explain with examples on what is fuel and energy substitution? [5]

P.T.O.

- Q5) a)** What is the Net Present Value of an ENCON project with cash flows given in table below? The discount rate is 10%. Is the ENCON project attractive for implementation? [8]

Initial Investment	Rs. 10,00,000/-
Savings in Year	Cash Flow
1	Rs. 2,00,000/-
2	Rs. 2,00,000/-
3	Rs. 3,00,000/-
4	Rs. 3,00,000/-
5	Rs. 3,50,000/-

- b) What are important guidelines to achieve energy efficiency in steam systems? [8]

OR

- Q6) a)** Use the Net Present value method to evaluate which of ENCON Project-I or Project-II is finalized to be implemented in an organization. Assume the annual discount rate as 8%. [10]

	Project-I	Project-II
Capital Investment	Rs. 80,000/-	Rs. 80,000/-
Year	Savings (Rs.)	Savings (Rs.)
1	12,000/-	13,200/-
2	12,000/-	13,200/-
3	12,000/-	12,600/-
4	12,000/-	12,600/-
5	12,000/-	12,000/-
6	12,000/-	12,000/-
7	12,000/-	11,400/-
8	12,000/-	11,400/-
9	12,000/-	10,800/-
10	12,000/-	10,800/-
11	12,000/-	10,000/-

- b) Explain any six options for financing an energy saving financing program in any organization? [6]

- Q7)** a) What are the parameters to be monitored for evaluating ‘direct efficiency’ of boilers and what is the empirical relation used? [8]
- b) Explain the factors that affect the performance evaluation of an Electric Heating Furnace? [8]

OR

- Q8)** a) Explain as to how do you assess the performance of centrifugal fan? [8]
- b) Find the furnace efficiency to melt one ton of steel from an ambient temperature of 30 Deg C. Following is the test data obtained: [8]

Specific heat of steel = 0.682 kJ/kg/Deg C

Latent heat of melting of steel = 272 kJ/kg

Melting point of Steel = 1650 Deg C.

The melting furnace consumes 625 kWh to melt one ton of Steel.

- Q9)** a) What are the different effects of acid rain? [6]
- b) Explain briefly Kyoto Treaty and its importance to the world. [6]
- c) Why cogeneration systems play an important role in any industry? [6]

OR

- Q10)** a) Explain global warming and its implications. [6]
- b) Explain three different types of instruments used during an energy audit. [6]
- c) What is the different energy saving opportunities in any residential electrical lighting system? [6]



Total No. of Questions :10]

SEAT No. :

P3885

[5561]-541

[Total No. of Pages :3

B. E. (Mechanical) (Mechanical Sandwich)

ENERGY ENGINEERING

(2015 Pattern) (Semester - II) (402047)

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, Q.9 OR Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right of each question indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and calculator is allowed.

Q1) a) Explain the concept of cascade efficiency. [5]

- b) In thermal power plant steam turbine of 11 MW capacity requires 5.1 kg of steam per hour per kW. The quantity of air leakage into the condenser is 1 kg per 1 ton of steam used by the turbine. The vacuum in the condenser is 71 cm of Hg and barometer reading is 760 mm of Hg. The temperature at the suction of air pump is 31 degree Celsius. The surface condenser is fitted with separate condensate extraction and air pump. The rise in the temperature of cooling water of condenser is 8 degree Celsius. The quality of steam entering condenser is 0.89 dry and no under cooling in the condenser. Determine : [5]
- i) The capacity of air pump per minute basis
 - ii) Quantity of cooling water required in tones per minutes.

OR

Q2) a) What is a purpose of coal benefication? Explain flow in this process with suitable diagram. [5]

- b) Explain the methods used to control NOx in thermal power plant. [5]

Q3) a) Write Note on following. [5]

Flow duration curve and its use.

- b) What do you mean by Supercritical Boiler? Explain the advantages of the same. [5]

OR

P.T.O.

Q4) a) What are different methods for disposal of Nuclear waste? [5]

b) Explain typical closed type condensing plant with simple diagram? [5]

Q5) a) The air enters the compressor of a gas-turbine power plant at 1 bar, 30 degree Celsius and 162 tons per hour. The maximum cycle temperature, pressure are 650 degree Celsius, 5 bar respectively. The two stage expansion with reheating pressure of 2.24 bar is used in the plant. In the reheater gas is heated up to maximum cycle temperature. The isentropic efficiency of compressor, first turbine, and second turbine is 80%, 85%, 90% respectively. Take adiabatic index for air gas as 1.4, 1.33 respectively. Take specific heat for air, gas as 1KJ/kg-K, 1.15 KJ/kg-K respectively. Neglect mass flow rate of fuel. Draw cycle arrangement and T-s diagram and determine. [10]

i) The thermal efficiency of cycle.

ii) Power output of plant in MW.

b) Explain General Layout of Diesel Power Plant indicating different systems. [8]

OR

Q6) a) Air enters the compressor of a gas-turbine power plant having capacity 12 MW at 1 bar and 27 degree Celsius. The maximum cycle temperature, pressure are 577 degree Celsius, 6.5 bar respectively. The two stage compression with perfect inter cooling arrangement is incorporated in the plant. The compression in both stages and expansion in turbine are isentropic. Take adiabatic index, specific heat for both air and gas as 1.4, 1 KJ/kg-K respectively. Assume calorific value of fuel as 45.5 MJ/Kg. Draw Cycle arrangement and T-s diagram and determine. [10]

i) Maximum work saved per kg of air compressed due to use of inter cooling.

ii) Fuel consumption in Tph (with inter cooling arrangement)

iii) The thermal efficiency of cycle with considering effect mass flow rate of fuel on air.

b) Explain the advantages, disadvantages and applications of diesel power plant. [8]

- Q7)** a) Explain the superheated steam geothermal power plant with simple diagram. [6]
 b) Explain the Claude cycle for OTEC with component arrangement diagram. [6]
 c) What are applications of solar photovoltaic power systems? [4]

OR

- Q8)** a) Explain the working of open cycle MHD generator with simple figure. [6]
 b) Write Note on : Solar Chimney. [6]
 c) How wind turbines are classified? [4]

- Q9)** a) What is function of circuit breaker in supply system? Explain working of air circuit breaker with simple sketch and list out its limitations. [8]
 b) Input output curve of 25 MW capacity generating power plant is given by $I=5\times10^6(7+0.2L+0.1L^2)$ [I in kJ/hr and L in MW] then [8]
 Determine:
 i) Average rate of heat supplied (heat supplied MW-hr) when plant operating at 25 MW load for 10 hours in a day and kept at zero load for 14 hours
 ii) Saving in heat rate if same energy is produced for whole day at constant load.

OR

- Q10)** a) Write note on following : [8]
 i) Generatar cooling ii) Effects of short circuits
 b) Explain following terms with its significance. [4]
 i) Plant capacity factor ii) Plant use factor
 c) A steam power station has an installed capacity of 120 MW and average load of 50 MW. The coal consumption is 0.4 kg per kWh and cost of coal is Rs. 80 per ton. The annual expenses on salary bill of staff and other overhead charges excluding cost of coal are Rs. 50×10^5 . The power station works at a load factor of 0.5 and the capital cost of the power station is Rs. 4×10^5 . If the rate of interest and depreciation is 10%. Determine the cost of generating per kWh. [4]



Total No. of Questions : 10]

SEAT No. :

P3886

[5561]-542

[Total No. of Pages : 4

B.E. (Mechanical/Mechanical Sandwich)

MECHANICAL SYSTEM DESIGN

(2015 Pattern) (Semester - II) (402048)

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) State and explain the parameters used in kinematic design of gearbox. [6]
b) Explain design and natural tolerances. [4]

OR

- Q2)** a) Draw the structure and gear box diagrams for the following equations of twelve speed gear box and determine the maximum transmission range for each equation for R 5 Series. $\phi = \sqrt[5]{10}$. [6]
i) $Z = 2(6) 2(1) 3(2)$
ii) $Z = 2(3) 2(6) 3(1)$
iii) $Z = 2(6) 2(3) 3(1)$
b) Define the following terms: [4]
i) Population
ii) Sample
iii) Random variables
Also explain the concept of reliability based design

- Q3)** a) Explain the steps involved in belt conveyor analysis? [4]
b) A three idler through belt, horizontal conveyor is to be used used for transporting 500 ton/hr of coal having weight density 8000 N/m^3 . The surcharge factor 'c' for three idler through belt is 0.1. If the belt speed is 100 m/min. Select the standard belt width for conveyor belt. Available standard belt width is : 400, 450, 500, 650, 750, 800, 900, 1000, 1200, 1400, 1600, 1800, 2000 mm. [6]

OR

P.T.O.

- Q4)** a) Explain the concept of containerization. [4]
b) A three idler, troughed belt, horizontal conveyor is to be used for transporting 500 ton of iron per hour having mass density of iron ore is 1700 kg/m^3 . If the belt speed is 2m/sec, determine the required belt width. Take surcharge factor = 0.1. [6]

- Q5)** a) Explain, with the help of neat sketches, the different types of formed heads used as end closures in cylindrical pressure vessels. [8]
b) A high pressure compound cylinder consists of an inner and outer diameters of 300 mm and 400 mm OD respectively. It is jacketed by an outer cylinder of 500 mm outside diameter. The tubes are assembled by a shrinking process in such a way that the maximum principal stress induced in any tube is limited to 100 N/mm^2 . Calculate the shrinkage pressure and original dimensions of the tube assuming $E = 210 \text{ GPa}$. [10]

OR

- Q6)** A pressure vessel consists of a cylindrical shell with an inner diameter of 1500 mm and thickness of 20mm. It is provided with a nozzle of inner diameter 250 mm and thickness 15 mm. The yield strength of the material for the shell and the nozzle is 200 N/mm^2 and the design pressure is 2.5 Mpa. The extension of the nozzle inside the vessel is 15 mm. The corrosion allowance is 2mm, while the weld joint efficiency is 0.85. Neglecting the area of welds, determine whether or not a reinforcing pad is required for the opening. If so, determine, the dimensions of the pad made from a plate of 15 mm thickness. [18]

- Q7)** a) Explain the buckling of connecting rod? Why I section preferred for connecting rod? [6]
b) The following data is given for the piston of four stroke diesel engine.
Cylinder bore = 100mm, Material of piston rings = grey cast iron,
Allowable tensile stress = 90 N/mm^2 [10]
Allowable radial pressure on cylinder wall = 0.035 MPa
Thickness of piston head = 16mm
Number of piston rings = 4
Calculate:
i) Radial width of piston rings;
ii) Axial thickness of piston rings;
iii) Gap between the free ends of piston ring before assembly and after assembly;
iv) Width of top land;
v) Width of ring grooves;
vi) Thickness of piston barrel; and
vii) Thickness of barrel at open end.

OR

Q8) The following data is given for the connecting rod of a diesel engine. [16]

Cylinder bore = 85 mm

Length of connecting rod = 350mm

Maximum gas pressure = 3 MPa

Factor of safety against buckling failure = 5

(l/d) ratio for piston pin bearing = (1.5)

(l/d) ratio for crank pin bearing = (1.25)

Allowable bearing pressure for piston pin bearing = 13 MPa

Allowable bearing pressure for crank pin bearing = 11 MPa.

length of stroke = 140 mm

Mass of reciprocating parts = 1.5 kg

Engine speed = 2000 rpm

Thickness of bearing bush = 3 mm

Material of cap = 40 C8 ($S_{yt} = 380 \text{ N/mm}^2$)

Material of bolts=Alloy steel ($S_{yt} = 450 \text{ N/mm}^2$)

Factor of safety for cap and bolts = 4 and 5 respectively.

Density of connecting rod = 7800 kg/m³

Determine:

- a) Dimensions of the cross-section of connection rod.
- b) Dimensions of small and big and of bearings.
- c) Nominal diameters of bolts for the cap.
- d) Thickness of cap; and
- e) Magnitude of whipping stress.

Q9) a) Differentiate between optimum designs problems with normal specifications and redundant specifications. [6]

b) A cantilever beam is to function as a spring subjected to varying load of $\pm 120\text{N}$. Following materials are available. [10]

Material	Density Kg/m ³	Cost Rs./Newton	Fatigue Strength, MPa
M1	8450	120	24
M 2	8020	120	42
M 3	7830	80	38

The length of the cantilever is 350 mm and width to height ratio is 6:1, factor of safety is 2. Design the cantilever for optimum cost. Specify the material, cross section dimensions and the cost for selected design.

OR

Q10) The optimum material and dimensions for a machine shaft subjected to twisting moment of 3 KNm and desiring a torsional stiffness of 100Nm/degree, so as to have a minimum weight of the shaft. Following materials are available. Factor of safety = 2. [16]

Material	Mass density Kg/m	Yield strength MPa	Modulus of rigidity GPa	Material factor gG/S_{yt}^2
Mg. Alloy	1760	225	16	5.53×10^{-4}
Plastic	1200	55	2	8.533×10^{-4}
Ti-Alloy	3600	910	42	1.825×10^{-4}
Steel	7650	1380	84	3.374×10^{-4}



Total No. of Questions : 10]

SEAT No. :

P4764

[Total No. of Pages : 4

[5561]-543

B.E. (Mechanical) (Semester - II)
TRIBOLOGY
(2015 Pattern) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) List the various physical and chemical properties of lubricant and explain any five of them. [6]
- b) List the different theories of wear and explain Archard's wear theory in brief. [4]

OR

- Q2)** a) What is the difference between gasket and oil seal? Explain non-metallic gasket. [4]
- b) List the different methods to measure friction and explain pin-on-disc rig. [6]

- Q3)** a) What are the factors affecting wear? [2]
- b) What do you understand by infinitely long journal bearing and infinitely short journal bearing? Comment on pressure gradient and load carrying capacity in both cases. [8]

OR

- Q4)** a) Differentiate between real and apparent area of contact. [2]
- b) A 360° hydrodynamic journal bearing has 50 mm diameter and 50 mm length. The journal is carrying a load of 15 kN and rotating at a speed of 1450 rpm. The eccentricity ratio is 0.75. If the radial clearance is 20 microns, [8]

P.T.O.

Calculate :

- i) The minimum oil-film thickness;
- ii) The viscosity of oil;
- iii) The quantity of oil in circulation;

- Q5)** a) Derive an equation for load carrying capacity for given instantaneous velocity of approach and film thickness in case of circular plate approaching a plane. [10]
- b) Explain squeeze film lubrication. State and explain any six practical examples of squeeze film. [8]

OR

- Q6)** a) Derive equation for friction and pumping power losses in hydrostatic bearings. [8]
- b) Following data is given for a hydrostatic thrust bearing : [5]

Supply pressure	=	5 N/mm ²
Shaft diameter	=	400 mm
Specific gravity of oil	=	0.86
Specific heat of oil	=	1.76 kJ/kg °C
Oil viscosity	=	30 cP
Film thickness	=	0.15 mm

Find :

- i) The load carrying capacity of bearing;
- ii) The flow requirement in l/min;
- iii) The frictional power loss;
- iv) The pumping power loss, and
- v) The temperature rise

Assume that the total power loss in the bearing is converted into frictional heat.

- c) The two parallel plates of 30 mm length and infinite width are separated from the plane by an oil-film of 25 μm thickness and having viscosity of 0.65 N-s/m². If the normal load per unit width of 15 kN/m is applied on the plate, determine : [5]
- The time required to reduce the film thickness to 2.5 μm
 - The maximum pressure

Q7) a) Write short notes on [8]

- Gas lubricated bearings
 - Features of gas lubricated bearings
- b) What do you understand by gas lubricated bearings? Compare gas lubricated bearings with oil lubricated bearings based on following parameters [8]

- Viscosity of lubricant
- Viscous resistance
- Frictional power loss

OR

Q8) a) Write Ertel-Grubin equation with all specific terms and also write the limitations of this equation. [8]

- b) Explain in brief, working principle of hydrostatic gas lubricated bearings. [8]

Q9) a) Write short note on: selection of coatings. [8]

- b) State and discuss the lubricant and lubricating method for gears. [8]

OR

Q10) Write short notes on :

[16]

- a) Lubricant and lubricating method for rope and chain
- b) Lubrication system in I.C. engine

$\frac{l}{d}$	$\frac{h_0}{c}$	ϵ	S	$\left(\frac{r}{c}\right)_f$	$\frac{Q}{rcn_s l}$	$\frac{Q_s}{Q}$	$\frac{P_{max}}{P}$
1	0.00	1.00	0.0000	0.000	0.000	1.0000	0.0000
	0.03	0.97	0.00474	0.514	4.820	0.973	6.579
	0.10	0.90	0.0188	1.050	4.740	0.919	4.048
	0.20	0.80	0.0466	1.700	4.620	0.842	3.195
	0.40	0.60	0.1210	3.220	4.330	0.680	2.409
	0.60	0.40	0.2640	5.790	3.990	0.497	2.066
	0.80	0.20	0.6310	12.800	3.590	0.280	1.890
	0.90	0.10	1.3300	26.400	3.370	0.150	1.852
	1.00	0.00	∞	∞	3.142	0.0000	0.0000



Total No. of Questions : 12]

SEAT No. :

P5140

[Total No. of Pages : 3

[5561]-544

B.E. (Mechanical Engineering)

INDUSTRIAL ENGINEERING (Elective - III)

(2015 Pattern) (Semester - II)

Time : 2 Hours 30 Minutes]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers should be written in one answer book.
- 2) 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, Q.11 or Q.12.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Assume Suitable data if necessary.

- Q1)** a) Define productivity? Explain various factors which affect productivity? [4]
b) Explain any two productivity models used in Industrial Engineering? [4]

OR

- Q2)** a) Enlist elements of an organization? Explain the term departmentalization in details? [4]
b) Enlist any 4 objectives of an industrial engineering? [4]

- Q3)** What are therblings? Give any 5 therblings with symbols? [6]

OR

- Q4)** Describe Travel chart following with suitable example. [6]

- Q5)** a) Define the term:- work sampling. [2]
b) In a work sampling study carried out in heat treatment shop, following data was collected [4]

- i) Total time spent by the operator = 450 minutes
- ii) Number of components produced = 150 No's
- iii) Working time of the operator = 70%
- iv) Idle time for operator = 30%
- v) Avg. rating for operator = 90%

Calculate the standard time for the component if total relaxation allowance is 30% of the basic time?

P.T.O.

OR

- Q6)** a) Define the term with suitable example:- MOST. [2]
b) Compare : Work sampling and PMTS? [4]

- Q7)** a) Explain SCM with flow diagram? Discuss its importance in industry?[8]
b) Write a short note on [8]
i) Aggregate planning
ii) Push and Pull System

OR

- Q8)** a) Discuss the importance of sales forecasting. Explain any one method of sales forecasting? [8]
b) Discuss MRP-I and MRP-II with suitable example. [8]

- Q9)** a) Enlist & Explain different computer aided layout design techniques? [8]
b) Classify & Explain different types of material handling equipments? [8]

OR

- Q10)**a) Define Inventory and its importance. Enlist different types of Inventories? Also explain various costs involved with Inventory? [8]
b) A manufacturing company requires 9000 units per year. Ordering cost is Rs. 125/- per order and carrying cost is 20%. Purchase price per unit is Rs. 42 Determine [6]
i) EOQ
ii) Optimum number of orders
iii) Total cost including acquisition of material
c) Explain the term:- ABC analysis. [2]

- Q11)**a) Write a short note on : [10]
i) KRA
ii) Break even analysis
b) What is cost accounting? What are objectives of cost accounting? Explain elements of cost. [8]

OR

- Q12)a**) What is industrial safety? What are the objectives of industrial safety?
Explain general safety rules. [8]
- b) Calculate B.E.P.(In Unit and In Rupee) from the following information.[5]
- Fixed cost = Rs 1200/-
Variable cost = Rs 4000/-
Sales in rupee = Rs 7000
Sales in unit = Rs 1000/-
- c) Explain the term:- Payback method. [5]

▽ ▽ ▽ ▽

Total No. of Questions : 10]

SEAT No. :

P5548

[Total No. of Pages : 2

[5561]-545

B.E. (Mechanical) (Semester - II)
ROBOTICS
(2015 Pattern) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

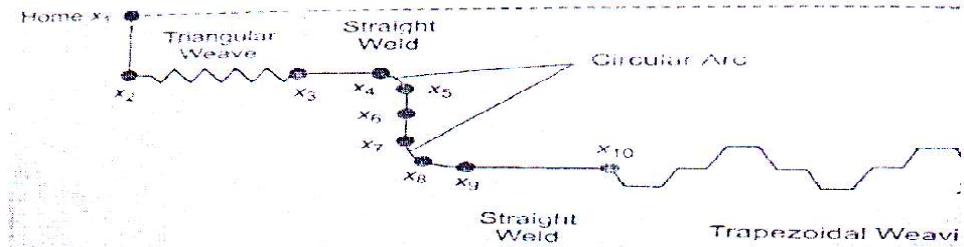
Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 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) Explain Technical Specification (performance characteristics) of Robots. [6]
b) Explain static force analysis of Robot Manipulator. [4]
OR
- Q2)** a) Discuss the classification of Grippers. Explain with neat sketch Vacuum gripper. [5]
b) Explain the construction & working of Vision sensor used in robotic. [5]
- Q3)** a) Classify Robot actuator. Discuss construction & working of Stepper Motor. [6]
b) Differentiate between Forward & Inverse Kinematic. [4]
OR
- Q4)** a) List out application of Robots. Explain any one in details with neat sketch. [5]
b) Write a short note on Position sensor in robotics. [5]
- Q5)** a) Explain types of potential field method for motion planning of manipulator. [8]
b) An actuated joint of six axis robot is to be rotated from 20° to 80° in 6 seconds. [8]
Determine coefficients of cubic polynomial to interpolate a smooth trajectory.
Plot linear, quadratic and cubic trajectories for the joint.
OR

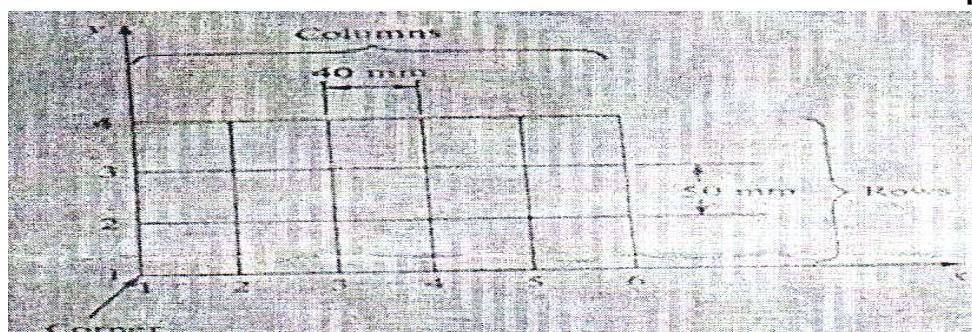
P.T.O.

- Q6)** a) Write a short note on [8]
 i) Steps in trajectory planning
 ii) Robot Dynamic
- b) The second joint of the SCARA manipulator is required to move from 30° to 150° in 5 seconds Find the cubic polynomial to generate a smooth trajectory of joint. Find the angle at which maximum velocity occurs for this trajectory. [8]
- Q7)** a) Explain with block diagramme Machine vision system for Robots.[8]
 b) Write a Programme using VAL for following weld to be made [10]



OR

- Q8)** a) Explain the different steps involved in Segmentation. [8]
 b) Write a Programme using VAL for palletizing operation as shown in fig. The robot must pick up parts from an incoming conveyor & deposit them on to pallet. The pallet has four rows that are 50 mm apart & six columns that are 40 mm apart. The object to be picked up are about 25 mm tall. [10]



- Q9)** a) Explain the forward & backward search technique in problem solving for AI. [8]
 b) What are different tools used in simulation of robotics. [8]

OR

- Q10)** a) Write a short note on [8]
 i) Internet of things
 ii) Industry 4.0
- b) Explain Need of AI & application of Artificial Intelligence for Robotics System. [8]



Total No. of Questions : 10]

SEAT No. :

P4774

[Total No. of Pages : 2

[5561]-546

B.E. (Mechanical Engineering)

ADVANCED MANUFACTURING PROCESSES (Elective - IV)
(2015 Pattern) (Semester - II)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory i.e. Solve Q.1 or Q.2, solve Q.3 or Q.4, Solve Q.5 or Q.6, Solve Q.7 or Q.8, Solve Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

- Q1)** a) Explain with neat stretch forming and list their applications. [6]
b) Explain the construction and working of Ultrasonic welding. [4]

OR

- Q2)** a) Explain with neat sketch Magnetic pulse forming and list their applications. [6]
b) List applications of adhesive bonding. [4]

- Q3)** a) Explain with sketch working principle of Abrasive Water Jet machining with the process parameter. [6]
b) Explain the process of underwater welding. [4]

OR

- Q4)** a) Explain with sketch working principle of wire electric discharge machining with the process parameter. [6]
b) Write short note on welding of plastics and composites. [4]

- Q5)** a) Explain how the ultrasonic micro machining carried out. [6]
b) Explain the challenges in micro and nano fabrication process. [6]
c) Write short note on Lithography. [4]

OR

P.T.O.

- Q6)** a) Explain the need of micro machining. [6]
b) Explain the process of focused Ion Beam Machining. [6]
c) Write short note on Diamond micro machining. [4]

- Q7)** a) Explain in detail post processing of parts manufactured by additive manufacturing processes. [6]
b) Explain the generalized additive manufacturing process. [6]
c) Write application of additive manufacturing processes in aerospace industry. [4]

OR

- Q8)** a) What are factors which play important role while designing the object which is manufactured by additive manufacturing? [6]
b) Explain any one Additive Manufacturing process with its principle, process steps and materials. [6]
c) Write application of additive manufacturing processes in medical technology. [4]

- Q9)** a) Explain in detail the importance of material characterization. [6]
b) Explain operating principle of Scanning Electron Microscopes with neat sketch. [6]
c) Describe the applications of microscope. [6]

OR

- Q10)** a) Explain operating principle of Atomic Force Microscopes with neat sketch. [6]
b) Explain with sketch operating principle of X-Ray Diffraction. Spectroscopy. [6]
c) Describe the applications of spectroscope. [6]



Total No. of Questions : 10]

SEAT No. :

P5577

[Total No. of Pages : 3

[5561]-547

B.E. (Mechanical) (Semester - II)
SOLAR AND WIND ENERGY
(2015 Pattern) (Elective - IV)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Draw suitable neat diagrams, wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if required.*

Q1) a) Explain present energy scenario and role of governing bodies for solar and wind energy. [6]

b) Explain Solar tower with figure. [4]

OR

Q2) a) Explain any one solar measurement instrument with figure. [6]

b) Explain solar distillation with figure. [4]

Q3) a) Classify solar thermal collectors and describe flat plate collector with the help of suitable diagram. [6]

b) Explain solar PV Cell with figure. [4]

OR

Q4) a) Classify solar concentrating collectors and explain point contact concentrator with figure. [6]

b) Describe classification of solar cells based on type of active material. [4]

P.T.O.

- Q5)** Design a solar PV System wherein load consists of a CFL, TV, Fan, Refrigerator and Computer. The system should allow the use of loads in non sunshine hours. The operating hours and the power rating of these loads are given in following table. [18]

Load	Watts	Hr/day	Numbers
CFL	18	6	10
Fan	70	4	8
TV(21")	250	2	2
Refrigerator	150	8	8
Computer	250	1	3

OR

- Q6)** An evacuated tube solar water heating system is designed for daily hot water supply of 300 lit. The daily average solar global radiation is 780 W/m^2 . The inlet and outlet temperature of water is 25°C and 50°C . The effective sunshine hours are 7 hours. Calculate number of evacuated tube required if dimension of one tube is $1800\text{mm} \times \phi 57\text{mm} \times 47\text{mm}$. Calculate efficiency of the system. [18]

- Q7)** a) Sketch the diagram of HAWT and explain function of its main components. [8]
 b) Describe main considerations in selecting a site for wind generators. [8]

OR

- Q8)** a) Explain analysis of aerodynamic forces acting on wind mill blades with figures. [8]
 b) Explain various design considerations for horizontal and vertical axis wind turbines. [8]

Q9) A propeller type turbine has a following data : [16]

Speed of free wind at a height of 10m = 15 m/sec

$\alpha = 0.14$

air density = 1.226 kg/m^3

height of tower = 100m

diameter of rotor = 90m

wind velocity at turbine reduces by 25%

generator efficiency = 90%

Find total power available to wind, power extracted by wind turbine, electrical power generated, axial thrust on turbine, maximum axial thrust on turbine.

OR

Q10) a) Explain in detail step by step design process for miniature wind mill. [8]

b) Explain status of wind energy potential and installation in India. [8]



Total No. of Questions : 10]

SEAT No. :

P3410

[Total No. of Pages : 2

[5561]-548

B.E. (Mechanical Engineering)
PRODUCT DESIGN AND DEVELOPMENT
(2015 Pattern) (Elective - IV) (Semester - II)

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 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) With suitable example explain Product Verification and Product Validation. [6]
b) For an appropriate product discuss the concept of economic analysis. [4]

OR

- Q2)** a) With suitable examples discuss different types of Customer needs in detail. [6]
b) Explain concept of Concurrent Engineering useful in modern Product development. [4]

- Q3)** a) Explain Function tree of standard coffee making machine using subtract and operate procedure [8]
b) What are design drivers. [2]

OR

- Q4)** a) Construct Pugh's Matrix for Mobile handset by considering four variants and five factors. [8]
b) Explain uses of Product testing. [2]

P.T.O.

Q5) a) Discuss in detail the process of Product Tear down with suitable example. [10]

b) Discuss detail procedure of Benchmarking with suitable example. [8]

OR

Q6) a) Which are different types of product portfolio architecture and how to choose the type architecture for particular product. [10]

b) How to set product specifications based on the benchmarking. [8]

Q7) a) Explain how reliability is ensured during design state. [8]

b) Discuss various guide lines of Design for assembly and explain their significance. [8]

OR

Q8) a) With suitable example explain environmental concerns implemented in product design. [8]

b) Explain process of Product Life Cycle assessment with example and what design strategies are used for extending product life cycle. [8]

Q9) a) Which are different phases of product life cycle and various technologies applied in PLM. [8]

b) Explain three major subsystems of product life cycle management tool. [8]

OR

Q10) a) Explain significance of customer involvement in the process of detail design with suitable example. [8]

b) Discuss the concept of product workflow and explain link between product data and product workflow with example. [8]



Total No. of Questions : 10]

SEAT No. :

P4775

[Total No. of Pages : 2

[5561]-549

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 indicate full marks.
- 4) Use of electronic pocket Calculator is allowed.
- 5) Assume Suitable data, if necessary.

- Q1)** a) Draw a layout of front engine rear wheel drive automobile chassis and explain parts of it. [5]
- b) What are vehicle specifications? Describe the vehicle specification of LMV of your own choice. [5]

OR

- Q2)** a) Explain the purpose and requirement of Front axle beam. [5]
- b) Describe clearly main components of car body with help of neat sketch. [5]

- Q3)** a) What is the advantage of two piece Propeller shaft? Describe function of Hooke's Joint used with propeller shaft. [5]
- b) Explain the following concepts used in steering geometry. [5]
- i) Caster.
 - ii) Camber
 - iii) Under steer
 - iv) Over steer

OR

- Q4)** a) What Forces are supported by Leaf spring? Describe role of Helper spring. [5]
- b) Describe the requirements of automobile brakes. [5]

P.T.O.

- Q5)** a) What if the function of steering gear box. Explain construction and working of recalculating ball type steering gear box. [8]
b) Draw a neat sketch of brake Master cylinder and explain working of it.[8]

OR

- Q6)** a) Write short note on the following. [16]
i) Frameless body construction
ii) Rubber Suspension
iii) Power steering
iv) Wheel Alignment

- Q7)** a) List the active safety components and describe with neat sketch role of each in vehicle safety. [8]
b) What do you understand by Pedestrian safety? What provisions are made as per AIS for the protection of Pedestrians? Explain. [8]

OR

- Q8)** a) What are the crash tests carried out for the automobile? Explain with neat sketch side impact test with specifications. [8]
b) Explain various vehicle performance parameters. [8]

- Q9)** a) What is bulldozer, where it is used and how it works? Explain with suitable sketch. [9]
b) Describe with neat sketch construction and working of the following. [9]
i) Wind screen wiper
ii) Voltage current Regulator.

OR

- Q10)** Write short note on the following (any three) : [18]
a) Digital Engine control System.
b) Endurance Test.
c) Multi axle vehicle
d) Stability of vehicles.



Total No. of Questions : 10]

SEAT No. :

P3887

[5561]-550

[Total No. of Pages : 2

B.E. (Mechanical Sandwich)

PLANT ENGINEERING AND MAINTENANCE (Self Study-III)

(2015 Course) (Semester-I) (402065)

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 diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What are the primary and secondary functions of plant engineering. [5]

b) Discuss the classification of maintenance system. [5]

OR

Q2) a) Explain the REL chart in detail. [5]

b) What is the scope and importance of plant engineering functions in industrial activities? [5]

Q3) a) Discuss the factors which need to be considered for implementation of an efficient spare parts control systems. [5]

b) Discuss in brief main steps in systematic layout planning (SLP). [5]

OR

Q4) a) What factors will be considered for the site selection for following industries. [5]

i) Automobile Industry ii) Cement Factory

b) Compare the advantages and disadvantages of a product to a process lay-out. [5]

P.T.O.

- Q5)** a) What is reliability? Explain ‘Bath-tub-curve’ in detail. [8]
b) Explain the concept of product life cycle. [8]

OR

- Q6)** a) Explain any one model of life cycle costing. [8]
b) What is the scope of preventive maintenance in an organization and what activities are carried out under PM? [8]

- Q7)** a) Explain the need of failure analysis. What is FMEA? [8]
b) Explain the general procedure for failure analysis. [8]

OR

- Q8)** a) Write a short note on: [8]
i) Fish bone diagram ii) Pareto chart
b) Explain in short various fire prevention practices? [8]

- Q9)** a) Discuss various diagnostic techniques used in maintenance activity. [9]
b) What is ferrography? How it is used in oil analysis? [9]

OR

- Q10)** Write short notes on: [18]
a) Total Productive Maintenance (TPM).
b) Reliability Centered Maintenance (RCM).
c) Design for Maintainability.



[5561]-551

**B.E. (Mechanical-Sandwich)
Mechanical Vibrations
(2015 Pattern) (Semester - II)**

*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) a) Define the following terms : [4]

- i) Natural frequency
- ii) Critical damping coefficient
- iii) Damping Factor
- iv) Logarithmic Decrement

b) A right circular cylinder of mass 'M' and radius 'a' is connected to a spring of stiffness 'k' at a distance 'd' above its center as shown in figure. The cylinder is free to roll on horizontal rough surface without slipping. Derive the equation of motion and hence find natural frequency of small angular oscillations of the cylinder. [6]

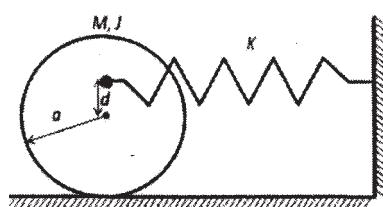


Figure: Q 1 b)

OR

Q2) a) Draw the time-displacement graph of free vibration of 1-dof viscously damped system for different damping conditions : [4]

i) zero damping,	ii) under damping,
iii) critical damping and	iv) over damping.

P.T.O.

- b) A room door is equipped with a hydraulic door closure system with torsional spring of stiffness 20 N-m/rad and a torsional viscous damper. The door has a mass of 50 kg and a centroidal mass moment of inertia about an axis parallel to the axis of door rotation is 5 kg-m^2 . The length and height of door are 0.9 m and 2.1 m respectively. Determine-
- the undamped natural frequency of the door
 - the required torsional damping coefficient of the door closure system for critically damped motion.
- [6]

- Q3)** a) Explain the method of finding damping factor of a system by using quality factor. [2]
- b) A spring-mass-damper system of mass 120 kg , spring stiffness 60 kN/m and damping coefficient 1 kN-s/m is subjected to excitation force of $f(t) = 150 \sin(18t) \text{ N}$. For steady state vibrations of the system, determine
- Amplitude of displacement of mass
 - Phase angle of displacement of mass with respect to $f(t)$
 - Amplitude of acceleration of mass
 - Maximum dynamic force transmitted to the support
- [8]

OR

- Q4)** a) With neat diagram distinguish between the transverse and torsional vibration. [2]
- b) A rotor of 12 kg mass is mounted midway on a horizontal shaft of diameter 2.5 cm which is simply supported with a span of 90 cm in bearings at both the ends. The center of gravity of the rotor is 0.02 mm offset from its axis of rotation. The modulus of elasticity of shaft material is 200 GPa . Determine - [8]
- Static deflection of rotor
 - Critical speed of shaft
 - Amplitude of steady state vibrations of rotor and dynamic load on each bearing at a speed of 3000 rpm .
- Q5)** a) Explain the matrix method to determine natural frequencies and mode shapes of a multi-dof (2-dof) system by solving eigen value problem. [4]

- b) For the system of spring and masses shown in the figure, derive differential equations of motion in terms of displacement x_1 and x_2 of masses. Determine natural frequencies and corresponding mode shapes. Describe the mode shapes graphically. [12]

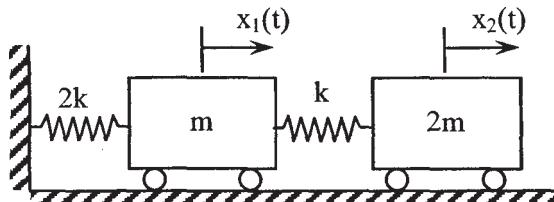


Figure: Q 5 b)

OR

- Q6)** a) What do you mean by principal mode of vibration and mode shape? [4]
 b) For a system of spring, mass and pulley as shown in figure, derive differential equations of motion in terms of absolute displacement x of mass m_1 and angular displacement θ of pulley. Find natural frequencies of the system and mode shapes. The cord connecting the springs is inextensible and there is no slip between the cord and pulley. Take $m_1 = 10\text{kg}$, $m_2 = 40\text{kg}$, $k_1 = 1 \text{ kN/m}$, $k_2 = 2 \text{ kN/m}$ and $r = 200 \text{ mm}$. [12]

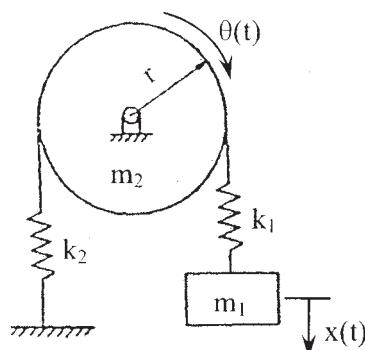


Figure: Q No 6 b)

- Q7)** a) Differentiate between static and dynamic balancing. Why there is a need of accurate dynamic balancing of high speed machines? [4]
 b) A rotating shaft carries four masses A, B, C and D at radii 110, 140, 210 and 160mm respectively. The planes in which the masses revolve are spaced 700 mm apart and the masses of B, C and D are 12 kg, 7kg and 5 kg respectively. Find the mass A and relative angular positions of all the four masses so that the shaft is in complete balance. [12]

OR

Q8) a) Explain the concept of partial balancing in single cylinder IC engine. [4]
b) A four stroke four cylinder inline engine has firing order of 1-4-2-3. The length of crank and connecting rod are 80 mm and 320 mm respectively. The angular position of cranks is at equal angles and engine cylinders are at 180 mm apart. The mass of reciprocating parts of each cylinder is 3 kg. Determine unbalanced primary and secondary forces and couples at a speed of 2000 rpm. [12]

Q9) a) Explain in brief various methods and techniques for vibration control. [6]
b) Explain with neat sketches the working principle of seismic sensor for vibration measurement. [6]
c) A vibration pick-up has a natural frequency of 5.75 Hz and a damping factor 0.65. Determine the lowest frequency beyond which the amplitude can be measured within 2% error. [6]

OR

Q10)a) Explain with neat labeled sketches a typical arrangement of vibration measurement system. [6]
b) Write a short note on the undamped dynamic vibration absorber. [6]
c) Explain the method of vibration based condition monitoring of machines. [6]



Total No. of Questions : 10]

SEAT No. :

P6171

[Total No. of Pages : 2

[5561]-552

**B.E. (Mechanical Sandwich)
Computational Fluid Dynamics
(2015 Pattern) (Semester - II) (Elective - I)**

Time : 2.30 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 fall marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Write the Momentum equation in differential form and explain the each term with significance. [4]
- b) Write the significance of initial and boundary conditions in fluid flow analysis. Why solution initialization is necessary in transient numerical problems? [6]

OR

- Q2)** a) Define curl of velocity. Give an example of practical application of curl of velocity. [6]
- b) Explain the concept of conservation and non-conservation principle using suitable example. [4]

- Q3)** a) Derive the discretized form of the steady, one-dimensional, heat conduction equation. [6]
- b) Explain the term order of accuracy using Taylor series expansion and its truncation. [4]

OR

- Q4)** Discretize the two-dimensional heat conduction, equation using explicit discretization method. [10]

P.T.O.

- Q5)** a) Explain Dirichlet boundary condition with an example. [4]
 b) Derive an expression of first order upwind scheme. [4]
 c) Derive finite volume discretized expression for two-dimensional advection equation using suitable approach. [10]

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]

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

- b) Discretize the one-dimensional transient convection diffusion equation using suitable discretization method. Discuss the accuracy of the scheme.

[8]

- Q7)** a) Develop an algorithm to solve problem of incompressible flow over an airfoil. [10]
 b) Discuss the challenges in solving Navier-Stokes Equations numerically? Suggest two remedies to overcome these challenges. [6]

OR

- Q8)** a) Write down the stepwise procedure to solve the lid driven cavity problem using any commercial software. Draw the neat sketches. [10]
 b) Write short note on SIMPLE algorithm. [6]

- Q9)** a) Give practical example of real life problem where one-equation turbulence model is used. Explain any “one-equation” turbulence model in detail. [10]
 b) Write a note on Reynolds Averaged Navier-Stokes Equations. [6]

OR

- Q10)** a) Write in detail CFD analysis process with pre-processing, solver and post-processing for aerodynamic analysis of formula one car. Highlight some of the crucial issues in numerical analysis. [12]
 b) Why turbulence modeling is required in numerical analysis? [4]



[5561]-553

**B.E. (Mechanical Sandwich)
CAD/CAM and AUTOMATION
(2015 Pattern) (Semester - II) (Elective - I)**

*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.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Discuss the rotation matrices for rotation about X, Y and Z axis. [5]
 b) Discuss inverse transformation and its use in computer graphics. [5]

OR

- Q2)** a) A line PQ with vertices P (2, 5), Q (6, 7) is rotated by 45° clockwise about a point R(1, 1) determine the new coordinates. [5]
 b) Discuss Boolean operations in Constructive Solid Geometry. [5]

- Q3)** a) Discuss application of hermit cubic spline surface. [5]
 b) A line is represented by the endpoints P (2, 4) and Q (-3, 6). If the value of Parameter u at P and Q is 0 and 1 respectively, determine the equation of the line. Also determine the coordinate of point on the line at u = 0.25, 0.5 and 0.75. [5]

OR

- Q4)** A two bar Truss is shown in Fig 1. Determine nodal displacements, support reactions and element stresses. Area of both element is 1000 mm² and E = 200 GPa. [10]

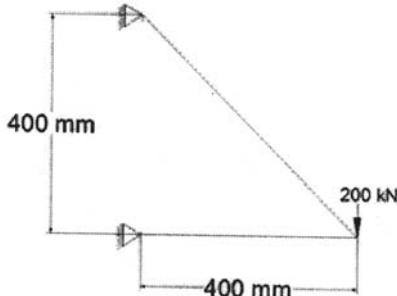


Fig. 1

- Q5)** a) Discuss working principles of CNC Turning center and Milling center. [8]
b) Write CNC program using G and M codes to turn the component shown in fig. 2 having Stock size is ϕ 50mm. Use canned cycles wherever applicable. Assume suitable data for speed and feed. [10]

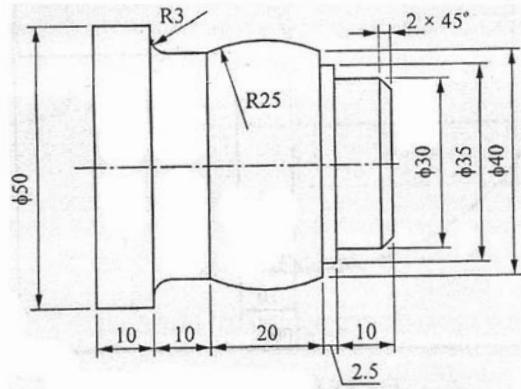


Fig. 2

OR

- Q6) a)** Write CNC program using G and M codes to contour, face and drill the component shown in fig. 3. Use canned cycles wherever applicable. Thickness of blank is 7 mm. Assume suitable data for speed and feed. [10]

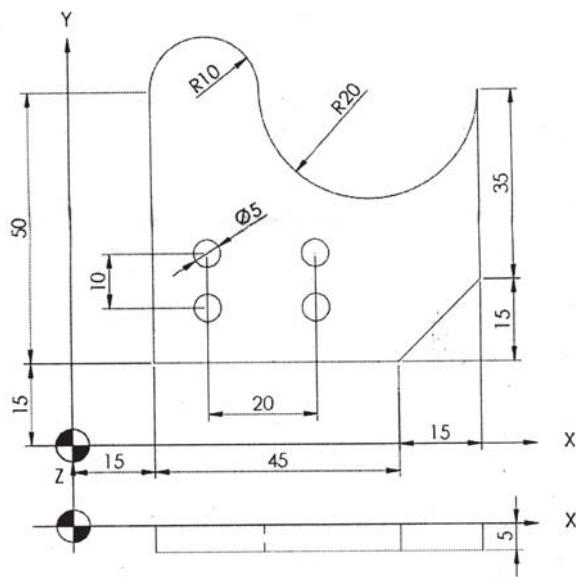


Fig. 3

- b) Discuss steps in developing CNC part program in detail. [8]

- Q7)** a) Discuss the elements of Product Life Cycle. [8]
b) Discuss the 4D Rapid prototyping concept. [8]

OR

- Q8)** a) Explain working principle of Stereo Lithography Apparatus method for rapid prototyping. [8]
b) Discuss Collaborative Engineering with suitable example. [8]

- Q9)** a) Discuss types of flexible manufacturing systems with suitable example. [8]
b) Discuss the laws of Robotics with suitable example. [8]

OR

- Q10)**a) Discuss types of coding methods of Group Technology and explain any one in brief. [8]
b) Discuss Computer Aided Process Planning. [8]



Total No. of Questions : 10]

SEAT No. :

P5141

[Total No. of Pages : 3

[5561]-554

**B.E. (Mechanical Sandwich)
FINITE ELEMENT ANALYSIS
(2015 Pattern) (Semester - II)**

Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

- 1) Draw suitable neat diagram, wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if required.

- Q1)** a) State different types of analysis used in Finite Element Analysis. Explain any TWO of them. [6]
b) Explain the term shape function. Write the properties of Shape Function. [4]

OR

- Q2)** a) How Pascal triangle is used to determine a shape function for two-Dimensional elements? How rigid body displacement and constant strain rate is taken into account in these polynomial terms? [6]
b) State properties of stiffness matrix. [4]

- Q3)** For the plane truss as shown in figure 1, take $E = 2 \times 10^5 \text{ N/mm}^2$, $A = 200\text{mm}^2$
Determine : 1. Nodal Displacement 2. Support Reactions 3. Element stress. [10]

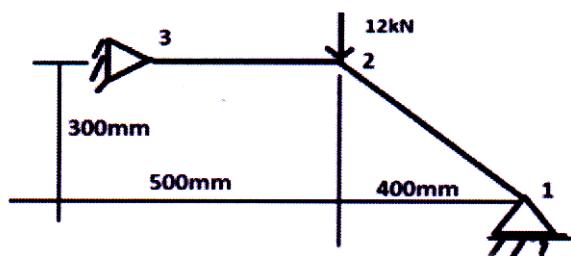


Figure 1

OR

- Q4)** a) Explain in detail Galerkin weighted residual method. [6]
b) Explain CST and LSR elements. [4]

P.T.O.

Q5) a) Write a short note on : [12]

- i) Area Coordinate of the triangular Element and Natural coordinates.
- ii) Higher order triangular and quadrilateral element.

b) Determine the Jacobian of the triangular element as shown in figure 2. Also find area of the triangle. [6]

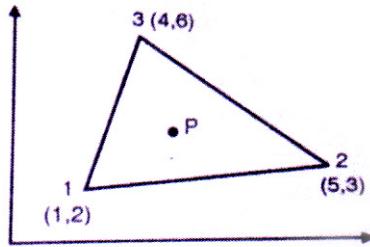


Figure 2

OR

Q6) a) Write a note on uniqueness of mapping. How the Jacobian matrix used to check uniqueness of mapping? [6]

b) Write difference between P refinement and h refinement. [4]

c) Determine integration of following function by using Gauss 2- Point and 3 - Point integration method and compare with exact solution. [8]

$$\int_2^8 x \, dx$$

Q7) a) Write down governing equation of steady state heat transfer. Also write down element stiffness matrix and compare it with bar element. [6]

b) Consider a composite slab consist of three materials with thermal conductivities 20W/m °C, 40W/m °C and 60W/m °C and thickness 0.2m, 0.3m and 0.3m respectively. The outer surface is at 20 °C and inner surface is exposed to the fluid having convective heat transfer coefficient of 25 W/m² °C and temperature 800 °C. Determine temperature distribution within the slab. [10]

OR

- Q8)** Determine the temperature distribution along the length of the rod (at $L/4$, $L/2$, $3L/4$ and L) as shown in figure 3, The rod with radius 25mm is insulated at the perimeter. The left end has a constant temperature of 40°C and a free stream temperature is -10°C , Take, $K = 35 \text{ W/m}^{\circ}\text{C}$, $h = 55 \text{ W/m}^2\text{ }^{\circ}\text{C}$. [16]

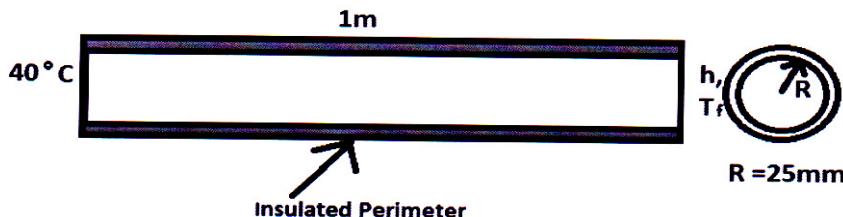


Figure 3

- Q9)** a) Write a lumped and consistent mass matrix for Bar Element and Truss Element. [6]
 b) Find the natural frequencies of longitudinal vibrations of the same stepped shaft of area A and $2A$ of equal length(L), as shown in figure 4. Use consistent mass matrix. [10]

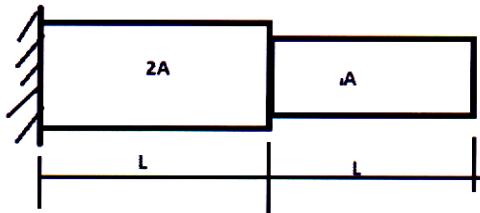


Figure 4

OR

- Q10)** a) Explain each term of dynamic equation and explain importance of Eigen values and Eigen vectors. [6]
 b) Find the natural frequencies of longitudinal vibrations of the same stepped shaft of area A and $2A$ of equal length(L), as shown in figure 5. Use Lumped mass matrix. [10]

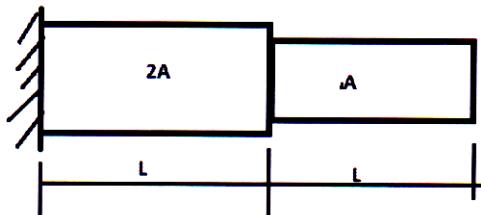


Figure 5

▽▽▽▽

Total No. of Questions : 10]

SEAT No. :

P5578

[Total No. of Pages : 4

[5561]-555

B.E. (Mechanical Sandwich)

HYDRAULICS AND PNEUMATICS

(2015 Pattern) (End Semester) (Theory) (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 Q8, 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 is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What are the important properties of hydraulic fluids? Explain any four in details. [5]

b) Compare Hydraulics and Pneumatics System. [5]

OR

Q2) a) What are the different causes of pump failures in a hydraulic system? [5]

b) Explain in detail the Energy losses in hydraulic system. [5]

Q3) a) What is cushioning in a cylinder and how is cylinder are rated? [4]

b) Explain with neat sketch: Closed centre DCV. Draw circuit showing its application. [6]

OR

Q4) a) Describe the pressure compensated valves. [4]

b) Hydraulic motor has a displacement of 164 cc/rev. and operates with a pressure of 70 bar. It runs at 200 rpm. If the actual oil flow rate consumed by the motor is 360 LPM and the actual torque delivered by the motor is 170 N-m, determine the i) Volumetric efficiency ii) Mechanical efficiency iii) Overall efficiency. [6]

P.T.O.

Q5) a) What is fail safe circuit? Explain with neat diagram. [8]

b) Write short note on “Unloading circuit.” [8]

OR

Q6) a) Sketch a typical sequencing circuit and explain its working. What is the difference between sequence valve and pressure relief valve? [8]

b) Explain with a neat sketch the working of counter balance valve and draw a typical circuit showing its application. [8]

Q7) a) Explain in detail the advantages and applications of pneumatics in industrial Automation. [8]

b) Explain with the help of a neat sketch a time delay valve and also draw a typical circuit showing its application. [8]

OR

Q8) a) Write short notes on : [8]

i) OSHA standards

ii) Air oil intensifier

iii) Air dryer

iv) Use of pneumatics in low cost automation

b) Explain Atuator locking circuit. [8]

Q9) a) Explain different methods of vacuum measurement. [6]

b) A machine tool slide is moved by means of a hydraulic cylinder as follows. [12]

i) Initially it moves through a distance of 200 mm against an effective load of 12KN in about 3 sec.

ii) It is followed by a working stroke of 100 mm against an effective load of 35 KN. The feed rate during this part of the stroke is required to be between 0.5 to 1m/min.

- iii) The return stroke is as fast as possible. A meter out type of circuit is used. Draw a circuit. Select different components used in the circuit from the data tables.

OR

Q10) a) Write a short note on “Trouble shooting maintenance procedures for “pumps & pressure Relief valves” [6]

b) Draw a simple hydraulic circuit which will operate a hydraulic cylinder of a machine. The load during the forward stroke is 15 KN and that during the return stroke is approximately 9.5 K.N. The forward and return speeds are about 3.5 m/min and 5.5m/min respectively. The total stroke of the cylinder is 300 mm. A provision is required to hold the cylinder anywhere in between the end positions. Select the different components form the given data tables. Specify the ratings of the components in case; it is not available in the given data. [12]

DATA**1. SUCTION STRAINER:**

Model	Flow capacity (lpm)
S1	38
S2	76
S3	152

6. DIRECTION CONTROL VALVE:

Model	Max. working pressure (bar)	Flow capacity (lpm)
D1	350	19
D2	210	38
D3	210	76

2. PRESSURE GAUGE:

Model	Range (bar)
PG1	0-25
PG2	0-40
PG3	0-100
PG4	0-160

7. CHECK VALVE

Model	Max. working pressure (bar)	Flow capacity (lpm)
C1	210	15.2
C2	210	30.4
C3	210	76

3. VANE PUMP:**8. SEQUENCE VALVE**

Model	Delivery (lpm)			Model	Max. working pressure (bar)	Flow capacity (lpm)
	at 0 bar	at 35 bar	at 70 bar			
P1	8.5	7.1	5.3	PO1	210	19
P2	12.9	11.4	9.5	PO2	210	38
P3	17.6	16.1	14.3	PO3	210	76
P4	25.1	23.8	22.4			
P5	39	37.5	35.6			

9. CYLINDER (Max. working pressure -210)**4. RELIEF VALVE:**

Model	Flow range (lpm)	Max. working pressure (bar)	Model	Bore Dia. (mm)	Rod Dia. (mm)
				(mm)	
R1	11.4	70	A1	25	12.5
R2	19	210	A2	40	16
R3	30.4	70	A3	50	35
R4	57	105	A4	75	45
			A5	100	50

5.FLOW CONTROL VALVE:**10. OIL RESERVOIR:**

Model	Max. working pressure (bar)	Flow range (lpm)	Model	Capacity (lit)
F1	70	0-4.1	T1	40
F2	105	0-4.9	T2	100
F3	105	0-10.3	T3	250
F4	70	0-24.6	T4	400
			T5	600



Total No. of Questions : 10]

SEAT No. :

P5142

[Total No. of Pages : 3

[5561]-556

**B.E. (Mech Sndwitch Engg)
Energy Audit & Management (Elective - II)
(2015 Pattern) (Semester - II)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagram must be drawn whenever necessary.*
- 2) *Figure to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Define with example. [4]

- i) Primary and secondary energy.
- ii) Commercial and non-commercial energy.

b) Explain energy consumption pattern of global Industry. [6]

OR

Q2) a) Write short note on energy policy. [5]

b) List all requirements of energy action planning. [5]

Q3) a) Explain any four strategies for better energy security of the nation. [4]

b) Distinguish between preliminary energy audit and detailed energy audit.
How does a preliminary energy audit help conduct detailed energy audit? [6]

OR

Q4) Calculate net present value and IRR for the project which has following cash flow. Discount rate 10%. [10]

Investment	Rs. 10,00,000
Saving in year	Cash flow (Rs)
1	2,00,000
2	2,00,000
3	3,00,000
4	3,00,000
5	3,50,000

P.T.O.

- Q5) a)** Consider 2 projects A & B with the initial investment Rs. 80,000. The project life times are 5 years in case. The saving in each of the 5 years for the two projects are as shown in following table. ROI = 20% [10]

	Project A	Project B
Capital Cost (Rs)	Rs. 80,000	Rs. 80,000
year	Cash flow(Rs)	Cash flow(Rs)
1	10,000	30,000
2	20,000	40,000
3	30,000	30,000
4	40,000	20,000
5	50,000	10,000

- b) A company borrows Rs 30000 to finance a new boiler installation. If the interest rate is 12% per annum & repayment period is 6 years. Calculate the value of total repayment & monthly repayment value for. [6]
- Simple interest.
 - Compound interest.

OR

- Q6) a)** What are the different heat losses occurring in oil fired furnace? Explain in brief. [8]
- b) Explain the energy saving opportunities in compressed air system. [8]

- Q7) a)** What are the parameters to be monitored for evaluating 'direct efficiency' of boilers and what is the empirical relation used? [8]
- b) What are the factors affecting energy efficiency of electric motor? [8]

OR

- Q8) a)** Explain the following terms: [8]
- Power factor.
 - Maximum demand.
- b) The lighting connected load for the small industry consisting of 140 fluorescent tubes of 55 W each with magnetic ballast. In first option, the magnetic ballast of fluorescent tubes reduces to 40 W. Calculate the simple payback period of above replacement if cost of electronic ballast is Rs. 110. In second option, fluorescent tubes are replaced by energy efficient fluorescent tubes of 20 W & cost of Rs. 450 each. Calculate simple payback period. Which energy saving option is better & why? consider usage of 16 hrs per day & an electrical tariff of Rs4. per kwh.[8]

- Q9)** a) What are the benefits of waste heat recovery system. [6]
b) Why cogeneration system play an importeant role in any industry. [6]
c) Explain lux meter with diagram. [6]

OR

Q10) Write a note on following with example. [18]

- a) Carbon credit.
- b) Bottoming cycle.
- c) Heat pipe.
- d) CDM project.



Total No. of Questions : 10]

SEAT No. :

P4776

[Total No. of Pages : 5

[5561]-557

**B.E. (Mechanical Sandwich)
OPERATIONS RESEARCH**

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

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) Answers in one answer books.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain with the help of neat sketch methodology use in Operation research. [4]
- b) An airline company has drawn up a new flight schedule that involves five flights. To assist in allocating five pilot to the five flights, it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater is the preference. A few of these flights are unsuitable to some pilots, owing to domestic reasons. These have been marked with "X"

Flight Number

	I	II	III	IV	V
A	8	2	X	5	4
B	10	9	2	8	4
C	5	4	9	6	X
D	3	6	2	8	7
E	5	6	10	4	3

What should be the allocation of the pilots in order to meet as many preferences as possible? [6]

OR

P.T.O.

- Q2)** a) A truck owner finds from his past records that the maintenance cost per year of a truck whose purchase price is Rs. 8,000 are as follows :

Year	1	2	3	4	5	6	7	8
Maintenance Cost(Rs)	1000	1300	1700	2000	2900	3800	4800	6000
Resale price (Rs)	4000	2000	1200	600	500	400	400	400

Determine at which time it is profitable to replace the truck. [6]

- b) Discuss different types of Decision making environments. [4]

- Q3)** a) Find the initial basic feasible solution using Vogel's approximation method. [6]

	W1	W2	W3	W4	Availability
F ₁	19	30	50	10	7
F ₂	70	30	40	60	9
F ₃	40	8	70	20	18
Requirement	5	8	7	14	

- b) Discuss the generalised model of linear programming (LLP) in OR. [4]

OR

- Q4)** Two players P and Q play a game. Each of them has choose one of the three colours, white (W), Black (B) and the red (R) independently of the other. Thereafter the colours are compared. If both P & Q have chosen white (W,W), neither wins anything. If players P select white and player Q selects Black (W, B), player P loses Rs 2 or player Q wins the same amount and so on. The complete payoff matrix is as shown below. Fins the optimum strategies for P and Q and the value of the game. [10]

Colour chosen by Player Q

	W	B	R
W	2	-2	7
B	2	5	6
R	3	-3	8

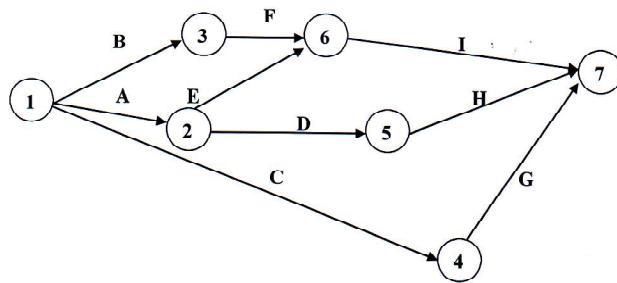
Colour chosen by Player P

- Q5) a)** The following network diagram represents activities associated with a project as shown in the following figure : [12]

Activities	A	B	C	D	E	F	G	H	I
Optimistic time	5	18	26	16	15	6	7	7	3
Pessimistic time	10	22	40	20	25	12	12	9	5
Most likely time	8	20	33	18	20	9	10	8	4

Determine the following

- i) Expected completion time and variance of each activity
- ii) The earliest and latest expected completion time of each activity.
- iii) The critical path
- iv) The probability of expected completion time of the project if the original scheduled time of completing the project is 41.5 weeks. ($P = 0.3048$ for $z = -0.52$)
- v) The duration of the project that will have 95% chance of being complete. ($P = 0.95$ for $z = 1.64$)



- b) What is looping and Dangling errors in the network. [4]

OR

- Q6) a)** A dentist scheduled all his patients for 30 minute appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probability and time actually needed to complete the work:

Category of service	Time required in Minute	Probability
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Checkup	15	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8:00 a.m. Use the following sequence of random numbers to simulate the above problem.

Random Numbers: 40, 82, 11, 34, 25, 66, 17, 79 [12]

b) Explain the significance of CPM and PERT. [4]

Q7) a) A book binder has one printing press, one binding machine and manuscripts of 7 different books. The times required for performing printing and binding operations for different books are shown below :

Book	1	2	3	4	5	6	7
Printing Press(Hours)	3	12	15	6	10	11	9
Binding time (Hours)	8	10	10	6	12	1	3

Decide the optimum sequence of processing book in order to minimize the total time required to bring out all the books. [10]

b) Draw the sketch of queuing system structure and explain various components of it. [6]

OR

Q8) a) Six jobs are to be process on three machines. The processing time is as follows, Find the optimal schedule so that the total elapsed time is minimized. [10]

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

b) Explain following terms related to the queue discipline. [6]

- i) First- come, first- served (FCFS)
- ii) Last - come, first- served (LCFS)
- iii) Service in random order (SIRO)

Q9) a) Solve the following integer LP problem using branch and bound method. [12]

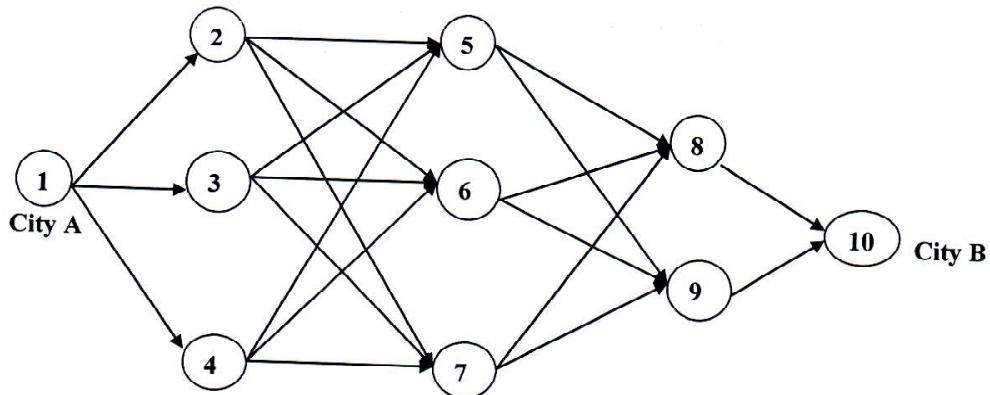
$$\text{Maximize } Z = 2X_1 + 3X_2$$

Subject to constrain

- i) $6X_1 + 5X_2 \leq 25$
- ii) $X_1 + 3X_2 \leq 10$
- iii) $X_1, X_2 \geq 0$ and integers

- b) Explain in brief Dynamic programming (DP) model. [6]
OR

- Q10)** a) A salesman located in a city A decided to travel to city B. He knew the distances of alternative routes from city A to city B. He then drew a highway network map as shown in following figure. The city of origin A, is city 1. The destination city B is city 10. Other cities through which the salesman will have to pass through are numbered 2 to 9. The arrow representing routes between cities and distances in kilometres are located on each route. The salesman problem is to find the shortest route that covers all the selected cities from A to B. The time for each activity is given in the table. (Solve by using Dynamic programming) [12]



Activity	Duration	Activity	Duration
1-2	4	4-5	6
1-3	6	4-6	10
1-4	3	4-7	5
2-5	7	5-8	4
2-6	10	5-9	8
2-7	5	6-8	3
3-5	3	6-9	7
3-6	8	7-8	8
3-7	4	7-9	4
		8-10	7
		9-10	9

- b) Explain methodology used in cutting plane method. [6]



Total No. of Questions : 9]

SEAT No. :

P3888

[5561]-558

[Total No. of Pages : 3

B.E. (Automobile Engineering)

**AUTOMOTIVE REFRIGERATION & AIR-CONDITIONING
(2015 Course) (Semester - I) (416488)**

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) Question No. 9 is compulsory.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of Logarithmic tables, sliderule, electronic pocket calculator is allowed.
- 6) Assume Suitable data if necessary.
- 7) Use of steam table, psychrometric chart is allowed

Q1) a) 1.5 kW per TR is required to maintain the temperature of -40°C in the refrigerator. If the refrigeration system works on Carnot cycle, determine the following:

- i) C.O.P. of system
- ii) temperature of sink
- iii) heat rejected to sink per TR

[6]

b) Explain effect of suction and discharge pressure on vapour compression cycle. **[4]**

OR

Q2) a) Draw Bell-Coleman cycle and derive expression of COP for it. **[6]**

b) Define Tonne of refrigeration and compare COP of refrigerator & heat pump. **[4]**

Q3) a) Classify refrigerants in detail. **[6]**

b) Differentiate flooded type and Dry evaporators. **[4]**

OR

Q4) a) Explain various modes of air distribution system **[6]**

b) Define GWP and ODP in detail. **[4]**

P.T.O.

- Q5)** a) Explain following properties of air [8]
- Relative humidity
 - DBT & DPT
 - Dry air & saturated air
 - WBT & Wet bulb depression
- b) A sample of air has a dry-bulb temperature of 43°C and a wet-bulb temperature of 29°C . Calculate without using psychrometric chart. [8]
- Partial pressure of water vapour
 - Specific humidity
 - Relative humidity
 - Dew point temperature

OR

- Q6)** a) Explain in detail sensible heating and By-pass factor. [8]
- b) The atmospheric air at 30°C DBT and 75% RH, enters a cooling coil at the rate of $200 \text{ m}^3/\text{min}$. The coil dew point temperature is 14°C and by-pass factor of the coil is 0.1. Determine: [8]
- Temperature of air leaving cooling coil.
 - Capacity of cooling coil in TR
 - Amount of water vapour removed per minute
 - SHF

- Q7)** An air conditioned auditorium is to be maintained at 27°C DBT and 60% RH. The ambient condition is 40°C DBT and 30°C WBT. The total sensible heat load is 100,000 kJ/hr and total latent heat load is 40,000 kJ/hr. 60% of return air is recirculated and mixed with 40% of make-up air after cooling coil. The condition of air leaving the cooling coil is at 18°C . Determine [16]

- RSHF
- Condition of air entering the auditorium
- Amount of make-up air
- ADP
- By-pass factor of cooling coil

OR

Q8) The bus sensible and latent heat load for air-conditioned space are 25 kW and 5kW respectively. The room conditions are 25°C DBT & 50% RH. The outer condition is 40°C DBT & 50% RH. The ventilation requirement is such that 20% fresh air is mixed with supply air. BPF of cooling coil is 0.15. [16]

Determine:-

- a) Supply air flow
- b) Outside air sensible heat
- c) Outside air latent heat
- d) Grand total heat

Q9) Write short notes on (any three) [18]

- a) Temperature measurement in AC.
- b) Leak detection test.
- c) Sensors & actuators used in AC system.
- d) Refrigerant system flushing and odour removal.
- e) Refrigerant recovery and retrofitting.

X X X

Total No. of Questions : 10]

SEAT No. :

P3889

[5561]-559

[Total No. of Pages : 2

B.E. (Automobile Engineering)

**ALTERNATIVE FUELS AND EMISSION CONTROL
(2015 Course) (416489)**

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, 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) Suggest good characteristics of alternative fuel for I.C. engine. [5]
b) List and explain the role of diesel fuel additives in C.I. engine. [5]

OR

- Q2)** a) Explain the working principle of dual fuel technology for automotive engine with its advantages. [5]
b) Discuss the Biogas as alternative fuel for gasoline engine. [5]

- Q3)** a) Compare the properties of LPG and CNG as an alternative fuel for IC engine. [5]
b) Analyze the effects of fuel - air ratio on SI engine emission. [5]

OR

- Q4)** a) Explain the effect of combustion chamber dead volumes on C.I. engine emission. [5]
b) Justify the major causes for formation of HC emission in SI engine. [5]

- Q5)** a) Explain with neat sketch constructional and operational features of NDIR analyzer for measurement of CO and CO₂ concentration. [8]
b) Draw and explain with neat sketch urban ECE 15 and EUDC driving test cycle for emission measurement. [8]

OR

P.T.O.

- Q6)** a) Explain with neat sketch constructional and operational features of flame ionization detector (FID) for measurement of HC concentration. [8]
b) Explain the constant volume sampling emission measurement technique with neat sketch. [8]

- Q7)** a) Discuss in detail role of engine design parameters on SI engine emission control. [8]
b) Explain with neat sketch evaporative emission control system. [8]

OR

- Q8)** a) Classify and explain PM emission control techniques in C.I. engine. [8]
b) Explain the construction and working of exhaust gas recirculation system with neat sketch. [8]

- Q9)** a) Explain the working principle of turbo charger with its advantages. [6]
b) Describe the advantages and disadvantages of CRDI system in CI engine. [6]
c) List and explain the good requirements of Catalyst Substrate. [6]

OR

- Q10)**a) Discuss the role of thermal reactor for emission control technology in IC engine. [6]
b) Draw and explain the performance characteristics of CRDI system. [6]
c) Describe the functions of two way and three way catalytic convertor.[6]



Total No. of Questions : 10]

SEAT No. :

P3891

[5561]-561

[Total No. of Pages : 2

B.E.(Automobile Engineering)

**FUNDAMENTALS OF COMPUTATIONAL FLUID DYNAMICS
(2015 Pattern) (Semester - I) (Elective - 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, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) Write short note on Couette flow equation. [4]

b) Write short note on Strengths and Weakness of CFD. [6]

OR

Q2) a) State and explain types of grid generation. [4]

b) Explain Euler's model. [6]

Q3) a) Write down a formula for Finite difference approximation using Taylor series (first order). [2]

b) Write short note on Alternating Direction Implicit method (ADI) [8]

OR

Q4) a) Explicit approaches. [2]

b) Explain Solution of two dimensional steady and unsteady heat conduction equation with Dirichlet. [8]

Q5) a) What is Peclet number? State its Significance. [8]

b) Derive First order wave equation with Mac Cormac scheme. [8]

OR

Q6) a) Write in brief about Lax Wendroff method and its stability criteria. [8]

b) Explain 1D steady Convection Diffusion system. [8]

P.T.O.

Q7) a) Write applications of flow through pipe. [9]

b) Explain Finite volume method. [9]

OR

Q8) Write difference between SIMPLE, SIMPLER, SIMPLEC algorithm with the help of Navier stroke equation. [18]

Q9) a) Explain following solver models [8]

i) K - ϵ

ii) K - w

b) Explain the following [8]

i) Control residual in any CFD tool

ii) Setup solver for obtaining plots for analysis

OR

Q10) Write short on [16]

a) Steps in pre-processing

b) Introduction to turbulence models.

c) Geometry creation

d) Reynolds Averaged Navier-Stokes equations



B.E.(Automobile Engineering)**FUNDAMENTALS OF FINITE ELEMENT ANALYSIS
(2015 Course) (Semester - I) (Elective - I) (416491B)****Time : 2½ Hour]****[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 and calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1)** a) Describe in detail the steps involved in solving structural problem. [6]
 b) Determine the nodal displacement strain and stresses in each element as shown in figure 1. Consider the $E = 200 \text{ GPa}$, force $P = 10 \text{ N}$. [8]

Given: $A_1 = 20 \text{ mm}^2$ $A_2 = 10 \text{ mm}^2$
 $L_1 = 100\text{mm}$ $L_2 = 100\text{mm}$

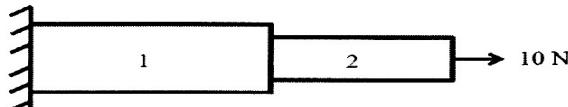


Figure 1

- c) Write the importance of shape function with neat sketch for CST element. [6]

OR

- Q2)** a) Obtain the shape functions for the two node 1 D element. [6]
 b) For the two-bar truss shown in figure 2. Determine the nodal displacement. A force of $P = 1000 \text{ kN}$ is applied at node 1, take $E = 210 \text{ GPa}$ and $A = 600 \text{ mm}^2$ for each element. [8]

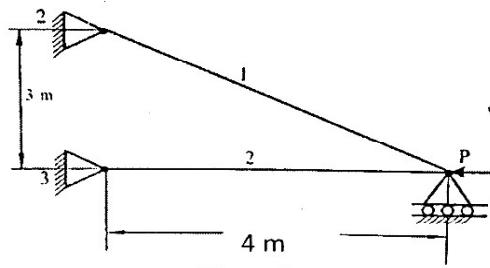


Figure 2

- c) Explain the terms patch test. Uniqueness of mapping. [6]

P.T.O.

Q3) a) Write a short note (Any Two): [8]

- i) Jacobian matrix
- ii) Submodeling
- iii) Isoparametric Element

b) Evaluate the integrals using two point Gaussian quadrature. [10]

i) $I = \int_{-1}^1 \left(x^2 + \cos\left(\frac{x}{2}\right) \right) dx$

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

OR

Q4) a) Explain in detail the Gauss quadrature method for numerical integration. [8]

b) For CST element as shown in Figure 3 are given as $N1 = \zeta$, $N2 = \eta$, and $N3 = 1 - \zeta - \eta$. Evaluate shape functions at interior point P. Also, if temperatures at node 1, 2 and 3 are 25° , 30° , and 50° respectively, evaluate the temperature at the interior point P. [10]

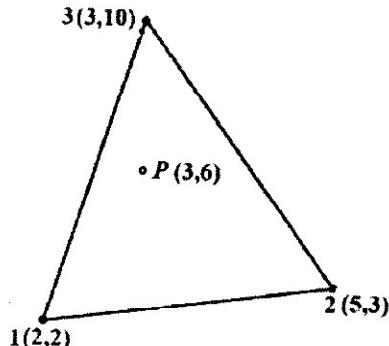


Figure 3

Q5) a) Derive elements stiffness matrix formulation for one dimensional steady state Heat Conduction problems. [8]

- b) A composite wall consists of three materials as shown in figure 4. The outer temperature of wall is $T_0 = 22^\circ \text{C}$. Convection heat transfer takes place on the inner surface of the wall with $T_\infty = 30^\circ \text{C}$ and $h = 25 \text{ W/m}^2\text{K}$. Determine the temperature distribution in the wall. [8]

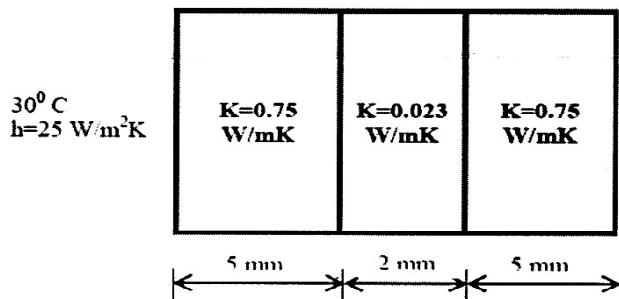


Figure 4

OR

- Q6)** The fin shown in Figure 6.1 is insulated on the perimeter. The left end has a constant temperature of 100°C . A positive heat flux of $q = 5000 \text{ W/m}^2$ acts on the right end. Let $K_{xx} = 6 \text{ W/(m}^\circ\text{C)}$ and cross sectional area $A = 0.1 \text{ m}^2$. Determine the temperatures at $L/4$, $L/2$, $3L/4$ and L where $L = 0.4 \text{ m}$. [16]

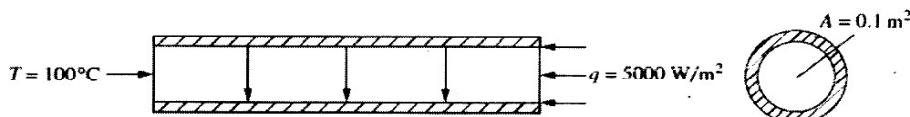


Figure 5

- Q7)** For bar element shown in figure 6 with length $L = 2.5 \text{ m}$, $E = 210 \text{ GPa}$, $\rho = 7850 \text{ kg/m}^3$. Determine the first two natural frequencies by using lumped mass & consistence mass matrix. Consider two elements. [16]

$$\text{Lumped Mass} = \frac{\rho Al}{2} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \& \quad \text{Consistence Mass} = \frac{\rho Al}{6} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

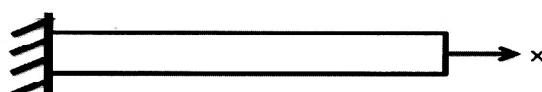


Figure 6

OR

- Q8)** a) Types of error in FEA & explain mesh refinement used in adaptive mesh refinement process. [8]
 b) Explain the difference between lumped mass matrix and consistent mass. [8]



Total No. of Questions : 10]

SEAT No. :

P3893

[5561]-563

[Total No. of Pages : 3

B.E.(Automobile)

CAE & AUTOMATION

(2015 Pattern) (Semester - I) (End Sem.) (Elective - I) (416491C)

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) Write a short note on Hermite cubic spline curve. [6]

b) Describe feature base modeling. [4]

OR

Q2) a) Determine the concatenated transformation matrix to reflect or mirror any entity about the line $y = mx + c$. [6]

b) What do you understand by “parametric representation” explain in brief. [4]

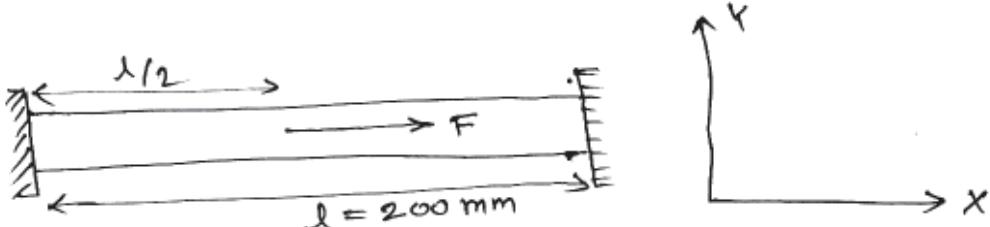
Q3) a) What do you understand by analytic curves? Explain any two curves in detailed. [6]

b) Explain Raylieh-Ritz approximation method. [4]

OR

Q4) a) A fixed beam of 10 mm^2 cross-sectional area and 200 mm length. shown in below fig. subjected to an axial force 2000 N at mid point. Using the Raylieh-Ritz approximation method determines. [6]

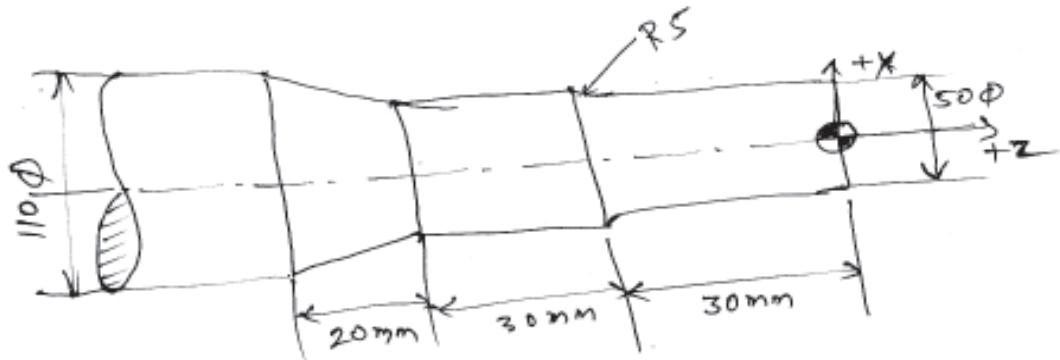
- i) Displacement function
- ii) Strain function
- iii) Stress function



b) Write the difference between finite difference method (FDM), finite volume method (FVM) and finite element method (FEM). [4]

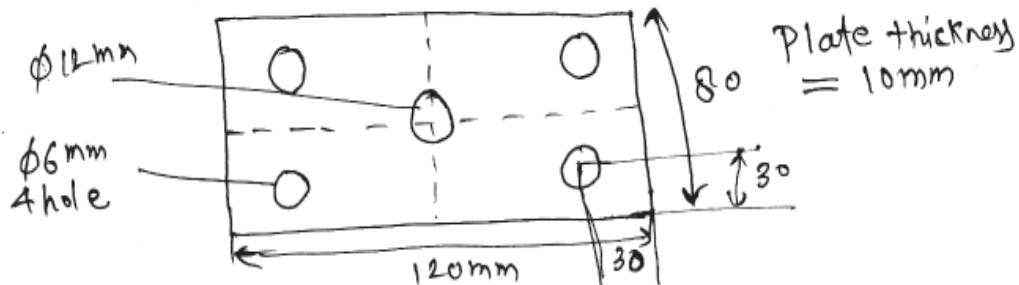
P.T.O.

- Q5)** a) Explain the concept of CIM. [6]
 b) Write a manual part programming for finished a forged component as shown in below fig. Assume feed and speed on training center is 0.30 mm/revolution and 450 rpm respectively. Assume 1 mm is to be removed radially from external diameter. [12]



OR

- Q6)** a) Write a manual part programming for drilling and milling as shown in bellow fig. Assume 5 mm diameter milling cutter and necessary size drill for drilling operation. The tool position in Z direction is manually controlled. Feed rate 480 mm/min and spindle speed is 1600 rpm. [12]



- b) Explain the steps in NC manufacturing. [6]

- Q7)** a) Why automation is required? Discuss Hard, soft and flexible automation. [8]
 b) What is FMS? Explain different elements of FMS. [8]

OR

- Q8)** a) Write short note on AGV, Write down advantages and disadvantages of AGV. [8]
b) What is Group Technology? Describe OPTIZ coding system in detail. [8]

- Q9)** a) What is Gripper? State different types of grippers. Explain any one gripper. [8]
b) State and explain parameters used in robot specifications. [8]

OR

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

- a) Robot programming Languages
- b) Sensors used in robots
- c) Application of robot in Industry
- d) Methods of robot programming



Total No. of Questions : 10]

SEAT No. :

P3894

[5561]-564

[Total No. of Pages : 2

B.E. (Automobile Engineering)
SPECIAL PURPOSE VEHICLE

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

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 indicates full marks.

Q1) a) Name the four special purpose vehicles and explain their applications. [8]

b) Explain about the power plant used in road construction. [8]

OR

Q2) a) Narrate the chassis and transmission considerations in an off road vehicle. [8]

b) Explain about the construction and working of Grader. [8]

Q3) Explain about the attachments of bulldozers. [4]

OR

Q4) What are the applications of self propelled scraper? [4]

Q5) a) With neat sketch explain about tanker. [10]

b) Compare transmission drive P.T.O. and Independent drive P.T.O. [8]

OR

Q6) Explain about the followings: [18]

- a) Gun Carriers
- b) Transport Vehicles
- c) Pulverizes & Rollers

P.T.O.

Q7) a) With neat sketch explain the working of Independent drive P.T.O. [8]

b) Explain OCDB and dry disc caliper brake system of the vehicle. [8]

OR

Q8) a) Narrate the design aspects of the dumper body. [8]

b) Explain the safe warning system for a dumper. [8]

Q9) a) Explain the characteristics of soil. [8]

b) Describe the main components of hydraulic system with the help of block diagram. [8]

OR

Q10) Explain the followings:

a) Soil Horizons with neat sketch. [8]

b) i) Distinguish between Ground pressure and Nominal ground pressure

ii) Mobility index (mi)

[8]



Total No. of Questions : 10]

SEAT No. :

P3895

[5561]-565

[Total No. of Pages : 2

B.E. (Automobile Engineering)

VEHICLE MAINTENANCE

(2015 Course) (Semester-I) (Elective-II) (416492B)

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 indicates full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Differentiate between the terms “Servicing” and “Maintenance”. [5]
b) Illustrate a typical maintenance log sheet of an automobile. [5]

OR

- Q2)** a) Explain the need of thermostat in a vehicle cooling system. [5]
b) What is vapour lock in fuel system? How it is caused? [5]

- Q3)** a) Explain in detail work to be carried out for Engine tune-up and top overhauling. [5]
b) What is mean by the valve lapping? Explain in detail? [5]

OR

- Q4)** a) Explain tuning of carburettor for optimum fuel supply. [5]
b) What is a circlip? How it can be removed and fixed? [5]

- Q5)** a) Explain with neat sketch of tyre rotation to ensure even wear of tyres for a passenger car having a spare wheel. [8]
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) Define the following terms with neat diagram: [8]

- i) Camber
- ii) Caster
- iii) King Pin Inclination
- iv) Toe in & Toe out

b) What are the causes for noise in the final drive housing of a vehicle. [8]

Q7) a) Explain different problems that may affect the performance of a hydraulic braking system with drum brakes. [8]

b) What is meant by bleeding of hydraulic brakes? Explain with neat sketch how it is done? [8]

OR

Q8) a) Explain the Air braking system with neat diagram & prepare a list of causes & remedies related to each component. [8]

b) Explain in the detail procedure for hub greasing. [8]

Q9) a) Discuss the reliability related to the vehicle Maintenance in detail. [9]

b) Analyze the role of electronic control module in automotive diagnosis system. [9]

OR

Q10)a) Explain in detail the different type of sensors used in diagnostic system and give its location in the vehicle. [9]

b) Discuss the role of maintainability related to the vehicle Maintenance in detail. [9]



Total No. of Questions : 10]

SEAT No. :

P3896

[5561]-566

[Total No. of Pages : 2

B.E. (Automobile Engineering)

PRODUCT DESIGN AND DEVELOPMENT

(2015 Course) (Semester-I) (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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) Elaborate the concept of Product Design Term. Explain any six Roles in term in Details. [10]

OR

Q2) a) Discuss in details how technical questioning and mission statement contributes to Product design phase. [6]

b) Discuss the concept of functional modeling. [4]

Q3) Discuss the product verification and product validation with suitable example. [10]

OR

Q4) Explain product function analysis with FAST method. Elaborate with suitable product example. [10]

Q5) a) Explain following tools used in Benchmarking Process: [8]

- i) Intended assembly cost analysis
- ii) Trend Analysis

b) Discuss step wise procedure of product Teardown process in details. [8]

OR

P.T.O.

- Q6)** a) Apply subtract and Operate procedure for paper punching machine. Analyse and explain force flow in machine with suitable diagram. [8]
- b) Explain in details the process of setting product specification with suitable example? [8]

- Q7)** a) Explain guidelines of Design for Manufacturing. [8]
- b) Discuss guidelines of design for welding. [8]

OR

- Q8)** a) Elaborate guidelines for Design for environment. [8]
- b) Explain manufacturing cost analysis and stepwise procedure for estimation of cost. [8]

- Q9)** a) Discuss Product, process, peoples and methods as components of PLM. [9]
- b) Draw the typical product life cycle and explain phases. [9]

OR

- Q10)** a) Explain product workflow and product data management system in details. [9]
- b) Explain the role of customers and vendors in implementation of PLM. [9]



Total No. of Questions :10]

SEAT No. :

P3897

[5561]-567

[Total No. of Pages :2

B.E. (Automobile Engineering)

AUTOMOTIVE SYSTEMS AND TESTING

(2015 Pattern) (Semester-II)

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.

Q1) a) Write short note on Davis steering mechanism. [4]

b) What are the different types of Suspension systems? Explain any one.[6]

OR

Q2) a) Explain Hydro-elastic suspension. [4]

b) Explain: [6]

- i) Camber
- ii) Castor
- iii) KPI

Q3) a) What is need of Shock Absorber? [2]

b) Write a note on tyre rotation and matching. [8]

OR

Q4) a) What is the use of anti roll bar? [2]

b) Explain Hydraulic braking system with neat sketch. [8]

P.T.O.

- Q5)** a) Write a note on vehicle performance parameters. [8]
b) Explain EGR system with neat sketch. [8]

OR

- Q6)** a) What is catalytic converter? Explain any one. [8]
b) Write a note on mechanism of noise generation. [8]

- Q7)** a) What is Passer by noise test? Explain with neat sketch. [8]
b) Explain:
i) Endurance test.
ii) High speed performance test.

OR

- Q8)** a) What are the different types of testing tracks? Explain any one in brief. [8]
b) Explain:
i) Deep water through shallow water.
ii) Corrugated Track.

- Q9)** a) Differentiate Active safety and Passive safety. [10]
b) What are the different types of seats? Explain any one in brief. [8]

OR

- Q10)** a) What are the different types of Crash Testing? Explain any one. [10]
b) Write short note on Adaptive cruise control? [8]



Total No. of Questions : 10]

SEAT No. :

P3898

[5561]-568

[Total No. of Pages : 3

B.E. (Automobile Engineering)
AUTOMOTIVE SYSTEM DESIGN
(2015 Pattern) (Semester - II) (416496)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer five questions from the following.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculator is permitted.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain the classification of gearbox. [4]
b) The multi plate clutch is to transmit 6kW at 800rpm. The Inside radius is 38mm and outer radius is 70 mm. Coefficient of friction 0.1. Maximum pressure is 350 kN/m². Determine axial force required total number of disc and average pressure. [6]

OR

- Q2)** a) An automobile gear box gives 3 forward speeds and one reverse with a top gear of unity and bottom and reverse gear ratio of approximately 3.3:1. The center distance between the shafts is to be 110 mm approximately. Gear teeth of module 3.25 mm. find the number of gear teeth. [6]
b) Narrate about the torque tube drive. [4]

- Q3)** a) Sketch the layout of sliding mesh gear box. [4]
b) An engine develops a maximum torque of 162 Nm and the low gear ratio of transmission is 2.75, while the back axle ratio is 4.25. The effective wheel radius is 0.325 m, the coefficient of friction between the tyre and road surface is 0.6. If the permissible shear stress is 323.70 MPa, determine the maximum shaft diameter. Assuming the load is nearly torsional. What is the maximum load on each wheel? [6]

OR

- Q4)** a) An engine develops 28 kW at 1500 rpm and its bottom gear ratio is 3.06. If a propeller shaft of 40mm outside diameter is to be used, determine the inside diameter of mild steel tube to be used, assuming a safe shear stress of 55×10^3 kPa for MS. [4]
b) Discuss about clutch frictional materials and their properties. [6]

P.T.O.

Q5) a) Explain in brief about under steer and over steer. [6]

b) In a hydraulic single line braking system the force on foot pedal is 100N, pedal leverage ratio is 4.4, cross sectional area of master cylinder is 4 cm^2 , cross sectional area of front piston 20 cm^2 . Cross sectional area of the rear piston is 5 cm^2 . Distance moved by effort is 1 cm. Calculate the following. [12]

- i) Front to rear brake ratio
- ii) Total force ratio
- iii) Distance moved by output
- iv) Cylinder movement ratio
- v) Total movement ratio

OR

Q6) a) A light motor vehicle has a wheel base of 2.64m, the height of its CG above the ground is 0.61m and it is 1.12 m in front of the rear axle. If the car is travelling at 40km/h on a level track, determine the minimum distance in which the car may be stopped, when, [12]

- i) The rear wheels are braked.
- ii) The front wheel are braked.
- iii) All wheels are braked.

b) What is the braking efficiency? Explain in detail. [6]

Q7) a) A vehicle spring of semi elliptic type has leaves of 75 mm width and 10 mm thickness, effective length is 900 mm. If the stress is not to exceed 220.725 MPa, when the spring is loaded to 4905 N. Estimate the required number of leaves and the deflection under this condition. If the spring is just flat under load, what is the initial radius? Take $E = 196.2 \text{ GPa}$. [10]

b) Discuss the general design considerations of suspension system. [6]

OR

Q8) Discuss on: [16]

- a) What is nipping in leaf springs?
- b) Brake fade and Brake torque.
- c) Brake balance and Braking efficiency.
- d) Components used in hydraulic brake system

Q9) Design a Tensile Bar for Minimum Cost of the following materials. Assume Factor of Safety of 1.8. [16]

Material	Mass density (kg/m ³)	Yield strength (MPa)	Material cost Rs./N
Steel	3000	16	130
Al alloy	3000	32	50
Magnesium alloy	2100	32	20

Length of the bar is 175 mm and a constant tensile load on bar is of 4000N.

OR

Q10)a) What do you understand by, [12]

- i) Optimum and adequate design.
- ii) Significance of free variable and constrained variable in Johnson's method of optimum design.
- iii) Design for natural tolerances.

b) Explain about aspects of Aesthetic Design. [4]



Total No. of Questions : 10]

SEAT No. :

P3899

[Total No. of Pages : 2

[5561]-569

B.E. (Automobile Engineering)

AUTOMOTIVE NVH

(2015 Course) (Elective -III)

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 Logarithmic tables, Sliderule, Electronic pocket calculator is allowed.
- 5) Assume Suitable data, if necessary

Q1) Define the following. [10]

- a) Periodic Motion & Time Period
- b) Frequency & Amplitude
- c) Natural Frequency
- d) Fundamental mode of vibration
- e) Degree of Freedom

OR

Q2) Enlist the different types of vibrations. Explain each one in short [10]

Q3) Drive the equation for two degree of freedom undamped system. [10]

OR

Q4) a) Describe in detail untuned dry friction damper & draw its Frequency response curve. [5]
b) How to control torsional oscillations amplitude in engine crank shaft? Describe its procedure in detail? [5]

Q5) a) What are the adverse effect caused to Machine, Structure and Human being. [8]
b) List down the different methods of vibration control. Explain any one of them in short. [8]

OR

P.T.O.

- Q6)** a) Enlist the different steps involved in the Vibration Control. [4]
b) Discuss the characteristics of Sound Wave in brief. [12]

- Q7)** a) Enlist the types of the Noise measuring instruments. Explain Microphone as Noise measurement device in detail. [10]
b) Discuss in brief Ambient Emission Noise standards in India. [8]

OR

- Q8)** a) Explain decibel addition. subtraction and averaging with derivation. [10]
b) Explain in detail Interior Noise in a Vehicle. [8]

- Q9)** a) Explain in detail Vehicular Noise Measurement Techniques? [8]
b) What do you mean by Noise Control along the path? Discuss it in brief. [8]

- Q10)** a) Write a note on Engine Noise Control. [8]
b) Discuss the following [8]
i) Brake Noise
ii) Noise Control at Source.



Total No. of Questions : 10]

SEAT No. :

P3900

[5561]-570

[Total No. of Pages : 2

B.E. (Automobile Engineering)

HYBRID ELECTRIC AND FUEL CELL VEHICLE

(2015 Course) (Semester - II) (416497(B))

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) Assume suitable data, if necessary.

Q1) a) Explain Solar panel for vehicle with advantage, disadvantage and application. [6]

b) Explain conceptual illustration Hybrid electric drive train. [4]

OR

Q2) a) What is EV? Explain conceptual illustration of EV. [6]

b) Explain operation modes of series hybrid (electrical coupling). [4]

Q3) a) What are advantages of hybrid vehicle? [2]

b) Explain design of [EM] traction motor. [8]

OR

Q4) a) What are different drive train configurations of hybrid vehicle? [2]

b) Explain parametric design of drive train. [8]

Q5) a) Explain charging and discharging of lead acid battery with its chemical reaction. [8]

b) Explain basic terms of battery performance and characterization. [8]

OR

Q6) a) Explain design consideration of battery. [8]

b) Explain selection of battery in EHV. [8]

P.T.O.

- Q7)** a) Explain hydrogen storage system. [8]
b) Explain solid oxide fuel cell with neat sketch. [8]

OR

- Q8)** a) With neat sketch explain Direct methanol fuel cell (DMFC). [8]
b) Explain Fuel Cell Electric Vehicle with neat layout. Also give advantage of same. [8]

- Q9)** a) With neat sketch explain working of hydraulic motors. [9]
b) Explain pneumatic hybrid power train. [9]

OR

- Q10)** a) Enlist type of accumulator? Explain gas loaded accumulator. [9]
b) Explain with neat sketch ultra high speed flywheel as an energy storage device. [9]



Total No. of Questions : 10]

SEAT No. :

P3901

[5561]-571

[Total No. of Pages : 2

B.E. (Automobile Engineering)

AUTOMOTIVE HYDRAULICS AND PNEUMATICS

(2015 Course) (Semester - II) (416497(C)) (Elective - III)

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

Q1) a) Explain in detail classification of hydraulic fluids. [6]

b) Explain the advantages of fluid power system over other systems. [4]

OR

Q2) a) Classify seals used in hydraulic systems. What are the required properties of sealing materials? [6]

b) Explain quick action coupling with neat sketch. [4]

Q3) a) A pump has a displacement of 81.9 cm³. It delivers 75.8 lit/min at 1000 rpm at 67 bar. If the prime mover input torque is 100 Nm. Determine : [6]

- i) Overall efficiency.
- ii) Volumetric efficiency.
- iii) Theoretical torque required to operate the pump.

b) Explain with neat sketch working of solenoid actuated Direction control valve. [4]

OR

Q4) a) Explain with neat sketch fixed displacement vane pump and suggest the method for pressure balancing. [6]

b) Explain telescopic cylinder with neat sketches. [4]

P.T.O.

- Q5)** a) Explain with neat sketch meter-in and meter-out circuits. [8]
b) Explain regenerative circuit with a neat sketch. [8]

OR

- Q6)** a) Draw Sequencing circuit and explain its working. [8]
b) Draw and explain unloading circuit. [8]

- Q7)** a) Explain working of reciprocating compressor. Also draw P-V diagram for single stage compressor. [8]
b) Explain in detail lubricators and dryers used in pneumatic system. [8]

OR

- Q8)** a) Explain with circuit diagram direct control of single and double acting cylinder used in pneumatic system. [8]
b) Explain with neat sketch vane type air motor used in pneumatic system. [8]

- Q9)** a) Explain different types of accumulators with neat sketches. [9]
b) Draw and explain power steering circuit used in automobiles. [9]

OR

- Q10)** a) Give different applications of accumulators. [9]
b) Draw and explain circuit for air suspension system used in automobiles. [9]



Total No. of Questions : 8]

SEAT No. :

P3902

[Total No. of Pages : 4

[5561]-572

B.E.(Automobile Engineering) (Elective-IV)
OPERATION RESEARCH
(Semester-II) (416498 A) (2015 Pattern)

Time : 2½Hour]

[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) Answers in One answer Books.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data , if necessary.

Q1) A manufacturer of furniture makes two products- chairs and tables. Processing of this product is done on two machines A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A and no time on machine B. There are 16 hours of time per day available on machine A and 30 hours on machine B. Profit gained by the manufacturer from a chair and a table is Rs 2 and Rs 10 respectively. What should be the daily production of each of two products? (Use Graphical method) [10]

OR

Q2) A machine tool company decides to make four subassemblies through four contractors is to receive one assembly. The cost of each assembly is known and given in the following table. Find the assignment of the contractors and subassemblies that will minimize the total cost. [10]

		Contractors			
		I	II	III	IV
Subassemblies	A	5	7	11	6
	B	8	5	9	6
	C	4	7	10	7
	D	10	4	8	3

Q3) a) Discuss the Linear Programming Model in OR. [4]
b) Find the initial basic feasible solution by using North- West Corner Rule.[6]

W → F ↓	W ₁	W ₂	W ₃	W ₄	Factory Capacity
F ₁	19	30	50	10	7
F ₂	70	30	40	60	9
F ₃	40	8	70	20	18
Warehouse Requirement	5	8	7	14	34

P.T.O.

OR

Q4) Solve following LPP using Big - M method

[10]

$$\text{Maximize } Z = 5X_1 - 2X_2 + 3X_3$$

Subject to Constraints

$$2X_1 + 2X_2 - X_3 \geq 2;$$

$$3X_1 - 4X_2 \leq 3;$$

$$X_1 + 3X_3 \leq 5;$$

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

Q5) a) Differentiate between CPM and PERT. **[6]**

b) A bank has decided to modernize its office. The major elements of the project are as follows. **[12]**

Activity	Description	Predecessor Activity	Duration (Days)
A	Design New premises	----	14
B	Obtain tenders from Contractors	A	4
C	Select the contractor	B	2
D	Arrange details with selected contractor	C	1
E	Decide which equipment is to be used	A	2
F	Arrange storage of equipment	E	3
G	Arrange disposal of other equipment	E	2
H	Order new equipment	E	4
I	Take delivery of new equipment	H,L	3
J	Renovations take place	K	12
K	Remove old equipment for storage or disposal	D,F,G	4
L	Cleaning after the contractor Finished	J	2
M	Return old equipment for storage	H,L	2

- i) Draw an arrow diagram for this project.
- ii) Find out the critical path.
- iii) For each non-critical activity find out the total, free and independent float or Slacks.

OR

- Q6) a)** Six jobs are to be process on three machines. The processing time is as follows, Find the optimal schedule so that the total elapsed time is minimized. [12]

Job	J1	J2	J3	J4	J5	J6
Machine M1[Turning]	10	3	5	4	2	1
Machine M2[Threading]	2	4	6	3	1	2
Machine M3[knurling]	8	6	7	9	7	7

- b) Explain the graphical method of sequencing for 2 Job and M machine with help of suitable Example. [6]

- Q7) a)** Reduce the following game by dominance and find the game value.[12]

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

- b) Explain Kendall's notation to represent the generalised queuing model. [4]

OR

- Q8) a)** A repair shop attended by a single mechanic has an average of four customers an hour who bring small appliances for repair. The mechanic inspects them for defects and takes six minutes an average. Arrivals are Poisson and service rate has the exponential distribution. [8]

You are required to

- i) Find the proportion of time during which there is no customer in the shop.
- ii) Find the probability of finding at least one customer in the shop.
- iii) What is the average number of customers in the system?
- iv) Find the average time spent by a customer in the shop including service.

- b) Solve following $n \times 2$ game theory problem using by graphical method [8]

	B1	B2
A1	1	2
A2	5	4
A3	-7	9
A4	-4	-3
A5	2	1

- Q9)** a) The data on the running costs per year and the resale price of an equipment A whose purchase price is Rs. 2,00,000 are as follows: [12]

Year	1	2	3	4	5	6	7
Running Cost(Rs)	30,000	38,000	46,000	58,000	72,000	90,000	1,10,000
Resale price(Rs)	1,00,000	50,000	25,000	12,000	8,000	8,000	8,000

- i) What is the optimum period of replacement?
 - ii) When Equipment A is two years old, Equipment B which is new model for the same usage is available. The optimum period for replacement is 4 years and an average cost of Rs. 72,000. Should equipment A be changes with equipment B? If so Why.
- b) Discuss the various types of failure. [4]

OR

- Q10)a)** The following mortality rates have been observed for a certain type of light bulbs. [12]

Week	1	2	3	4	5
% failing by the End of Week	10	25	50	80	100

In the industrial unit there are 1,000 special type of bulbs is use, and it cost Rs. 10 to replace an individual bulb which has burned out. If all the bulbs were replace simultaneously it would cost Rs. 2.50 per bulb. It is proposed to replace all the bulbs at fixed intervals, whether or not they have burned out, and to continue replacing burned out bulbs as they fails. At what intervals of time should the manager replace all the bulbs?

- b) Discuss the replacement policy with considering time value of money.[4]



Total No. of Questions :10]

SEAT No. :

P3903

[5561]-573

[Total No. of Pages :2

B.E. (Automobile Engineering)

TRANSPORT MANAGEMENT & MOTOR INDUSTRIES

(Elective-IV) (2015Course) (Semester - II) (416498 B)

Time : 2½Hours]

[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.
- 5) Assume suitable data if necessary.

Q1) a) Mention the duties of conductor and drivers of State Transport Organization. [5]

b) Write down road offences and penalties for the same. [5]

OR

Q2) a) Enlist the authorities to collect tax. Explain any two of them. [5]

b) Explain from 1, from 1A, from 2, from 3 & from 5 [5]

Q3) a) Explain the effect of non-payment of tax. [5]

b) Explain fire insurance, machine insurance & vehicle insurance. [5]

OR

Q4) a) What is zero depth insurance? [5]

b) Explain the benefits of warranty system. [5]

Q5) a) What is depot? Draw and Explain layout for S T Depot. [9]

b) Explain in detail management information system for goods transport operation. [9]

OR

P.T.O.

- Q6)** a) Explain in detail fleet management & fleet maintenance for transport operation & write down its advantages. [9]
b) What points are needed to be considered in storage of petroleum products? Discuss briefly. [9]

- Q7)** a) Explain in detail modes of transport. [8]
b) Write a note on storage & transportation of petroleum product. [8]

OR

- Q8)** a) Write a note on MSRTC, BEST, PMT bus service. [8]
b) Explain the economic factors that influences the goods transport operation. [8]

- Q9)** a) What is global positioning system? Explain its function and role in automobile industry. [8]
b) Explain VRDE in detail. [8]

OR

- Q10)** a) Explain the role of ARAI in automobile industry. [8]
b) Explain in detail CIRT. [8]



Total No. of Questions :10]

SEAT No. :

P3904

[5561]-574

[Total No. of Pages :4

B.E. (Automobile Engineering)
ENGINEERING ECONOMICS AND FINANCIAL
MANAGEMENT
(2015 Pattern) (416498C) (Semester-II) (Elective-IV)

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.

- Q1)** a) What are the factors which affects the wages? Explain. [6]
b) Explain the qualities of good money. [4]

OR

- Q2)** a) Define the terms: Value, Price and Utility. [6]
b) What are the characteristics of a good taxation system? [4]

- Q3)** a) What are the different kinds of taxes? [2]
b) A melting unit for a steel foundry was purchased for Rs.40,000 and Rs.10,000 were spent in its erecting and commissioning. The estimated residual value after 10 years was Rs. 12,000. [8]
 - i) Calculate the annual rate of depreciation.
 - ii) Calculate the book value of the machine at the end of each year using the straight line depreciation.
 - iii) Calculate the depreciation fund collected at the end of year 8.

OR

- Q4)** a) What are different types of Insurances? [2]
b) What are the causes of depreciation? Explain. [8]

P.T.O.

Q5) a) What are the objectives of cost accounting? [6]

b) For manufacturing a turret machine, the expenditure is as given below. Find direct cost, factory cost, total cost of production, cost of sales and selling price. [10]

Material consumed	=	Rs.55,000
Indirect factory wages	=	Rs.8,000
Direct fees	=	Rs.3,000
Advertising	=	Rs.10,000
Net profit	=	Rs.12,500
Depreciation on sales department car	=	Rs.1,100
Printing and stationary	=	Rs.250
Depreciation on plant	=	Rs.4,500
Direct wages	=	Rs.65,000
Factory rent	=	Rs.6,000
Telephone and postages	=	Rs.150
Gas and electricity	=	Rs.500
Office salaries	=	Rs.2,100
Office rent	=	Rs.500
Show room rent	=	Rs.1,500
Salesman commission	=	Rs.12,650
Sales department car expense	=	Rs.1,500

OR

Q6) a) Explain the components of cost. [6]

b) A factory producing 150 electric bulbs a day, involves direct material cost of Rs.250, direct labor cost of Rs.200 and factory overheads of Rs.225. Assuming a profit of 10% of the selling price and selling overhead 30% of the factory cost, calculate the selling price of one electric bulb. [10]

- Q7) a)** An investor can make three end year payments of Rs.15,000, which are expected to generate receipts of Rs.10,000 at the end of year 4 that will increase annually by Rs.2,500 for the following 4 years. If the investor can earn a rate of return of 10% on other 8 year investments, is this alternative attractive? [8]
- b)** The cost of the machine is Rs.6,100 and its scrap value is Rs.100. The maintenance cost found from experience is as follows. Where the machine should be replaced? [8]

Year	1	2	3	4	5	6	7	8
Maintenance cot(Rs)	100	250	400	600	900	1,200	1,600	2,000

OR

- Q8) a)** Two devices are available to perform a necessary function for three years. The initial cost for each device at time 0 and subsequent annual savings are shown in the following table. The required interest rate is 8%. Whether the alternatives meet the acceptable rate of return? Which alternative is most preferable? [8]

	0	1	2	3
Device A	9,000	4,500	4,500	4,500
Device B	14,500	6,000	6,000	8,000

- b)** A fleet owner finds from his past experience records that cost of machine is Rs. 6,000 and the running costs are given below, at what stage the replacement is due? [8]

Year	1	2	3	4	5	6	7	8
Maintenance cot(Rs)	1,000	1,200	1,400	1,800	2,300	2,800	3,400	4,000
Scrap value	3,000	1,500	750	375	200	200	200	200

- Q9)** a) What are the objectives and functions of estimating? [8]
 b) Explain the cost estimating procedure. [10]

OR

- Q10)** a) Explain the following. [8]
- Marketable securities
 - Book debts
 - Long term liabilities
 - Intangible fixed assets
- b) The company X having certain reserves and surplus has the following details as on 31 Dec 2000. Prepare a balance sheet. [10]

Dividend payable	Rs.72,000	Debtors	Rs. 1,60,000
Bank balance	Rs.10,000	Bills payable	Rs.20,000
Equity shares	Rs. 2,00,000	Plant and equipment	Rs. 80,000
Provision for taxes	Rs.40,000	Bills receivable	Rs.20,000
Stock	Rs.77,000	Creditors	Rs.55,000
8% preference shares	Rs.1,35,000	General reserve	Rs.40,000
Land and building	Rs.2,00,000	Cash in hand	Rs.15,000



Total No. of Questions : 10]

SEAT No. :

P3905

[5561]-575

[Total No. of Pages : 3

B.E. (Electrical Engineering)

**POWER SYSTEM OPERATION AND CONTROL
(2015 Course) (Semester - I)**

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

- Q1)** a) Explain transient stability analysis for sudden increase in mechanical input with the help of equal area criterion. [5]
- b) What are different types of compensations used in power system? [5]

OR

- Q2)** a) Why is it necessary to control reactive power? What are the ways of controlling reactive power? [5]
- b) Explain operating principle and working of TCSC with the help of circuit diagram and characteristic. [5]

- Q3)** a) Explain the importance of FACTS controllers in power system. [5]
- b) State and explain the methods to improve transient stability. [5]

OR

- Q4)** a) Explain synchronous motor as a source of reactive power with the help of phasor diagram and compare it with static capacitive compensation. [5]
- b) What is swing curve? What is its significance in stability studies? [5]

P.T.O.

- Q5)** a) With the help of neat block diagram and frequency response, explain proportional load frequency control for single area case. Draw frequency response for first order approximation as well as exact system. [10]
- b) With the help of schematic diagram, explain the operation of speed governing system. [8]

OR

- Q6)** a) With neat block diagram and frequency as well as tie line power response, explain two area load frequency control. [10]
- b) Explain following with respect to load frequency control system. [8]
- i) Control area
 - ii) Area control error
 - iii) Free governor operation

- Q7)** a) With suitable numerical, explain in detail priority list method of unit commitment. [8]
- b) State, explain constraints applied on Thermal power plant during unit commitment task. [8]

OR

- Q8)** a) The fuel cost of three units are [8]

$$F_1 = 500 + 5.3P_1 + 0.004P_1^2 \text{ Rs./hour.}$$

$$F_2 = 400 + 5.5P_2 + 0.006P_2^2 \text{ Rs./hour.}$$

$$F_3 = 200 + 5.8P_3 + 0.009P_3^2 \text{ Rs./hour.}$$

If the total demand is 800 MW, find the economic load scheduling of three units by using coordination equation. State system incremental fuel cost.

- b) Explain Lagrange multiplier method used for economic load dispatch without transmission loss and no constraints on generation limit, while meeting load. [8]

Q9) a) Write a short note on [8]

- i) Energy banking
- ii) Diversity interchange of power

b) Define power system reliability. State and explain customer oriented reliability indices. [8]

OR

Q10)a) What is power pool? State the advantages and problems associated with power pool. [8]

b) Explain hierarchical level of reliability evaluation in power system. What are the reliability indices of generation system. [8]

X X X

Total No. of Questions : 8]

SEAT No. :

P3906

[5561]-576

[Total No. of Pages : 2

B.E. (Electrical)

PLC AND SCADA APPLICATIONS

(2015 Course) (Semester - I) (403142) (End Semester)

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.*

Q1) a) Define Programmable Logic controller and explain its various types. [7]

b) Explain ON/OFF output devices. [7]

c) Explain UP/DOWN counter with RESET on ladder diagram and timing diagram. [8]

OR

Q2) a) Explain input and output module of Programmable Logic Controller.[7]

b) Describe any one type of float switch used as a level sensor. [7]

c) Draw the ladder diagram for the following function table. [8]

Inputs - I1, I2 Outputs : Q1, Q2, Q3, Q4

I1	I2	Q1	Q2	Q3	Q4
0	0	1	1	0	0
0	1	0	1	1	0
1	0	0	0	1	1
1	1	1	0	0	1

Q3) a) Explain analog signal processing. Assume input 0 to 80 V AC, input module 0 to 5 V DC, 8 bit base. How 31 VAC input voltage is converted and scaled to CPU input register? [8]

b) Explain "Adjust and Observe method" of PID tuning. [8]

OR

P.T.O.

Q4) a) Write short note on variable frequency drive. [8]

b) Explain temperature control using PLC with the help of block diagram only. [8]

Q5) a) Define the following terms : [8]

- i) SCADA.
- ii) MTU.
- iii) RTU.
- iv) HMI.
- v) SCADA desirable properties.

b) Explain three SCADA generations. [8]

OR

Q6) a) Write a short note on Automatic Substation Control. [8]

b) Explain SCADA system application in Petroleum Refining Process. [8]

Q7) a) Write a short note on ControlNet protocol in detail. [8]

b) Explain DeviceNet protocol along with its communication layers. [8]

OR

Q8) a) Explain Process Field Bus (Profibus) protocol. [8]

b) Explain MODBUS model. [8]



Total No. of Questions : 10]

SEAT No. :

P3908

[5561]-578

[Total No. of Pages : 2

B.E.(Electrical)

**FUNDAMENTALS OF MICROCONTROLLER MSP430 AND
ITS APPLICATIONS**

(2015 Course) (Semester - I) (End Sem.) (Open Elec.) (403143A)

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) Interface an LED with MSP430 and write a program of blinking display of LED Using suitable software delay. [6]
- b) Draw neat diagram the status register of a MSP430 microcontroller.[4]

OR

- Q2)** a) Explain with an example any two addressing modes of MSP430 microcontroller. [6]
- b) Differentiate between Von-Neuman and Harward architecture. [4]

- Q3)** a) Write a note on application development tools used for MSP430 microcontroller. [6]
- b) Explain the PWM mode of MSP430 microcontroller. [4]

OR

- Q4)** a) Explain the compare 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

P.T.O.

- Q6)** a) Explain working of Successive Approximation Register (SAR) ADC. [8]
b) Explain the following functions associated with A to D converter [8]
i) Sample and Hold
ii) Filtering

- 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. :

P3909

[5561]-579

[Total No. of Pages : 2

B.E.(Electrical)

POWER QUALITY

(2015 Course) (Semester - I) (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) Classify Power Quality events related to voltage and current. [5]

b) How voltage sag is characterized? What are the causes of voltage sag?[5]

OR

Q2) a) Explain Voltage tolerance curve for investigation of equipment sensitivity to voltage sag. [5]

b) Define and List the short duration RMS voltage variations. [5]

Q3) a) What is the effect of voltage sag on Motors? [5]

b) Explain factors governing severity of voltage flicker. [5]

OR

Q4) a) What are the sources of transient over voltages? What are the effects of over voltage on equipment? [5]

b) What is voltage sag mitigation technique used at equipment level? [5]

Q5) a) Classify harmonics based on various criteria. [8]

b) What indices are used for harmonic measurement? Explain. [8]

OR

Q6) a) What is harmonics? What are the causes of harmonics? [8]

b) Explain effects of harmonics on Electrical equipment and cables. [8]

P.T.O.

- Q7)** a) What is the need for identifying the source of harmonics? What is the role of capacitor in harmonic study? [8]
b) How harmonics are mitigated ? Explain. [8]

OR

- Q8)** a) Explain series resonance problem related to harmonics. How it can be avoided? [8]
b) How tuned filters are used to mitigate harmonics? [8]

- Q9)** a) What are the objectives for Power quality monitoring? How it varies for old and new industrial set up? [10]
b) Explain selection of Power Quality equipment for power quality monitoring. [8]

OR

- Q10)**a) Explain the provisions for Power Quality monitoring made in IEEE Std 1159? [10]
b) What computer tools are used for effective Power quality analysis? Explain. [8]



Total No. of Questions : 8]

SEAT No. :

P3910

[5561]-580

[Total No. of Pages : 2

B.E.(Electrical)

**RENEWABLE ENERGY SYSTEMS
(2015 Course) (Semester - I) (Elective - 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) *Assume Suitable data if necessary.*

Q1) a) Define [5]

- | | |
|--|--------------|
| i) LAT | ii) Air mass |
| b) Give equivalent ckt of a solar cell. What are the different factors that affect the η of solar cell? | [5] |
| c) Explain the factors affecting electrical design of a solar array. | [5] |
| d) Explain the components of wind electric system. | [5] |

OR

Q2) a) Define [5]

- | | |
|--|-----------------------|
| i) Solar constant | ii) Air mass |
| iii) Direct radiation | iv) Diffuse radiation |
| v) Latitude | |
| b) A solar cell has following parameters : | [5] |
| $V_{oc} = 0.6V$, $I_{sc} = 30 \text{ mA/cm}^2$, FF = 76%. What will be its efficiency? Assume that the solar cell is tested under standard conditions. | |
| c) What are the different components of standalene PV system? | [5] |
| d) Define | [5] |
| i) Tip speed ratio | ii) Pitch control |
| iii) Yan control | iv) Cut-out speed |
| v) Cut-in speed | |

Q3) a) Explain any one gasifier in detail with neat diagram. [8]

b) Discuss the method of power generation from liquid waste. [8]

OR

P.T.O.

- Q4)** a) What are the Biomass Resources? Explain with the help of block diagram a biomass based power generation. [8]
- b) The following data is given for a biogas digester suitable for the output of five Cows-retention time =20 days, temperature= 30°C, dry matter consumed per day = 2 kg, biogas yield = 0.24 m³ per kg, efficiency of burner = 60%, methane proportion 0.8. Heat of combustion of methane = 28 MJ/m³. Calculate [8]
- i) the volume of biogas digester
 - ii) the power available from the digester.

- Q5)** a) What is SMES? Explain in detail. [8]
- b) What are the different losses in electrochemical cell? State and explain the information about battery parameters. [8]

OR

- Q6)** a) What is a fuel cell? What are the advantages and disadvantages of a fuel cell? [8]
- b) List the methods of Hydrogen storage. Explain any two. [8]

- Q7)** a) Define [6]
- i) Payback period Method
 - 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) Explain with the help of block diagram grid connected PV System. [8]

OR

- Q8)** a) What is Time Value of money? Why it should be considered? [4]
- b) Compare simple payback period with life cycle costing. [6]
- 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 : 10]

SEAT No. :

P3911

[5561]-581

[Total No. of Pages : 2

B.E.(Electrical)

DIGITAL SIGNAL PROCESSING

(2015 Course) (Semester - I) (Elective - I) (403143(D))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Your answers will be valued as a whole.*
- 3) *Use of Logarithmic tables slide rule, Mollier charts, electronic Pocket calculator and steam tables is allowed.*
- 4) *Assume Suitable data if necessary.*
- 5) *All questions carry equal marks.*

Q1) a) State and explain sampling theorem. [5]

b) Determine z-transform including ROC of the following [5]

$$x(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n-10)]$$

OR

Q2) a) State and prove linearity and time shifting property of z-transform. [5]

b) Find the frequency response $H(e^{jw})$ of following differential equation [5]

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = 2x(n)$$

Q3) a) State and prove linearity and time shifting property of DTFT. [5]

b) Find the inverse z-transform of [5]

$$X(z) = \frac{2 + z^{-2} + 3z^{-4}}{z^2 + 4z + 3} \text{ for } |z| > 0$$

OR

P.T.O.

- Q4)** a) Define z-transform and DTFT. Also give relation between z-transform and DTFT. [5]
 b) With complete block diagram the process of analog to digital conversion. [5]

- Q5)** a) Explain 8-point radix2 DIT FFT algorithm. [8]
 b) Compute 4-point DFT of the sequence [9]

$$x(n) = \cos\left(\frac{\pi n}{4}\right)$$

OR

- Q6)** a) State and prove following properties of DFT [8]
 i) Periodicity
 ii) Time Reversal
 b) Define DFT and relation between DFT and z-transform. Also define IDFT. [9]

- Q7)** a) Explain Direct Form - I and Direct Form - II structure of IIR filter. [8]
 b) With mathematical equation and graphical representation explain ideal frequency selective filter. [8]

OR

- Q8)** a) Explain direct form and cascade structure of FIR filter. [8]
 b) Differentiate between analog and digital filter. [8]

- Q9)** a) Explain design procedure of FIR filter using rectangular window. [8]
 b) Compare FIR and IIR filter. [9]

OR

- Q10)** a) With block diagram explain application of DSP in power measurement. [8]
 b) What are the different techniques of frequency measurement. Explain any one in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P3912

[5561]-582

[Total No. of Pages : 2]

B.E. (Electrical)

RESTRUCTURING AND DEREGULATION

(2015 Pattern) (Elective-II) (403144A)

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.
 - 2) Neat diagrams must be drawn wherever necessary.
 - 3) Figures to the right indicates full marks.
 - 4) Use of logarithmic tables, slide rules, Mollier Charts, electronic pocket calculator and steam tables is allowed.
 - 5) Assume suitable data, if necessary.

Q1) a) Explain the challenges before Indian Power Sector. [8]

b) State the desirable characteristics of tariff. [6]

c) Explain following basic concepts of power sector economics: [6]

OR

Q2) a) Explain the objectives of “Electricity Act 2003”. With reference to generation, transmission and distribution. Also explain the guidelines under the act. **[8]**

b) Short Note on: Regulatory process in India. [6]

c) Explain any one methods to assess the financial feasibility of any project. [6]

Q3) a) Explain the following Models based on contractual arrangements: [8]

b) Explain the following ISO models in detail: [8]

OR

PTO

- Q4)** a) Write a short note on Renewable Energy Credits and Trading of Renewable Energy Credits. [8]
b) Explain the following models based on energy trading: [8]
i) Wholesale competition ii) Retail competition

- Q5)** a) Specify the peculiarities of electricity as commodity. State the rules that govern the electricity markets. [8]
b) Write short notes on: [8]
i) Market operation and settlement process
ii) Day ahead Market

OR

- Q6)** Write short notes on the following: [16]
a) Spot markets.
b) Ancillary services market.
c) Market for differences.
d) Option contract.

- Q7)** a) Write short notes on: [8]
i) Open access
ii) Objectives of cost allocation of transmission system
b) What are the reasons of congestion in power network? What do you understand by congestion management? Explain in detail the different methods of congestion management. [10]

OR

- Q8)** a) Elaborate the role of: [8]
i) National Load dispatch centers
ii) State Load dispatch centers in context to Indian Power sector
b) Explain in detail the different transmission pricing methods. [10]



Total No. of Questions : 8]

SEAT No. :

P3913

[5561]-583

[Total No. of Pages : 2

B.E. (Electrical)

ELECTROMAGNETIC FIELDS

(2015 Course) (Semester-I) (Elective-II) (403144 (B))

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.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Use of logarithmic tables, slide rules, Mollier Charts, electronic pocket calculator and steam tables is allowed.

Q1) Assume suitable data if necessary:

- a) Derive an expression for electric field intensity E due to infinite sheet of charge with charge density ρ_1 C/m using Gauss's law. [8]
- b) An electric dipole of pC.m is located at origin. Find V and E at points:[8]
 - i) (0, 0, 10)
 - ii) (1, $\pi/3$, $\pi/2$)
- c) Explain the physical significance of divergence and curl. [4]

OR

- Q2)** a) Derive an expression for energy density in electrostatic field. [8]
- b) Explain gradient of a scalar. Write the gradient of scalar in spherical coordinate system. [8]
- c) Explain Gauss's law in detail. [4]

- Q3)** a) Derive an expression for magnetic field intensity due to infinitely long straight conductor carrying current I at any point P using Biot-Savart's law. [8]
- b) Explain scalar magnetic potential and vector magnetic potential. [8]

OR

P.T.O.

Q4) a) A circular loop located on, $z = 0$ carries a direct current of 10A along. Determine at (i) $(0, 0, 4)$ and (ii) $(0, 0, -4)$ [8]

b) What is Poisson's equation for magnetostatic field? Use the equation to derive integral form of Ampere's law. [8]

Q5) a) Define relaxation time. Derive an expression for relaxation time. [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) Explain polarization in dielectrics. Derive mathematical expression for Polarization. [8]

b) Derive the boundary conditions at an interface between two magnetic media having permeability μ_1 and μ_2 in terms of magnetic field intensity and magnetic flux density. [8]

Q7) a) State the Maxwell's equations in point form for static field and steady magnetic field with their physical significance. Explain how these are modified for time varying fields. [10]

b) State Faraday's law. Derive an expression for transformer emf. [8]

OR

Q8) a) What is Poynting vector? What is its significance? Derive the expression of Poynting vector. [10]

b) Derive an expression for time varying potentials. [8]



Total No. of Questions : 8]

SEAT No. :

P3914

[Total No. of Pages : 2

[5561]-584

B.E. (Electrical)

EHV AC TRANSMISSION

(2015 Pattern) (Semester-I) (Elective-II) (403144)

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.
- 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 calculator is allowed.

- Q1)** a) Explain the concept of travelling waves and derive expression for equations of travelling waves. [8]
- b) Describe the measures taken to minimize the damage due to different types of vibrations of the transmission line. [8]
- c) The field strength on the surface of a sphere of 1 cm radius is equal to the corona inception gradient in air of 30 KV/cm. Find the charge on the sphere. [4]

OR

- Q2)** a) Derive expression for inductance of multi conductor lines and state Maxwell's coefficients. [8]
- b) Prove that a one 750 KV line power handling capacity of a.c. transmission line carry as much power as four 400 KV circuits for equal distance of transmission. [6]
- c) A charge of $25 \mu\text{C}$ is placed at a distance of 5 m from the center of a sphere. The radius of a sphere is 1.5 m. Calculate the magnitude, polarity and location of a point charge Q₂ which will make the sphere at zero potential. [6]

- Q3)** a) Derive the expression for electrostatic induction on unenergized circuit of a double circuit line. [7]
- b) Discuss the effects of high electrostatic field on: [9]
- i) Humans ii) Animals iii) Plants

OR

P.T.O.

- Q4)** a) Explain the concept of insulated ground wire and explain the purposes served by insulated ground wire. [7]
- b) Explain the terms in detail: [9]
- i) Primary shock current
 - ii) Secondary shock current
 - iii) Let-go currents

- Q5)** a) Explain formation of corona and define terms: [8]
- i) Disruptive corona voltage
 - ii) Visual corona voltage
- b) Draw a charge-voltage diagram and derive an expression $P_c = 1/2 KC (Vm^2 - Vo^2)$ for corona loss. [8]

OR

- Q6)** a) With the help of simple block diagram, explain the audible noise measuring circuit in EHV AC lines. [8]
- b) State and explain at least 4 formulae for power loss due to corona. [8]

- Q7)** a) Write note on various properties of XLPE used in EHV cables. [6]
- b) Define $\tan \delta$ loss factor and derive an expression for insulation resistance of a cable. [6]
- c) Name the materials used for insulation in EHV cables and state the properties of SF₆ gas as an insulating material used in cables. [6]

OR

- Q8)** a) Explain detail classification of cables and mention typical insulation thickness for EHV cables. [6]
- b) Explain in detail properties of cable insulation materials. [6]
- c) Brief, the line insulation design based upon transient over voltages. [6]



Total No. of Questions : 8]

SEAT No. :

P3915

[5561]-585

[Total No. of Pages : 2

B.E. (Electrical)

ELECTRIC AND HYBRID VEHICLES

(2015 Pattern) (Semester-I) (Elective-II) (403144D)

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) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain different charging algorithm and balancing method for battery pack charging. [12]
b) Explain Hybridization of drive trains in HEV's. [8]

OR

- Q2)** a) Explain battery-based energy storage and its analysis in detail. [10]
b) Explain Needs and Importance of transportation development. [10]

- Q3)** a) Explain concept and architecture of HEV drive train. [10]
b) Explain advantages and challenges in Electric Vehicle design. [6]

OR

- Q4)** a) Explain different components and configuration of Electric Vehicles.[10]
b) Explain need of Energy consumption in EV and HEV. [6]

P.T.O.

Q5) a) Explain Performance characteristics of BLDC drives. [10]

b) Compare BLDC drive and Switched reluctance motor drive for HEV & EV. [8]

OR

Q6) a) Explain the concept of vehicle tracking through GPRS. [8]

b) Explain in detail Instrumentation and control system of Hybrid and Electric Vehicles. [10]

Q7) a) Explain the concept & structure of EV aggregator in vehicle to vehicle energy systems. [8]

b) Explain in details PHEV control strategies in Vehicle to home energy systems. [8]

OR

Q8) a) Explain in details planning of vehicle to Grid infrastructure in the smart grid. [8]

b) Explain different control method for EV aggregator for dispatching a fleet of EV. [8]



Total No. of Questions : 11]

SEAT No. :

P3916

[5561]-586

[Total No. of Pages : 2

B.E. (Electrical)

SPECIAL PURPOSE MACHINES

(2015 Course) (Semester-I) (Elective-II) (403144 (E))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt all questions.
- 2) Figures to the right indicates full marks.

Q1) Obtain the respective expression of torque from coenergy in case of system with permanent magnets. [7]

OR

Q2) Explain in detail the MMF distribution with a distributed winding. [7]

Q3) Explain trapezoidal type in PM synchronous machines. [6]

OR

Q4) Give comparison between sinusoidal and trapezoidal motor operations. [6]

Q5) Explain the significance of abc- $\alpha\beta$ and $\alpha\beta$ -dq transformations in machine modelling. [7]

OR

Q6) Elaborate the basic concepts in field oriented control of PMSM machine. [7]

P.T.O.

- Q7)** a) With suitable diagram explain construction and working of switch reluctance motor. [8]
- b) Explain static and dynamic torque production in case of switched reluctance motor. [8]

OR

- Q8)** a) Explain effects of saturation in case of reluctance motor. [8]
- b) Draw and explain phasor diagram of reluctance motor. [8]

- Q9)** a) With suitable diagram explain construction & working of variable reluctance stepper motor. [9]
- b) Explain lead angle control in case of stepper motor. [9]

OR

- Q10)** a) With suitable block diagram explain micro stepping control of stepper motor. [9]
- b) Explain dynamic characteristics of stepper motor. [9]

Q11) Attempt any two: [16]

- a) Explain different types of linear induction motors.
- b) State and elaborate different applications of linear induction motor.
- c) Explain any two performance characteristics of linear induction motor.



Total No. of Questions :8]

SEAT No. :

P3917

[5561]-587

[Total No. of Pages :2

B.E. (Electrical)

**SWITCHGEAR & PROTECTION
(2015 Pattern) (403147) (Semester - II)**

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) Use of Non-Programmable Scientific Calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) What is fault? What are the causes of faults? State the different types of fault. [6]
- b) Explain the resistance switching in case of circuit breaker. [7]
- c) Explain the rated characteristics of High Voltage circuit breakers as per IS-2516. [7]

OR

- Q2)** a) What are the essential qualities of protective relaying? Explain. [6]
- b) A 11 kV, 3-ph, 50Hz alternator is protected by the circuit breaker. The inductive reactance upto to circuit breakers is 5ohm and distributed capacitor between phase and neutral is 0.01 microfarad. Determine- (i) peak restriking voltage across cb. (ii) Frequency of restriking voltage. (iii) Average rate of restriking voltage up to peak value. (iv) Maximum value of RRRV. [7]
- c) Draw the neat sketch & explain in detail the construction & working principle of SF₆ circuit breaker. [7]

- Q3)** a) Enlist the abnormal operating conditions and causes of failure of 3-phase induction motor? [8]
- b) With neat block diagram, explain numerical relays. Also enlist its advantages. [10]

OR

P.T.O.

Q4) a) Explain the protection against the single phasing of 3-ph Induction motor. [8]

b) Explain static relays with block diagram and operating principle. Also state its merits and demerits. [10]

Q5) a) Explain the phenomenon of over fluxing in the transformer. Suggest suitable protection for the same. [8]

b) A 3-phase, 2-pole, 11 kV, 10 MVA alternator has neutral grounding resistance of 5 ohm. The machine is protected by differential protection in which relay trips when its current exceeds 25% of full load current. Determine percentage of winding protected against earth fault. [8]

OR

Q6) a) Prepare a list of various types of faults taking place in alternator on stator side and rotor side and explain protection against- (i) Loss of field (ii) Rotor temperature rise. [8]

b) A 3 phase, 33/3.3 kV star/delta connected transformer is protected by differential protection. CT's on LT side have a ratio of 400/5. Determine the CT ratio on HT side. Draw the connection diagram. [8]

Q7) a) Draw the block diagram and explain the working of carrier current protection scheme for long transmission lines. [8]

b) What do you mean by power swings and arc resistance? Explain the effect of power swings and arc resistance on the performance of the distance relay. [8]

OR

Q8) a) Compare Impedance relay, Reactance relay and Mho relay with reference to application and characteristics used for protection of transmission line. [8]

b) Draw the necessary sketches for 3-zone distance protection scheme for transmission lines and explain it. [8]



Total No. of Questions : 10]

SEAT No. :

P3918

[5561]-588

[Total No. of Pages : 2

B.E. (Electrical Engineering)

POWER ELECTRONICS CONTROLLED DRIVES

(2015 Pattern) (Semester - II) (403148)

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) Explain load equalization in an electric drive. How flywheel helps in load equalization process. [5]
b) Explain plugging braking of DC motor along with speed torque characteristics. [5]

OR

- Q2)** a) Justify “steady state stability depends on relative characteristics of the motor and load both”. [5]
b) A 200 V, 875 rpm, 150A DC separately excited motor has an armature resistance of $0.06\ \Omega$. It is fed from single phase fully controlled rectifier with an AC source of 220 V, 50 Hz. Assuming continuous conduction, calculate:
i) Firing angle for rated motor torque of 500 rpm.
ii) Motor speed for $a = 160^\circ$ and rated torque.

- Q3)** a) Explain closed loop control speed control of DC motor with inner current control loop. How below and above speed control is obtained. [5]
b) A 220 V, 970 rpm, 100 A DC separately excited motor has an armature resistance of $0.05\ \Omega$. It is braked by plugging from an Initial speed of 100 rpm. Calculate:
i) Resistance to be placed in armature circuit to limit braking current to twice the fault load value.
ii) Braking torque
iii) Torque when the sped has fallen to zero.

OR

P.T.O.

- Q4)** a) What is the V/f control strategy? Explain with necessary diagram V/f control method using power control devices. [5]
- b) A drive has following parameters: $J=10 \text{ kg-m}^2$, $T = 100-0.1N$, N-m, passive load torque $T_p = 0.05N$, N-m, where N is speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristics is changed to $T = -100-0.1N$, N-m. Calculate the time of reversal. [5]
- Q5)** a) Explain the principal of vector control of Induction motor. [8]
- b) How Induction Motor is converted to Characteristics of DC motor. [8]
- OR
- Q6)** a) Write in brief about topology, control and applications of AC servo motor drives. [8]
- b) With the help of block diagram explain vector control of induction motor. [8]
- Q7)** a) With the help of neat block diagram, explain the closed loop speed control of self controlled synchronous motor drives fed from CSI. [8]
- b) Write a brief note on Thermal model for heating and cooling. [8]
- OR
- Q8)** a) With the help of neat block diagram, explain the closed loop speed control of self controlled synchronous motor drives fed from VSI. [8]
- b) What is the selection criterion for motors? How ratings of the motor subjected to variable load duty is decided. [8]
- Q9)** a) Write a short note on Solar and battery powered drives. [10]
- b) Explain Industrial application of Electric drives in Electric Traction. [8]
- OR
- Q10)** a) Write a short note on Drives used in Sugar mills. Also mention the load requirements like power ratings, speed, duty cycle etc. [10]
- b) Write a short note on applications of drives in machine tool. [8]



Total No. of Questions : 8]

SEAT No. :

P5143

[Total No. of Pages : 2

[5561]-589

B.E. (Electrical)

HIGH VOLTAGE ENGINEERING

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

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.
- 5) Use of calculator is allowed.

Q1) a) Explain following breakdown mechanism in solid insulating materials. [8]

- i) Intrinsic breakdown
- ii) Electromechanical breakdown

b) Explain the working of three cascade connected transformers used for generation of AC voltages. State its advantages and disadvantages also. [8]

c) Compare Townsend's theory and streamer mechanism of breakdown in gases. [4]

OR

Q2) a) Explain corona discharges for point plane electrode combination with positive and negative pulse application. [8]

b) A solid dielectric material with dielectric constant of 5.2 has void of thickness 2mm. The dielectric material thickness is 9 mm and voltage applied across it is 80 kV (rms). If void is filled with air and has dielectric strength of 30kV/cm (peak.) Find the voltage at which internal discharge can occur. [4]

c) Write a note on generation of high impulse voltage. [8]

P.T.O.

- Q3)** a) Explain how a sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such voltage measurement? [10]
- b) With neat diagram explain CVT. Explain its advantages. [8]

OR

- Q4)** a) Explain with a neat sketch principle and working of electrostatic voltmeter. Write down its merits and demerits. [10]
- b) With a suitable figure explain the working of generating voltmeter. State its advantages. [8]

- Q5)** a) Explain clearly the process of "Cloud to earth" and "Return" lightning stroke. State the characteristics of such stroke and their effect when they strike EHV AC installations or lines. [8]
- b) Explain "insulation co-ordination". How are protective devices chosen for the optimal insulation level in power system. [8]

OR

- Q6)** a) Explain in details Reynold's and Mason's theory of charge formation in clouds. [8]
- b) State and explain the causes of over voltage due to switching surges and system fault. [8]

- Q7)** a) List the different tests done on surge arresters? Mention the procedure for testing. [8]
- b) Classify the different High voltage laboratories and give salient features of each of them. [8]

OR

- Q8)** a) Explain the following terms as referred to high voltage testing: [8]
- i) Withstand voltage.
 - ii) Flashover voltage.
 - iii) 50% flashover voltage.
 - iv) Wet and dry power frequency tests.
- b) Describe earthing and shielding of high voltage laboratories. [8]



Total No. of Questions : 10]

SEAT No. :

P4777

[Total No. of Pages : 2

[5561]-590

B.E. (Electrical Engineering)

HVDC and FACTS - B

(2015 Pattern) (End Semester)

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 electronic pocket Calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) For six pulse full wave bridge circuit, state the assumptions made in deriving the expression for ideal dc voltage. Draw diagram and derive the expression for ideal dc voltage. [10]

OR

Q2) a) Explain converter operation as inverter. Define extinction advance angle γ and ignition advance angle β . [6]

b) Peak of line to neutral on secondary side of converter transformer is 76.829 KV. It is required to obtain a dc voltage of 100 KV from bridge connected rectifier operating with delay angle $\alpha=30^\circ$ and overlap angle $\mu=15^\circ$. Calculate the commutation reactance per phase if rectifier delivers 100 A dc. [4]

Q3) Explain multiterminal HVDC system. State applications of MTDC. Draw series and parallel MT HVDC systems and compare them. [10]

OR

Q4) a) Discuss the two applications of HVDC light. [6]

b) Explain the steps to be taken in sequence when fault occurs on dc side of HVDC system. [4]

P.T.O.

Q5) Explain what is meant by the static power converter structures? Explain the basic rules for association of source and load to two sides of static converter. Also with two examples, explain the term AC controller. [16]

OR

- Q6)** a) Write note on dc link converter topologies. [8]
b) Write note on harmonic control produced in HVDC system. [8]

- Q7)** a) Explain operation of TCSC with neat diagram. [9]
b) Compare inductive and capacitive vernier mode operation of TCSC. Differentiate between bypass breaker mode and bypass thyristor mode of TCSC. [9]

OR

- Q8)** a) Explain how midpoint shunt compensation rapidly increases the transmittable power. [9]
b) Explain the conditions for transient free switching of TSC. [9]

Q9) Explain basic operating principles and implementation of UPFC by two back to back voltage sourced converters. [16]

OR

- Q10)** a) Write note on control structure of UPFC. [8]
b) Explain power flow studies in UPFC embedded system with Operational constraint. [8]



Total No. of Questions : 8]

SEAT No. :

P5144

[Total No. of Pages : 2

[5561]-591

B.E. (Electrical)

DIGITAL CONTROL SYSTEMS (Elective - III)
(2015 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt questions Q.1 & Q.2, Q.3& Q.4, Q.5 & Q.6, Q.7 & Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Use of logarithmic tables, slide rules, electronic unprogrammable pocket calculator is allowed
- 5) Assume suitable data, if necessary.

Q1) a) State sampling theorem and explain sampling and reconstruction process. [8]

b) Write a short note on pole placement design using linear state-feedback. [6]

c) For the system $x(t) = Ax(t) + Bu(t)$, where $A = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$, compute e^{At} using Cayley Hamilton Theorem. [6]

OR

Q2) a) Define State Transition Matrix & explain its properties. [8]

b) Define and explain the concepts 'Controllability and observability of discrete-data Control System, with their methods. [6]

c) Derive the transfer function of ZOH and explain frequency domain characteristics of ZOH, [6]

Q3) a) Find out the state feedback gain matrix K for the following system using two different methods such that the closed loop poles are located at 0.5, 0.6 and 0.7. [8]

$$x(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

b) Write a note on state regulator design. [8]

P.T.O.

OR

- Q4)** a) Design a full state observer for the system having. [8]

$$G = \begin{pmatrix} 0 & 20.6 \\ 1 & 0 \end{pmatrix}; H = \begin{pmatrix} 1 \\ 0 \end{pmatrix}; C = (0 \ 1)$$

Desired Eigen values of observer matrix are $Z = -1.8+j2.4, Z = -1.8-j2.4$.

- b) Explain Compensator design by the separation principle. [8]

- Q5)** a) Explain Euler's forward, backward method and trapezoidal method with example. [8]

- b) Consider the following discrete transfer function. [8]

$$G(z) = \frac{0.17 + 0.04}{z^2 - 1.1z + 0.24}$$

Find out the state variable model in controllable canonical, observable canonical, Jordan canonical forms.

OR

- Q6)** a) Explain bilinear transformation with frequency warping. [8]

- b) Explain Pole-zero matching with example. [8]

- Q7)** a) Explain stepper motor control with block diagram and algorithm. [8]

- b) Draw a neat block diagram of digital temperature control scheme and explain the function of each block. [10]

OR

- Q8)** a) Explain digital position control with block diagram and control algorithms. [10]

- b) Explain computer program structure for simulation for simulation of discrete time control of continuous time plant. [8]



Total No. of Questions : 12]

SEAT No. :

P4778

[Total No. of Pages : 2

[5561]-592

B.E. (Electrical Engineering)

**Intelligent Systems And Applications In Electrical Engineering
(2015 Pattern) (End Semester) (Elective - III)**

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

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

UNIT - I

Q1) Explain with neat diagram artificial neuron model and its operations. [6]

OR

Q2) Write note on various ANN architectures [6]

UNIT - II

Q3) Explain supervised and unsupervised learning methods. [6]

OR

Q4) Draw and explain Perceptron model. [6]

UNIT - III

Q5) What is BAM? Explain its architecture. [8]

OR

Q6) Explain self-organizing maps (SOM). [8]

UNIT - IV

Q7) a) Explain basic fuzzy set operations. [8]

b) Explain properties of fuzzy set. [8]

OR

P.T.O.

- Q8)** a) Explain various fuzzy relations. [8]
b) Differentiate between fuzzy logic and crisp logic. [8]

UNIT-V

- Q9)** a) State and explain predicate logic formula. [8]
b) Explain various defuzzification methods. [9]

OR

- Q10)**a) Explain various de-fuzzification methods. [8]
b) Explain Mamdani inference system. [9]

UNIT - VI

- Q11)**a) Write short note on Genetic algorithm and explain selection genetic operator. [8]
b) Explain software architecture used in expert system. [9]

OR

- Q12)**a) Explain rule based system in expert system. [8]
b) List and explain GA operators. [9]



Total No. of Questions : 8]

SEAT No. :

P3919

[5561]-593

[Total No. of Pages : 2

B.E. (Electrical)

ANALOG ELECTRONICS AND SENSING TECHNOLOGY
(Open Elective)

(2015 Pattern) (403149E) (Semester - II) (Elective - III)

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) Design variable 0-30 V power supply using LM741. Explain all necessary parameters. [7]
b) Explain concept of switching regulator and IC-TPS40200. [7]
c) Explain Phase Locked Loop and its applications. [6]

OR

- Q2)** a) Explain application of Op-Amp as integrator and differentiator. [7]
b) Generate square, triangular and sawtooth waveform using Op-Amp. [6]
c) Explain concept of multiplexing and Demultiplexing and explain SN74LV4051A-Q18-Channel Analog Multiplexer/Demultiplexer. [7]

- Q3)** a) Explain principle of operation of LM35 sensor. Explain how it is interfaced, calibrated for temperature measurement accurately. [8]
b) Explain INA240 current sensor in terms of its principle of operation, calibration and application. [8]

OR

- Q4)** a) Explain advantages of Hall effect sensors. Explain DRV 5053 in detail. [8]
b) Explain humidity sensor HDC2010 in detail. [8]

P.T.O.

Q5) a) What is difference between absolute position sensing and relative position sensing? [9]

b) Explain DRV 5032 in detail. [9]

OR

Q6) a) Explain working and applications of mm wave sensors and ultrasonic sensors. [9]

b) Explain working of encoders and resolvers with their applications. [9]

Q7) a) How image is captured? Explain different image sensors. [8]

b) Explain 3D depth sensor. [8]

OR

Q8) a) Explain OPT3007 Light Sensor. [8]

b) Explain need for isolation and explain optical isolator. [8]



Total No. of Questions : 5]

SEAT No. :

P5579

[Total No. of Pages : 2

[5561]-595

B.E. (Electrical)

ROBOTICS & AUTOMATION

(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 and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain Denavit-Hartenberg (D-H) representation of Kinematic chain. [7]

b) Write short note on : [6]

- i) Homogeneous Co-ordinate.
- ii) Rotational transformation.

c) Explain Arm prosthesis Automation. [7]

OR

Q2) a) Explain co-ordinate reference frame and effect of pre and post multiplication of transformation. [7]

b) Write short note on SCARA Robot. [7]

c) Explain in short classification of Robot based on co-ordinate system & control system. [6]

Q3) Solve any two :

a) Write on existence and uniqueness properties of Inverse solution. What is mean by Inverse kinematics. [8]

b) Write short note on PUMA Robot. [8]

c) Explain with neat sketch about Homogeneous Co-ordinators. [8]

P.T.O.

Q4) Solve any two :

- a) Describe control of Robot arm for close loop control in position servo. [8]
- b) Write on end effector rotary motion about arbitrary axis using dynamic control. [8]
- c) Explain in detail with illustration about linear angular velocity. [8]

Q5) Solve any two :

- a) Explain various linear control schemes. [9]
- b) Write short note on application of Robot on i) Welding ii) Spray painting. [9]
- c) Write on Robot application for part sorting and inspection application. [9]



Total No. of Questions : 8]

SEAT No. :

P5580

[Total No. of Pages : 2

[5561]-596

B.E. (Electrical)

ILLUMINATION ENGINEERING

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

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.*

Q1) a) With suitable diagrams explain various methods to control natural light. [8]

- b) With suitable diagram explain construction and working of Compact Fluorescent Lamp (CFL). [8]
- c) Explain polar diagram and state its significance. [4]

OR

Q2) a) Draw a neat sketch of human eye, name all the parts. Explain function of any 2 parts. [8]

- b) State the detail classification of dimmers and explain any one type with suitable diagram. [8]
- c) Explain the term- Effective reflectance. [4]

Q3) a) Define following terms - Luminous flux, Mean spherical Candle Power (MSCP), Space to height ratio, Utilisation factor. [8]

- b) Explain in details the factors to be considered for design of illumination scheme for - Commercial installation. [8]

OR

P.T.O.

Q4) a) Define following terms : [8]

Luminous intensity, Mean horizontal Candle Power (MHCP),
Space to height ratio, Maintenance factor

b) Explain in details the factors to be considered for design of illumination scheme for - educational institute. [8]

Q5) a) Explain following terms : [8]

Visual performance, Visual comfort, Glare, Contrast

b) With suitable diagrams explain arrangement of luminaries for road lighting. [8]

OR

Q6) a) With suitable diagrams explain different arrangements of projectors for flood lighting. [8]

b) Explain following terms related to road lighting- Threshold increment, Surround ratio, Overall uniformity of road luminance, Luminance yield. [8]

Q7) a) Compare LED with flourocent lamp (minimum 9 points of comparison expected). [9]

b) State and explain any 5 types of intelligent LED fixtures. [9]

OR

Q8) a) With suitable diagrams explain construction and working of OLED. [9]

b) With suitable diagrams explain different fibre optic guide. [9]



Total No. of Questions : 8]

SEAT No. : _____

P4780

[Total No. of Pages : 2

[5561]-597
B.E. (Electrical)
VLSI DESIGN (Open Elective - IV)
(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.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate marks.
- 4) Use of logarithmic tables, slide rules, Mollier Charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain with logic diagram and truth table a 3:8 decoder. [8]
b) Write VHDL code for a 2 bit asynchronous up-down counter. [6]
c) Differentiate between functions and procedures. [6]

OR

- Q2)** a) Write VHDL code for 4:1 multiplexer using [8]
i) if.. else statement
ii) case statement
b) Explain with diagram the derivation of T flip flop from JK flip flop. [6]
c) Write VHDL code to detect a 110 sequence using Moore machine. [6]

- Q3)** a) List the features, specifications and applications of CPLD. [8]
b) Explain with diagram a generic architecture of FPGA. [8]

OR

- Q4)** a) Explain the need of PLDs. Compare ASIC with general purpose processor and microcontroller. [8]
b) Explain the following terms with reference to FPGA [8]
i) LUT
ii) Interconnect
iii) I/O block
iv) SRAM

P.T.O.

- Q5)** a) Draw and explain the CMOS inverter voltage transfer characteristics. [8]
b) Explain with diagram CMOS NAND gate and CMOS NOR gate. [8]

OR

- Q6)** a) Draw a CMOS logic diagram to realize following Boolean expression. [8]

i) $Y = \overline{AB + CD}$

ii) $Y = \overline{A(B + C)}$

- b) Compare TTL, ECL and CMOS logic families. [8]

- Q7)** a) Draw a top level diagram for comparator with three outputs of comparator: one corresponding to $a > b$, another to $a == b$ and finally $a < b$. To realize a signed and unsigned comparator using VHDL code, write the name of package to be used in library declarations. Write the VHDL entity for signed and unsigned comparator. [10]

- b) Explain with diagram the design of serial data receiver. Write the VHDL code to realize a 7 bit data receiver. [8]

OR

- Q8)** a) Explain the VLSI design of signal generator using VHDL code to realize it. [10]

- b) Explain the VLSI design implementation using VHDL code to realize a 8×8 ROM. [8]



Total No. of Questions : 10]

SEAT No. :

P3920

[Total No. of Pages : 2

[5561]-598

B.E. (Instre. & Control)

**PROCESS DYNAMICS & CONTROL
(End Sem.) (2015 Course) (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) *Your answer will be valued as a whole.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain empirical modeling method using step input. [6]

b) What is self regulation? Give its example. [4]

Q2) a) How do you analyze a typical flow control system? [6]

b) Explain terms Valve gain and variable time constant. [4]

Q3) a) Discuss on use of input processing required in feedback control. [5]

b) Explain fine tuning of controllers for good control performance. [5]

OR

Q4) Write note on [10]

- a) Feedback control algorithm.
- b) Output processing.

Q5) a) With suitable example describe use of three level cascade control system. [10]

b) Discuss on tuning of cascade control system. [6]

OR

P.T.O.

Q6) a) Illustrate application of selective control system. [8]

b) Explain typical ratio control system used in Boilers. [8]

Q7) a) Explain interaction and its effect in multivariable process control. [8]

b) Describe use of static decouplers in decoupling of control loops. [10]

OR

Q8) a) Explain use of relative gain array in decoupling control. [8]

b) Calculate relative gain array for following process. [10]

$$G(s) = \begin{bmatrix} -2e^{-s} & 1.5e^{-s} \\ \frac{10s+1}{s+1} & \frac{s+1}{10s+1} \\ \frac{1.5e^{-s}}{s+1} & \frac{2e^{-s}}{10s+1} \end{bmatrix}$$

Show CV-MV pairing using RGA matrix.

Q9) a) Discuss tuning relations based on integral error criteria. [6]

b) Explain procedure of internal model control for FPODT processes. [10]

OR

Q10) Write a note on (any two) [16]

- a) Smith predictor.
- b) Internal model control.
- c) IMC based PID controller design.

X X X

Total No. of Questions : 10]

SEAT No. :

P3921

[5561]-599

[Total No. of Pages : 2

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 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) Explain Various Organisational Explain Line Organisation structure with neat sketch. [10]

OR

Q2) a) Explain in detail the role of project team in developing the project statement. [6]

b) Write a short notes on "Project Risk Management". [4]

Q3) a) What is WBS? Explain SOW and WBS in detail. [6]

b) Explain PERT Method with suitable example. [4]

OR

Q4) a) Write a short notes on (Any One) : [5]

i) Types of estimates.

ii) Crash Time concept.

b) Explain Project Monitoring and control with PERT. [5]

Q5) a) What is bidding? Explain bid evaluation process. [8]

b) Explain Procurement activities in the project. [8]

OR

P.T.O.

Q6) a) Write a short notes on Front End Engineering and Design (FEED) documents. [8]

b) Draw and explain P&ID for the fractinators. [8]

Q7) a) What is UTP Cable? Give detailed category wise classification & Use of different UTP Cable. [8]

b) Draw and explain PFD & P & ID for the simple feedback control of Heat exchanger. [8]

OR

Q8) a) What are BOM and MBOM? Give its importance. [8]

b) Explain the cable identification scheme, cable trays. [8]

Q9) a) Prepare CAT for any control panel. [9]

b) Explain the installation & commissioning in detail. [9]

OR

Q10)a) Explain important features of intelligent operator interface. [9]

b) Explain guidelines, considerations in design of Control Panel. [9]



Total No. of Questions : 10]

SEAT No. :

P3923

[Total No. of Pages : 2

[5561]-601

B.E.(Instrumentation)

**INDUSTRIAL INTERNET OF THINGS
(2015 Course) (Semester - I) (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 side 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 business View point in architecture of IIOT. [5]

b) What is purpose of subnet mask explain with example. [5]

OR

Q2) a) Discuss deployment options of IIOT platforms. [5]

b) Explain Implementation View point in architecture of IIOT. [5]

Q3) Explain relationship of architectural view points, Application Scope, System Lifecycle Process. [10]

OR

Q4) Explain Web of Things with neat diagram and example. [10]

Q5) a) Explain FOG computing in brief. [8]

b) Explain data synchronization in IIOT. [8]

OR

Q6) a) What is clustering? Discuss clustering in IOT. [8]

b) Explain design guideline in resource management. [8]

P.T.O.

Q7) a) Explain security requirement for maintaining privacy and safety in IIOT. [8]

b) Explain FP7 icore access framework. [8]

OR

Q8) a) Explain work capability based access control system. [8]

b) Discuss security issues in smart city. [8]

Q9) a) Explain use of IOT in home appliances. [9]

b) Explain IOT in building management system. [9]

OR

Q10)a) Discuss use of IOT in industry. [10]

b) Explain use of IOT in security. [8]



Total No. of Questions : 12]

SEAT No. :

P3924

[5561]-602

[Total No. of Pages : 2

**B.E.(Instrumentation & Control)
ELECTRICAL DRIVES
(2015 Course) (Semester - I) (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., 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) What is drive? Explain the need of drive? [6]

OR

Q2) Explain state of art of drive? [6]

Q3) Explain the various types of control methods used in drive? [8]

OR

Q4) Explain the steady state stability of electrical drive? [8]

Q5) Explain the various converters with waveform. [6]

- a) Buck
- b) Buck Boost

OR

Q6) Explain the four quadrant operations of drive with reference to vehicle? [6]

Q7) a) Enlist and explain the internal functions of DC drives? [8]
b) Explain various load characteristics with example? [8]

OR

Q8) a) Enlist and explain the various speed and torque control methods of DC motors? [8]
b) What do you understand by constant torque and constant speed applications? Give example. [8]

P.T.O.

- Q9)** a) What is the relation between slip and torque with equation? [8]
b) Explain control techniques used in AC drive? [10]

OR

- Q10)**a) Explain working of induction motor with its speed torque characteristics? [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 speed control of AC motor? [8]

OR

- Q12)**a) How to configure a siemens AC drive? [8]
b) Write a short note on traction drives. [8]



Total No. of Questions : 10]

SEAT No. :

P3925

[5561]-604

[Total No. of Pages : 2

B.E.(Instrumentation & Control)

**ADVANCED BIO-MEDICAL INSTRUMENTATION
(2015 Course) (Semester - I) (End Sem.) (Elective - I) (406264D)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 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 the principle of Coulter blood cell counter? [5]

b) Explain the principle of Pulse oximetry? [5]

OR

Q2) a) Explain the relation between frequencies, resolution and depth of penetration with respect to Ultrasonography. [6]

b) Explain the acoustic impedance with respect to Ultrasound imaging. [4]

Q3) a) Draw and explain front panel controls of x-ray machine. [5]

b) Explain with neat sketch the principle of photon annihilation process in PET? [5]

OR

Q4) a) Explain stationary anode x-ray generation assembly with neat diagram. [5]

b) Explain the principle of getting image in CT scanning. [5]

Q5) a) Explain D.C. Defibrillator with neat labeled diagram? Find the energy stored $25\mu\text{f}$ capacitor charged To 2200V dc. [10]

b) Explain short wave diathermy. [8]

OR

Q6) a) What is the necessity of pacemaker? List out Various types of pacemaker with respect to its use. Explain implanted pacemaker in detail. [10]

b) Explain various modes of ESU? Justify why patient electrode should have large area. [8]

P.T.O.

- Q7)** a) Discuss various properties of LASER. [8]
b) Explain the general construction with the help of a neat diagram. Enlist characteristics of Endoscope. [8]

OR

- Q8)** a) Explain diabetic retinopathy treatment with the help of LASER. [8]
b) Explain port wine treatment with the help of LASER. [8]

- Q9)** a) Enlist the basic types of Wheelchair. Discuss various materials used for constructing wheel chair. [8]
b) Explain various frame design considerations in wheel chair. [8]

OR

- Q10)** a) Elaborate on lithotripsy? [8]
b) Draw and explain the structure of nephron and explain the process of regulation of water and electrolyte balance. [8]



Total No. of Questions : 10]

SEAT No. :

P3926

[5561]-605

[Total No. of Pages : 2

B.E.(Instrumentation & Control Engineering)

DIGITAL CONTROL SYSTEMS

(2015 Course) (Elective - I) (406264E)

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.
- 5) Use of calculators is allowed.

Q1) Draw Block Diagram of Digital Control System and explain the working of each block in short. **[10]**

OR

Q2) Derive mathematical model of Zero Order Hold. Explain why ZOH is preferred in Control System over the higher order hold circuits. **[10]**

Q3) Derive the Pulse Transfer function of Positional form of Digital PID Controller and show the block diagram representation of Positional form of Digital PID controller. **[10]**

OR

Q4) By using Bilinear Transformation and Routh Hurwitz array check the stability of following characteristics equation **[10]**

$$Z^4 - 7Z^3 + 6Z^2 - 5Z + 3 = 0$$

Q5) a) Derive equation to find out Pulse Transfer function form a State Model. **[10]**

b) Define State Transition Matrix $\Psi(K)$ and write down its importance in the Digital Control System. **[6]**

OR

P.T.O.

Q6) a) Check the State Controllability and State Observability of the following system. [10]

$$X(K+1) = \begin{bmatrix} 0 & 1 \\ -1 & 1 \end{bmatrix} X(K) + \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} U(K)$$

$$Y(K) = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} X(K)$$

b) Explain various Canonical forms in short. [6]

Q7) a) Write a short note on State Controllability and Output Controllability. Explain it with the help of equations. [8]

b) Write a short note on State Observability and Output Observability. Explain it with the help of equations. [8]

OR

Q8) a) What is the function of Observer Circuit in Digital Control Systems? [8]

b) Explain in short, the types of Observers used in DCS. [8]

Q9) Discrete Control System is having the State Equation as [18]

$$X(K+1) = G X(K) + H U(K)$$

$$G = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}; H = \begin{bmatrix} 1 \\ 1 \end{bmatrix}; X(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}; Q = S = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}; R = 1$$

The Performance Index is given by:

$$J = \frac{1}{2} X^2(6) + \frac{1}{2} \sum_{K=0}^5 [X^2(K) + U^2(K)]$$

Find Control Law and Minimum Performance Index J_{\min} .

OR

Q10) For a linear Discrete Time System is having the State Equation as [18]

$$X(K+1) = 0.635 X(K) + 0.932 U(K)$$

The Performance Index is given by:

$$J = \frac{1}{2} X^2(7) + \frac{1}{2} \sum_{K=0}^6 [X^2(K) + U^2(K)]$$

Find Control Law and Minimum Performance Index J_{\min}



Total No. of Questions : 12]

SEAT No. :

P3927

[5561]-606

[Total No. of Pages : 2

B.E. (Instrumentation & Control)

SMART AND WIRELESS INSTRUMENTATION

(2015 Pattern) (Semester-I) (406265 A) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn whenever necessary.*
- 2) *Figures to the right indicates full marks.*
- 3) *Assume suitable data if necessary.*

Q1) Explain decentralized management in detail. [6]

OR

Q2) Write short note on WSN. [6]

Q3) Explain XYZ node architecture. [6]

OR

Q4) Write short note on ASIC. [6]

Q5) Explain with neat diagram explain components of digital communication system. [8]

OR

Q6) Explain quadratic amplitude modulation. [8]

P.T.O.

Q7) Car theft control 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 Zigbee architecture. [8]
b) Explain in detail Zigbee data frame. [8]

Q9) a) Explain thermal energy harvesting technique in detail. [8]
b) Explain with neat diagram architecture of energy management in WSN. [8]

OR

Q10) a) Explain with neat block diagram R-F energy harvesting. [8]
b) Write short notes on:

- i) Vibration Energy Harvesting [4]
- ii) NiCd battery [4]

Q11) a) Explain global and local Inspection techniques in detail. [9]
b) Explain prototype of pipeline monitoring in detail. [9]

OR

Q12) a) Explain prototype of pipeline monitoring in detail. [9]
b) Explain magnetic sensors of structural health monitoring. [9]



Total No. of Questions : 10]

SEAT No. :

P3928

[5561]-607

[Total No. of Pages : 2

B.E. (Instrumentation & Control)

INSTRUMENTATION & CONTROL FOR POWER PLANTS

(2015 Pattern) (Semester-I) (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, Q9 or Q10.
- 2) Draw neat labelled diagrams wherever necessary.
- 3) Figures to the right indicates full marks.

Q1) a) Draw and Explain Furnace pressure control loop in a boiler. [5]

b) Explain the feed water and steam circuit in a thermal power plant. [5]

OR

Q2) a) Explain the working of Deaerator in a thermal power plant. [5]

b) Suggest suitable transducers for measurement of flue gas analysis, and turbine speed measurement. [5]

Q3) a) Explain the need and principle of smoke density measurement in a power plant. [5]

b) Explain the automation strategy in application of DCS to thermal power plant. [5]

OR

Q4) a) List various safety interlocks related to turbines. [5]

b) Explain the working of boiler feedwater pump. [5]

P.T.O.

Q5) a) Explain the working of pressurized water nuclear reactor with the help of a neat figure. [8]

b) Explain Nuclear Fission chain reaction. How is it controlled. [8]

OR

Q6) a) What are the measures undertaken for Radiological protection of the workers in Nuclear power plant. [8]

b) Give the function and material for the following components in a nuclear reactor Moderator, reflector, coolant and control rods. [8]

Q7) a) List various special temperature sensors used in Nuclear power plant. Explain any one type. [7]

b) Explain the cascade steam temperature control of Boiling water reactor. [9]

OR

Q8) a) Explain the working of Scintillation counter for radiation monitoring. [8]

b) Describe any one method for neutron flux density measurement in a nuclear reactor. [8]

Q9) a) Explain the function of the following in a hydroelectric power plant. [8]

- | | |
|-----------------|----------------|
| i) Penstock | ii) Surge tank |
| iii) Draft tube | iv) Tail race |

b) Explain with the help of a neat diagram, working of pelton turbine and its governing mechanism. [10]

OR

Q10)a) What is SCADA? How is it useful for power plant operation. [8]

b) What is the purpose of a substation? List and give the function of different components of a substation. [10]



Total No. of Questions : 10]

SEAT No. :

P3929

[5561]-608

[Total No. of Pages : 2

**B.E. (Instrumentation & Control Engineering)
AUTOMOTIVE INSTRUMENTATION
(2015 Course) (Semester-I) (406265C) (Elective-II)**

Time : 2½ Hours] [Max. Marks : 70

- 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 circuit diagrams should be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) Write short notes on: [10]

- a) Automotive Electronic dashboard instruments.
- b) Lighting system in automobile.

OR

Q2) Draw and explain the principle of operation of Electronics Control Unit (ECU). [10]

Q3) What is fuel metering? Explain various sensors used for fuel metering. [10]

OR

Q4) Explain various methods of exhaust emission control in vehicles. [10]

Q5) Explain the following with respect to automobile (Any two) [18]

- a) ABS
- b) ASR
- c) ESP

OR

Q6) a) Write short note on electronic steering control in automobile. [10]

- b) Write short note on tyre pressure system in automobile. [8]

P.T.O.

Q7) a) How air bag technology helps in saving human's life, justify. [8]

b) Explain the working of Antitheft control system in automobile? [8]

OR

Q8) a) Explain in detail the Reverse Park Assist System along with different methods. [8]

b) Elaborate on Battery monitoring & control features in automobiles. [8]

Q9) a) Compare Conventional cars with Electric cars? [8]

b) Which concept is used in hybrid vehicles mentioning its advantages & disadvantages. [8]

OR

Q10)a) How are electric vehicles classified? Mention its significance to society. [8]

b) Explain the Automatic Driver Assist Systems in automobiles. [8]



Total No. of Questions : 10]

SEAT No. :

P3930

[5561]-609

[Total No. of Pages : 2

B.E. (Instrumentation & Control)

**OPTO - ELECTRONICS INSTRUMENTATION
(2015 Course) (Semester-I) (Elective-II)**

Time : 2½ Hours]

[Max. Marks : 70

- 1) *Answers Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10.*
- 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 the classification of Fibers. Explain classification of fibers in detail. [5]
- b) List the splices used in fiber optic. Explain the various types of splices in detail. [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) With neat sketch elaborate the steps of manufacturing of optical fiber. [5]

- Q3)** a) Write a short note on : Application of optical fiber for displacement measurement. [5]
- b) Explain in detail what are the designing parameters of optical link? [5]

OR

- Q4)** a) Enlist the losses in fiber cable. Explain Bending losses in detail. [5]
- b) Explain with diagram application of optical fiber for pressure measurement. [5]

P.T.O.

Q5) a) List out the types of LASER. Explain construction and working of semiconductor laser. [8]

b) What is Holography? Explain the basic principle and applications of Holography. [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 Refractometer (OTDR). [9]

b) Explain with block diagram working principle of Fiber Optical Numerical Aperture Measurement. [9]



Total No. of Questions :10]

SEAT No. :

P3931

[5561]-611

[Total No. of Pages :3

B.E. (Instrumentation and Control Engineering)

PROCESS INSTRUMENTATION

(2015 Pattern) (406268) (Semester-II)

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) Assume suitable data, if necessary.

- Q1)** a) Discuss the temperature control system using three way valves in a liquid to liquid heat exchanger. [5]
- b) How the feed forward control strategy is implemented in the Heat exchanger? What is adaptive gain? [5]

OR

- Q2)** a) What is desuperheater? Describe implementation of cascade control for superheater temperature control? [5]
- b) Illustrate how the Burner Management System works in Boiler. [5]

OR

- Q3)** a) Give the significance of furnace draft in the combustion of fuel in Boiler. [5]
- b) With necessary diagram, explain the Air Fuel ratio control. [5]

OR

- Q4)** a) Explain the control scheme for bottom product composition control through reboiler temperature. [5]
- b) Formulate material and energy balance equations in distillation process. [5]

P.T.O.

- Q5)** a) Distinguish between ‘Continuous’ and ‘Batch’ Dryers? Describe the humidity corrected feed forward control of the continuous fluid bed dryer. [9]
- b) Elaborate the following terms with reference to Evaporator. [4]
- Single effect evaporation
 - Multiple effect evaporation
- c) Illustrate the cascade control implementation for two effect evaporators. [5]

OR

- Q6)** a) Describe the feed forward control scheme for Evaporators considering following cases-
- Manipulated variable is steam flow
 - Manipulated variable is feed flow
- b) Write the factors on which the drying characteristics of a material depend. [2]
- c) How spray dryer is different from other dryers? Explain with suitable control scheme. [7]

- Q7)** a) With neat sketches, explain the cascade control strategy used for control of temperature in an exothermic chemical reactor. [6]
- b) What are the limitations of cascade control in case of reactors? [2]
- c) Comment on stability of reactors, reaction rate, time constant and effects of lag. [8]

OR

- Q8)** a) Illustrate a control system using multiple coolants for temperature control in a chemical reactor. [8]
- b) Why end point detection is important in reactors. [2]
- c) Describe the pH end point control in detail. [6]

- Q9)** a) Draw schematic and discuss about the control system implementation, when two compressors are in series and when in parallel. [8]
- b) Enlist the types of pumps? Explain in detail about on/off control and speed control of pump. [8]

OR

- Q10)** a) Enlist the types of compressors? With neat diagram, explain the Surge control in compressors. [8]
- b) How the distribution control is implemented for multiple pumps. [8]



Total No. of Questions : 10]

SEAT No. :

P3932

[5561]-612

[Total No. of Pages : 2

**B.E. (Instrumentation & Control)
INDUSTRIAL AUTOMATION
(2015 Pattern) (406269) (Semester - 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 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 evolution of Instrumentation and control? [6]
b) Write short note on RS 232? [4]

OR

- Q2)** a) Explain open system interconnection model with neat diagram? [5]
b) Explain in brief architecture of PLC? [5]

- Q3)** a) Draw ladder diagram to turn ON motor for 10 seconds and turn off for 5 seconds. It is require to repeat process continuously. [6]
b) Explain role of automation in industries? [4]

OR

- Q4)** a) Explain HART protocol and its frame structure. [6]
b) Write short note on types of Automation? [4]

- Q5)** a) Explain various evolution stages of DCS with neat diagram. [10]
b) State various objectives of SCADA and types of SCADA? [8]

OR

- Q6)** a) Explain the architecture of SCADA in detail? [10]
b) State IEC 61511 standard for Functional safety? [8]

P.T.O.

- Q7)** a) Explain the block diagram of ESD system? [8]
b) Draw DCS flow sheet symbols and describe it. [8]

OR

- Q8)** a) Describe control techniques in DCS? [8]
b) With neat diagram, explain SCADA application? [8]

- Q9)** a) With neat diagram, explain the concept of safety Integrity Level? [8]
b) List out the supervisory computer functions in DCS? [8]

OR

- Q10)** a) Explain with any suitable application implementation of closed loop SCADA system? [8]
b) Draw the architecture of safety Instrumented system and explain it in detail? [8]



Total No. of Questions : 10]

SEAT No. :

P3933

[5561]-613

[Total No. of Pages : 2

B.E. (Instrumentation & Control)

BUILDINGAUTOMATION

(2015 Course) (Elective - III) (Semester - II) (406270A)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 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 Intelligent building system with its architecture? [6]
b) Explain importance of Security system in BAS? [4]

OR

- Q2)** a) Explain Dew point and Saturation point in BAS? [5]
b) Explain flow measurements in HVAC for air side application. [5]

- Q3)** a) Explain series fan powered VAV system? [6]
b) Explain Plate heat exchanger in HVAC? [4]

OR

- Q4)** a) Differentiate between BACnet and Modbus Protocol? [6]
b) Explain the Enthalpy and Entropy? [4]

- Q5)** a) Draw and explain the concept of geothermal system with an example.[10]
b) Differentiate between water tube and fire tube boilers? [8]

OR

- Q6)** a) What is Fire? Explain Fire alarm system with its architecture. [10]
b) Explain Battery calculations for FAS system with an example. [8]

P.T.O.

- Q7)** a) Explain NFPA-72 for Fire alarm system? [8]
b) Explain fire detection system with its components? [8]

OR

- Q8)** a) Explain water leak detection system for FAS? [8]
b) Explain in details different types of Camera & their use in CCTV based Surveillance system. [8]

- Q9)** a) Explain Smartcard and Proximity Card technology in detail. [8]
b) Explain Antipass back and Two men Rule? [8]

OR

- Q10)** a) Explain Access control system with its benefits. [8]
b) Explain video Analytics and Camera connectivity. [8]



Total No. of Questions : 10]

SEAT No. :

P4779

[Total No. of Pages : 2

[5561]-614

**B.E. (Instrumentation and Control Engineering)
ROBOTICS & AUTOMATION
(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) Neat circuit diagrams should be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) Write short notes on : [10]

- a) Cycle time concept in robots.
- b) Proximity and range sensors of robotic systems.

OR

Q2) Draw and explain architecture of robotic system. [10]

**Q3) a) What is digitizing in machine vision? [4]
b) Why is it needed for robots? [2]
c) Explain hardware required for digitizing. [4]**

OR

Q4) Explain position control and force control in robotics. [10]

**Q5) Explain the following with respect to robots : [17]
a) Lead - through programming
b) Signal commands
c) Wait commands**

OR

Q6) Write short note on capabilities and limitations of lead - through programming. [17]

P.T.O.

Q7) Write short notes on : [16]

- a) Path planning of robots
- b) Navigation architectures

OR

Q8) Explain in detail how obstacle avoidance is done in robots. [16]

Q9) Explain the following : [17]

- a) Remote Centre Compliance (RCC)
- b) Inspection automation

OR

Q10)a) What is adaptable programmable assembly system?

- b) What is assembly system configurations?

[17]



Total No. of Questions : 10]

SEAT No. :

P3934

[5561]-615

[Total No. of Pages : 2

B.E. (Instrumentation & Control)

ENVIRONMENTAL INSTRUMENTATION

(2015 Course) (Semester - II)

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) Assume suitable data, if necessary.

- Q1)** a) Elaborate role of Instrumentation Engineer in Environmental analysis with example. [5]
- b) Explain Ultraviolet analyzer for environmental analysis. [5]

OR

- Q2)** a) Explain the Gas chromatography method used in environmental analysis. [5]
- b) Explain working of the total hydrocarbon analyzer using flame ionization detector. [5]

- Q3)** a) Explain conductivity analyzers and their applications in water quality parameterization. [5]
- b) Enlist and discuss in brief about water quality parameters. [5]

OR

- Q4)** a) Which are the various sources of water? Enlist and discuss in brief about water quality parameters. [4]
- b) Explain Opacity Monitor for measuring water quality parameter. [6]

- Q5)** a) What is the concept of waste water monitoring? Discuss in brief about automatic waste water sampling. [8]
- b) Write a note on selection criteria for waste water sampling location. [8]

OR

P.T.O.

- Q6)** a) Explain the role of NGOs and municipal corporation in Rain water harvesting. [8]
b) Compare between open channel and non open channel flow measurement. [8]

- Q7)** a) Enlist various analytical methods used in air pollution studies. Explain any one in detail. [10]
b) What is air pollution? Explain importance of air pollution control. [8]

OR

- Q8)** a) Define air sampling. What are the different air sampling methods? Explain any one in detail. [10]
b) Discuss about various devices used in air flow monitoring. [8]

- Q9)** a) What is Virtual Instruments Environmental Engineering Laboratory? [8]
b) Explain necessity of rain water harvesting. List the methods of same. [8]

OR

- Q10)** a) Define Sound pollution. Explain its effect to environment. [8]
b) Explain working principle of Rain Gauges and Barometer. [8]



Total No. of Questions : 10]

SEAT No. :

P3935

[5561]-616

[Total No. of Pages : 2

**B.E. (Instrumentation & Control)
DIGITAL IMAGE PROCESSING**

(2015 Pattern) (Semester-II) (406270 (D)) (Elective - III)

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) Assume suitable data, if necessary.

- Q1)** a) Explain various statistical parameters considered in image processing. [5]
b) Explain RGB color Model. [5]

OR

- Q2)** a) Explain sampling and Quantization in Image Processing. [5]
b) Explain relation between pixels,
i) 4 connectivity.
ii) 8 connectivity.
iii) mixed connectivity.

- Q3)** a) Explain fourier transform and discuss its properties and applications. [5]
b) Explain image decomposition using wavelet transform. [5]

OR

- Q4)** a) Explain image averaging in spatial domain. [5]
b) Explain image sharpening techniques. [5]

- Q5)** a) What is segmentation? Explain region oriented segmentation. [10]
b) Explain the 4 point and 8 point representation schemes in image processing. [8]

OR

P.T.O.

Q6) a) Explain the image regional descriptors. [10]

b) Explain pattern and pattern classes. [8]

Q7) a) Explain the arithmetic coding with examples. [8]

b) Find the Huffman code for the following string $[S_1, S_2, S_3, S_4, S_5]$ of probability $[0.4, 0.2, 0.2, 0.1, 0.1]$. [8]

OR

Q8) a) Explain lossy and lossless compression. [8]

b) Explain the block schematic of image compression. [8]

Q9) a) Explain with flowchart the steps of DIP in military. [8]

b) Explain the application of DIP in Medical field. [8]

OR

Q10) Write short note (Any two) : [16]

a) Application of DIP in Space.

b) Application of DIP in biometrics.

c) Application of DIP in Agriculture.



Total No. of Questions : 10]

SEAT No. :

P5587

[Total No. of Pages : 3

[5561]-617

B.E. (Instrumentation)

**PROCESS MODELLING AND OPTIMISATION
(2015 Pattern) (Elective - III)**

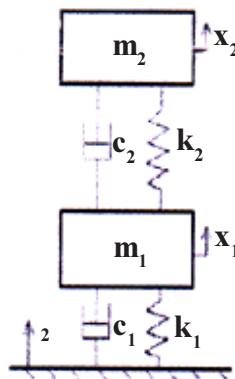
Time : 2½ Hours

[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, slide rule, Mollier charts, electronic Pocket calculator and steam tables is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Derive mathematical model of the mechanical system given in figure. [8]



b) State Continuity equations, Energy Equations. [2]

OR

Q2) For a experimentation following data is obtain [10]

X	0	5	10	15	20	25	30	35
Y	8	18	25	32	41	47	56	63

Identify the curve fitting equation will give best fit. Obtain the values coefficient of equation.

P.T.O.

- Q3)** Obtain mathematical representation of three isothermal tanks having constant holdups series converting reactant A and B into two product C with reaction rate k and reaction is exothermic. [10]

OR

- Q4)** Explain identification of system using step testing method. [10]

- Q5)** a) Explain the following terms : [8]

- i) Niderlinski Index.
- ii) Resiliency Index.

- b) Write short note on robust nests doylt stein criterion. [8]

OR

- Q6)** a) Determine the Morari Resiliency index of the systems given by [8]

$$G(s) = \begin{bmatrix} \frac{22.89e^{-0.2s}}{4.572s+1} & \frac{-11.64e^{-0.4s}}{1.807s+1} \\ \frac{4.689e^{0.2s}}{2.174s+1} & \frac{5.8e^{-0.4s}}{1.801s+1} \end{bmatrix}$$

- b) Explain calculation of RGA for two input and two output process. [8]

- Q7)** a) Explain Payback period, Return of Investment, Net present value, Internal Rate of Return with suitable example [8]

- b) Explain the following : [8]

- i) Concave, convex functions and continuity of a function.
- ii) Gradient of a function and Hessian matrix.

OR

- Q8)** For the functions given below, analyze the concavity and convexity in each case. [16]

a) $f(x_1, x_2) = x_1^2 + x_2^2 + x_2^2$

b) $f(x) = x_1^2 + 5x_1x_2 + 4x_2^2 + 2x_1 + 6x_2 + 2$

c) $f(x) = x + 3x^2 + 6x^3$

d) $f(x_1, x_2) = 2x_1^2 - 5x_1x_2 + 3x_2^2$

OR

- Q9)** a) Explain unidirectional search method for optimization. [9]
b) Explain Steepest Descent method for optimization. [9]

- Q10)** a) Explain polynomial approximation method. [9]
b) Explain constraint and unconstraint optimization problem. [9]



Total No. of Questions : 10]

SEAT No. :

P3955

[5561]-619

[Total No. of Pages : 2

B.E. (Instru.& Control) (Elective -IV)
RENEWABLE ENERGY SYSTEMS
(2015 Course) (Semester-II) (406271 B)

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

Q1) What is renewable energy? Explain geothermal energy and its scope in future.

[10]

OR

Q2) Explicate effect on solar photovoltaic panels.

[10]

- a) Irradiance
- b) Shading

Q3) Explain the scope of

[10]

- a) Thin film solar cells
- b) Polycrystalline amorphous solar cells

OR

Q4) Explain usages of fuel cells with suitable example.

[10]

Q5) a) Explain solar panel section and array design. **[8]**
b) How MPPT algorithms are used? **[8]**

OR

Q6) Explain various types of power converters and their role in photovoltaic systems. **[16]**

P.T.O.

- Q7)** a) How solar water pump works? [8]
b) Explain working of solar cooker. [8]

OR

- Q8)** Write note on [16]
a) Solar electric heaters.
b) Grid tied inverters.

- Q9)** Explain following hybrid wind power systems. [18]
a) Wind-photovoltaic.
b) Wind-diesel power.

- Q10)** a) Describe wind resource assessment with example. [9]
b) Which factors are important during design of wind turbines. [9]



Total No. of Questions :10]

SEAT No. :

P3936

[5561]-620

[Total No. of Pages :2

B.E. (Instrumentation & Engineering) (Elective-IV)

**INSTRUMENTATION IN AGRICULTURE & FOOD INDUSTRIES
(2015Course) (Semester - II) (406271-C)**

Time : 2½Hours]

[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 side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain the role of instrumentation in agriculture engineering. [5]
b) Short note on permeability. [5]

OR

- Q2)** a) What is a Hygrometer? List 2 types of Hygrometers. Explain one in detail. [6]
b) Short Note on Fine wire thermocouple (Features, Applications) [4]

- Q3)** a) List the Parameters which are maintained in a green House. [4]
b) Explain the Pasteurization Process and related instrumentation involved in dairy plant. [6]

OR

- Q4)** a) Draw the process of juice extraction from sugar cane. [6]
b) Detail about Centre pivot and Micro irrigation system. [4]

- Q5)** a) Explain agro metrological instrumentation weather station. [10]
b) Which factors should be consider while selection of pump? [8]

OR

P.T.O.

Q6) a) Explain various hydraulic controls in farm tractor. [10]

b) Write a short note on soil water content measurement. [8]

Q7) a) Explain food safety and standard bill 2005. [8]

b) Write a note on food quality measurement. [8]

OR

Q8) a) Explain recommended international code of hygiene for any of the Fruit juice item. [8]

b) Explain design consideration of cold storage, atmospheric controller and preservatives. [8]

Q9) a) Explain in detail application of PLC in food packing industry. [8]

b) Write a short note on recent trends in food processing. [8]

OR

Q10)a) Explain in detail application of SCADA in Food packing industry. [8]

b) List and explain the need of various control equipments in a Controlled atmosphere unit. [8]



Total No. of Questions : 10]

SEAT No. :

P4781

[Total No. of Pages : 2

[5561]-621

**B.E. (Instrumentation and Control)
SMART MATERIAL & SYSTEMS
(2015 Pattern) (Semester - II) (Elective - IV)**

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) Assume suitable data if necessary.

- Q1)** a) State the properties of smart materials. [4]
b) Explain Electrostrictiv elastomers in detail. [6]

OR

- Q2)** a) State the advantages of smart sensors over the conventional sensors. [5]
b) Write applications of shape memory ceramics. [5]

- Q3)** a) Compare SWCNT & MWCNT. [4]
b) State the concept of Self-Healing materials along with example & applications. [6]

OR

- Q4)** a) Enlist applications areas of CNT. [5]
b) Explain the concept of Electrostatic comb drive. [5]

- Q5)** a) Define MEMS. Enlist advantages & applications MEMS. [10]
b) Explain the Microsystems at radio frequencies & its applications. [8]

OR

- Q6)** a) State the advantages of MEMS over conventional systems. Explain Piezoelectric inkjet print head. [10]
b) Explain magnetic micro relay systems. [8]

P.T.O.

- Q7)** a) Explain Chemical vapor deposition process with neat diagram. [8]
b) Explain lithography in detail. [8]

OR

- Q8)** a) Explain the Diffusion and Ion implantation process of dopants. [8]
b) Explain surface machining in detail. [8]

- Q9)** a) Explain the concept, advantages, and disadvantages of Lab on chip technology. [8]
b) Enlist automotive applications of smart sensors. [8]

OR

- Q10)** a) Explain bulk machining in detail. [8]
b) Enlist application of lab on chip in research. [8]



Total No. of Questions : 8]

SEAT No. :

P3937

[Total No. of Pages : 2

[5561]-622

B.E. (Electronics)

VLSI DESIGN

(2015 Pattern) (End Sem.) (404201)

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) Draw CMOS inverter and explain (VTC) voltage transfer characteristics.

[6]

b) Explain noise margin. Write expression for the same. **[4]**

c) Implement 4 : 1 multiplexer using **[10]**

i) CMOS Logic

ii) Pass Transistor logic

OR

Q2) a) Explain different Power dissipation in CMOS circuit designs. **[10]**

b) What is technology scaling? What are types. Explain each in detail. **[10]**

Q3) a) What are different types of VHDL modeling? Explain any one with example. **[8]**

b) Explain any three attributes with suitable example. **[8]**

OR

Q4) a) Explain working of DRAM (any two schematic) in detail. **[8]**

b) Give classification of memories with application of each. **[8]**

P.T.O.

Q5) a) What are different Power distribution techniques used in floor planning. [8]

b) What is wire parasitic? How to take care while routing? [9]

OR

Q6) a) Draw a neat diagram and explain of BASIC FPGA configurable logic block and routing Structure. [9]

b) With suitable diagram explain carry chains in FPGA. [8]

Q7) a) Explain TAP Controller with its state diagram and with its flowchart. [9]

b) What is need of boundary scan? Explain boundary scan techniques in detail. [8]

OR

Q8) a) Write short note on Layout design rules. [8]

b) With diagram explain Modeling and extraction of circuit parameters from physical layout. [9]

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Total No. of Questions : 8]

SEAT No. :

P3938

[5561]-623

[Total No. of Pages : 2

B.E. (Electronics)

ADVANCED POWER ELECTRONICS

(2015 Pattern) (404202) (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.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Compare circulating and non-circulating type of Dual converter. [6]

b) With the help of neat circuit diagram & waveform explain single phase bridge diode clamped multilevel Inverter. [8]

c) What is braking? Explain Regenerative braking of DC Machine. Mention its advantages & disadvantages. [6]

OR

Q2) a) With circuit diagram and waveform explain symmetrical angle control (SAC) method for power factor Improvement of controlled rectifier. [6]

b) Discuss step down cycloconverter for $f_o = \frac{1}{2} f_{in}$. [6]

c) With the help of neat circuit diagram & waveform explain the operation of three phase full converter fed DC drives for continuous current mode. [8]

Q3) a) Which are speed control methods of Induction motor? Explain any two methods in detail with characteristics. [8]

b) With neat block diagram explain closed loop control of Induction motor. [8]

OR

Q4) a) With the help of suitable circuit diagram & waveforms explain the working of VSI drive for three phase Induction motor. [8]

b) What is vector control? With block diagram explain indirect vector control for Induction motor. [8]

P.T.O.

- Q5)** a) List the drive requirements for stepper motor drive. Draw the circuit diagram & explain the working of chopper drive for stepper motor. [8]
b) Explain the working principle of permanent magnet BLDC motor drive with constructional diagram. [8]

OR

- Q6)** a) With neat diagram explain synchronous reluctance motor drive. [8]
b) Explain working principle of servo motor drive & state its advantages. [8]

- Q7)** a) Discuss PV characteristics & working of solar power system with neat diagram. [10]
b) Explain selection criteria for solar panel, Inverter, Battery & charge controller in solar power system. [8]

OR

- Q8)** a) With the help of neat diagram explain standalone wind energy system. [8]
b) Discuss types of wind generator control of wind turbines. [10]



Total No. of Questions : 8]

SEAT No. :

P3940

[5561]-625

[Total No. of Pages : 2

B.E.(Electronics)

**DIGITAL IMAGE AND VIDEO PROCESSING
(2015 Course) (Semester - I) (Elective - I) (404204A)**

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 and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Discuss the following concepts with respect to digital image (Any two)[8]

- i) Spatial and gray level resolution
- ii) Basic relationship between pixels
- iii) Distance measures between pixels

b) What is the difference between image enhancement and image restoration.
Hence with the help of diagram explain Inverse filtering for image restoration. [6]

c) Write the formula for DCT and hence find DCT for the following image

$$\begin{bmatrix} 2 & 2 \\ 1 & 2 \end{bmatrix}$$

state how DCT provides energy compaction. [6]

OR

Q2) a) State the importance of color models? Give application of RGB, HSI and YIQ color model and explain each one in detail. [8]

b) Justify - Median filter is an effective tool to minimize salt and pepper noise as compared to average filtering, considering following image segment [6]

$$I = \begin{bmatrix} 23 & 21 & 32 & 21 & 28 & 25 \\ 30 & 255 & 24 & 26 & 0 & 23 \\ 24 & 22 & 33 & 25 & 22 & 24 \end{bmatrix}$$

c) What is JPEG? With the help of block diagram explain JPEG baseline encoder in detail. [6]

P.T.O.

Q3) a) With the help of morphological operations on binary images explain how the following operations are performed [10]

- i) Boundary extraction
- ii) Region/Hole filling
- iii) Thickening
- iv) Thinning

b) Explain the concept of region based segmentation. Hence explain following region based algorithms [8]

- i) Region growing
- ii) Region splitting & merging

OR

Q4) a) Explain following in detail [10]

- i) LOG
- ii) DOG
- iii) Canny Edge detector

b) What is skeleton? Explain the algorithm to obtain skeleton of an object in digital image. [8]

Q5) a) Explain the shape model and motion model with respect to camera. [8]

b) Explain how the digital videos are displayed on screen and hence explain different scanning methods in detail. [8]

OR

Q6) a) Explain in detail intrinsic and extrinsic parameters used for camera calibration. [8]

b) Explain the basics of color video. Why digital color videos are converted into $Y\bar{C}_b\bar{C}_r$ color spaces. [8]

Q7) a) Discuss in brief block matching algorithm and explain how the suitable block size is chosen in motion compensation. [8]

b) What are the requirements of digital video? Why video compression is required? Explain with suitable example. [8]

OR

Q8) a) Explain in detail gradient based motion estimation technique. [8]

b) Explain the use of motion analysis in video summarization. [8]



Total No. of Questions : 8]

SEAT No. :

P3941

[5561]-626

[Total No. of Pages : 2

B.E.(Electronics)

AUDIO AND SPEECH PROCESSING

(2015 Course) (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) 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 how voiced and unvoiced segments are identified on the basis of [8]

- i) Energy measurement &
- ii) Zero crossing rate

b) What is cepstrum? Explain cepstral domain approach for pitch measurement with mathematical equations. [6]

c) Explain the production of consonants like /t/, /s/, and /p/. [6]

OR

Q2) a) Discuss the phoneme classification in American English. [8]

b) What is autocorrelation? Discuss autocorrelation method for finding pitch period of a voiced speech segment. [6]

c) Discuss : [6]

- i) Concept of formant
- ii) Formant's relation with LPC

Q3) a) A speech signal has root mean square amplitude of 3V and is to be coded using 6 bits. Find the step size and the quantization noise power. Define : quantization noise power [8]

b) What is meant by parametric coding? Discuss channel vocoder transmitter block schematic. [8]

OR

Q4) a) Discuss the companded quantizer with block schematic. [8]

Illustrate the characteristics of compressor & expander. [8]

b) Discuss the channel vocoder receiver block schematic. [8]

P.T.O.

- Q5)** a) Draw block schematic of forward linear prediction.
Discuss covariance approach for finding LPC with mathematical treatment. [8]
b) What is meant by line spectral frequencies(LSFs)?
Discuss the algorithm for conversion of LPC to LSFs. [8]

OR

- Q6)** a) Discuss autocorrelation approach for finding LPC with mathematical treatment. [8]
b) Discuss two-stage lattice structure. [8]

- Q7)** a) Discuss the following features for musical instrument classification :[9]
i) temporal features
ii) spectral features
b) Discuss text-to-speech system with necessary block schematic with respect to [9]
i) prosody
ii) phonetic transcription

OR

- Q8)** Write short notes on : (any two) [18]
a) Automatic speech recognition
b) Linear and dynamic time warping
c) Speech enhancement



Total No. of Questions : 8]

SEAT No. :

P3942

[5561]-627

[Total No. of Pages : 2

B.E.(Electronics Engg.)

EMBEDDED SYSTEM 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.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Draw the block diagram of LPC 1768 and explain the function of each block in brief. [8]

b) With the help of task state diagram explain different states of the Task. [6]

c) Explain features of µC/OS-II RTOS. [6]

OR

Q2) a) Explain optimization of Time-to-market and NRE and Unit cost design metrics. Calculate loss of revenue for the following if life time is 52 weeks [8]

- i) If delayed time is 4 weeks
- ii) If delayed time is 8 weeks

b) What is RTOS Explain different types of RTOS. Explain different criteria to select OS for Embedded System. [6]

c) Explain the following firnctions related to µC/OS-II RTOS. [6]
i) OSTimeDly()
ii) OSTimeDlyHMSM()
iii) OSStart()

Q3) a) Explain the features of Embedded Linux operating system. Explain Open Source & GPL related to Embedded Linux. Explain and compare BIOS and Boot loader. [8]

b) What is meant by binary utilities or binutils in Embedded Linux? Explain different binary utilities for creating and managing programs in Embedded Linux. [8]

OR

P.T.O.

- Q4)** a) Explain following cross development tools used for Embedded Linux
i) GNU Debugger (GDB)
ii) Tracing and profiling [8]
- b) Explain Flash memory storage used in Embedded Linux. State the advantages and disadvantages of Flash memory. Compare NAND and NOR Flash memory. Explain flash memory layout for Embedded Linux OS. [8]

- Q5)** a) What is boot loader in Embedded Linux? Explain the role of boot loader in Embedded Linux. Explain different functional blocks of boot loader. [8]
- b) Explain in detail kernel configuration in Embedded Linux. [8]

OR

- Q6)** a) What is porting? Explain porting of U boot in embedded Linux on new board. [8]
- b) Explain Root file system and JFFS2 File System in Embedded Linux. [8]

- Q7)** a) Explain mobile phone with suitable block diagram and state its hardware requirements. [6]
- b) Explain the use of In-Circuit Emulator for testing embedded system with neat diagram. [6]
- c) With the help of neat diagram explain simple target system and sophisticated target system board. [6]

OR

- Q8)** a) Explain digital camera with suitable block diagram and state its hardware requirement. [6]
- b) With neat diagram explain the burning of application software code into PROM or Flash memory. [6]
- c) Explain linker, locator and loader software tools. Compare linker and loader. [6]



Total No. of Questions : 10]

SEAT No. :

P3943

[5561]-628

[Total No. of Pages : 2

**B.E.(Electronics Engg.)
INTERNET OF THINGS**

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

Time : 2½ 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 full marks assigned.

Q1) a) What is Internet of Things? What are characteristics of IoT. [5]

b) What is full form of MQTT. Explain the protocol by mentioning its architecture, structure and usage. [5]

OR

Q2) a) What are different challenges in IoT? Elaborate each challenge. [5]

b) Draw block diagram of RFID system. Discuss various components of RFID system. [5]

Q3) a) What are 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 benefits of cloud computing? List all the benefits and elaborate each benefit. [4]

b) Explain Overview and Motivation for Internet of Things. [6]

Q5) a) What is Arduino? What do you understand by open source hardware? Write specifications of any Arduino board that you know. [8]

b) What are different data types in Python? Explain each data type by giving one example. [8]

OR

P.T.O.

Q6) a) What is Raspberry Pi? Who invented it? Why is it called Raspberry Pi?
What are differences between different Raspberry Pi models available? [8]

b) An ultrasonic sensor is to be interfaced with Arduino. Show the interfacing with neat diagram. Write algorithm for this interfacing. [8]

Q7) a) Why is Hadoop used for big data analysis? Explain different features of Hadoop. [8]

b) What are different types of data analytics? Explain each type by giving appropriate example. [8]

OR

Q8) a) Explain need for modern corporate sector to go for Big Data strategy. [8]

b) What are characteristics of big data? Which are the data types in big data? Explain each data type by giving example. [8]

Q9) a) What do you think citizens expect from their cities? [9]

b) Write in detail business model scenario for Internet of things. [9]

OR

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

a) Smart metering and advanced metering infrastructure

b) Trends in wearable technology

c) IOT for Industrial development

d) Smart transportation



Total No. of Questions : 12]

SEAT No. :

P3944

[5561]-629

[Total No. of Pages : 2

B.E.(Electronics)

SOFTWARE DEFINED RADIO

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

Time : 2½ Hour]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*

SECTION - I

Q1) a) Draw the model of a software radio. Explain only the role of ADC and DAC. [4]

b) What is Software Defined Radio? Explain in short any 5 design principles of SDR. [4]

OR

Q2) a) State the need of RF-Front End for a SDR. List the requirements of the R.F. Front End. [4]

b) List the Pre-Distortion techniques why and where is this technique used? [4]

Q3) What is Software Communication Architecture? Explain its operating environment. [6]

OR

Q4) Explain the following w.r.t Data Convertors

a) Harmonic Distortion
b) Spurious Free Dynamic Range [6]

Q5) What is the benefit of using multi-stage structures of a decimator when large sampling rate are needed. [6]

OR

Q6) Explain the following in short [6]

a) Interpolation
b) Decimation
c) Multi-stage structure

P.T.O.

SECTION - II

- Q7)** a) i) How is cognitive radio different than software define radio? [5]
ii) State the use of SDR in CR. [4]
- b) List and explain the four capabilities in cognitive radio to enable dynamic use of spectrum. [9]

OR

- Q8)** a) Explain Interference Management technique used in Spectrum Sensing. [9]
- b) List and explain in detail the advantages of Cognitive Radio Network when compared to Cognitive Radios operating autonomously. [9]

- Q9)** a) Explain Architecture of CR Transceiver. [8]
- b) How to allocate the transmission power and spectrum access to cognitive users. [8]

OR

- Q10)**a) What is static spectrum allocation technique? Explain spectrum sharing approach in CR Network. [8]
- b) How does the performance of CR Network improve using STATISTICAL CHARACTERIZATION of Node Location. [8]

- Q11)**a) State and explain the three components of the Public Safety Communication N/W C2000. [8]
- b) Explain CR Network for Disaster Management. [8]

OR

- Q12)**a) Explain in detail Terrestrial Trunked Radio TETRA. [8]
- b) How can the Cognitive Communication improve the overall system spectral efficiency? Explain in detail. [8]



Total No. of Questions : 8]

SEAT No. :

P3945

[Total No. of Pages : 2

[5561]-630

B.E. (Electronics)
MOBILE COMMUNICATION
(2015 Course) (Semester-I) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers the 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) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data. if necessary.*

Q1) a) Explain impulse response of multipath channel. [7]

b) For given path exponent (a) $n = 4$ (b) $n = 3$, find the frequency reuse factor and the cluster size that should be used for maximum capacity. The signal - to - interference ratio of 15dB is minimum required for satisfactory forward channel performance of a cellular system. There are six co-channel cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations. [7]

c) Explain with neat diagram the working of RAKE receiver. [6]

OR

Q2) a) Find the Fraunhofer distance for an antenna with maximum dimension of 1 meter and operating frequency of 900 MHz. If antennas have unity gain, calculate the path loss. [6]

b) State different types of handoff strategies. Explain anyone in detail. [7]

c) What is diversity? State different diversity techniques. Explain feedback or scanning diversity in detail. [7]

P.T.O.

Q3) a) Explain GSM time hierarchy in detail. [8]

b) With neat block diagram explain USDC speech encoder and decoder. [8]

OR

Q4) a) Draw and explain GSM burst structure. [8]

b) Define vocoders and explain linear predictive coders. [8]

Q5) a) Explain radio and network components of CDMA2000. [8]

b) Write note on TD-CDMA. [8]

OR

Q6) a) Explain 4G wireless standards. [8]

b) Explain TD-SCDMA in detail. [8]

Q7) a) Write note on UMTS. [9]

b) Draw and explain architecture of ISDN. [9]

OR

Q8) a) Explain signaling traffic, services and performance with respect to SS7 protocol. [9]

b) With neat diagram explain the working of common channel signaling network architecture. [9]



Total No. of Questions : 8]

SEAT No. :

P3946

[Total No. of Pages : 2

[5561]-631

B.E. (Electronics)

BIOMEDICAL ELECTRONICS

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

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) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

- Q1)** a) Explain the sources of Bio-electric signals with diagram. [6]
b) Explain the structure of Neuron. [6]
c) Write short note on: [8]
 i) Limb Electrodes
 ii) Floating Electrodes

OR

- Q2)** a) Draw ECG waveform and give normal values of amplitude and duration of important ECG parameters. [6]
b) Draw the central nervous system & explain. [6]
c) Explain ECG amplifier with input protection and isolation circuit. [8]
- Q3)** a) Draw the block diagram of Bedside patient monitoring system and explain it. [8]
b) Differentiate between external and internal pacemaker. [8]

OR

- Q4)** a) What is Fibrillation? What causes it? How is this corrected? [8]
b) Explain the photoelectric plethysmograph in brief. [8]

P.T.O.

- Q5)** a) What is microshock and macroshock? Describe various methods of electrical accident prevention in hospital environment? [8]
b) Write short note on Autoanalyzer. [8]

OR

- Q6)** a) Explain Automatic optical method of blood cell counting. [8]
b) How does Hemodialysis work? Explain with diagram. [8]

- Q7)** a) Draw block diagram of an X-ray machine & Explain it's working. [8]
b) Draw block diagram of:
i) MRI machine
ii) CT scan machine

OR

- Q8)** a) Explain the ultrasound machine with block diagram. [8]
b) What is Bio - Telemetry? Explain the components of Bio-Telemetry system in detail. [10]



Total No. of Questions : 8]

SEAT No. :

P3947

[5561]-632

[Total No. of Pages : 2

B.E. (Electronics)

**OPTIMIZATION TECHNIQUES
(2015 Pattern) (Semester - I) (Elective - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stream tables is allowed.
- 2) Assume suitable data, if necessary.

Q1) a) Solve the problem using simplex method [10]

$$\text{minimize } Z = 20x_1 + 10x_2$$

$$\text{subject to } x_1 + 2x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60$$

$$x_1 \geq 0; x_2 \geq 0$$

b) Find the extreme points of the function [10]

$$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

OR

Q2) a) Use KKT conditions to solve [10]

$$\text{maximize } Z = 7x_1^2 - 6x_1 + 5x_2^2$$

$$\text{subject to } x_1 + 2x_2 \leq 10$$

$$x_1 - 3x_2 \leq 9$$

$$x_1, x_2 \geq 0$$

b) Obtain the solution using Lagrange multiplier method. [10]

$$\text{minimize } Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$$

$$\text{subject to } x_1 + x_2 + x_3 = 15$$

$$2x_1 - x_2 + 2x_3 = 20$$

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

P.T.O.

Q3) Minimize $f(x) = (100 - x)^2$ over the interval $60 \leq x \leq 150$. Use interval halving method for four stages. [16]

OR

Q4) Minimize using Secant method $f(x) = 2x^2 + \frac{16}{x}$ over the interval $1 \leq x \leq 5$.
Show calculations for four Iterations. [16]

Q5) Minimize $f(x_1, x_2) = x_1^2 - x_1 x_2 + 3x_2^2$ using Univariate method. Take starting point $(1, 1)$. Show output of three Iterations. [18]

OR

Q6) Solve using Powell's Quadratic Interpolation Method.

$$\text{minimize } f(\lambda) = \lambda^3 - 3\lambda^2 + 2.$$

Verify the answer using classical optimization technique method. [18]

Q7) Solve : Quadratic programming problem: [16]

$$\text{Minimize } Q(x) = x_1^2 + x_2^2 - 4x_1 - 2x_2 + 5$$

Subject to $x_1 + x_2 \leq 4$

$$x_1, x_2 \geq 0$$

OR

Q8) Complete one Iteration of the Generalized Reduced Gradient method:

$$\text{Minimize } f = x_1^2 + x_2^2$$

Subject to $x_1 x_2 - 9 = 0$

Starting from $X_1 = \begin{Bmatrix} 2.5 \\ 4 \end{Bmatrix}$ [16]



Total No. of Questions : 8]

SEAT No. :

P3948

[5561]-633

[Total No. of Pages : 2

B.E. (Electronics)

**COMPUTER MODELLING AND SIMULATION
(2015 Course) (Semester - I) (404205D)**

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 single channel queue. [4]
b) Explain time advance algorithm. [4]
c) Explain the flow diagram of unit entering system. [6]
d) Identify the calling population customers & server in the following queuing situations.
 i) University library.
 ii) Bank teller counter
 iii) Internet router

OR

- Q2)** a) What is calling population? Explain. [4]
b) Explain in brief finite population queuing model. [4]
c) Define following terms related to discrete event simulation. [6]
 i) System
 ii) Event
 iii) Event notice
d) Explain Gamma and triangular distribution. [6]

- Q3)** a) Describe the steps in the development of a useful model of input data. [8]
b) Explain the iterative process of calibrating a model. [8]

OR

P.T.O.

Q4) a) Explain in detail chi-square test. [8]

b) Write a short note on covariance and correlation. [8]

Q5) a) Explain in detail confidence interval estimation. [8]

b) Explain any one method for analysis of output for steady state simulation. [8]

OR

Q6) a) With the help of examples explain any two types of simulations with respect to output analysis. [8]

b) Write short note on initialization bias in steady state simulations. [8]

Q7) a) What is trace driven model? Explain. [9]

b) Explain different tools used for simulation of computer system. [9]

OR

Q8) With the help of diagram explain in brief simulation of following system. [18]

- a) super market
- b) any service sector



Total No. of Questions : 8]

SEAT No. :

P3949

[5561]-634

[Total No. of Pages : 2

B.E. (Electronics)

**DIGITAL SIGNAL PROCESSOR TMS320C67X
(2015 Pattern) (Semester-I) (404205E) (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 side indicate full marks.
- 4) Assume suitable data. if necessary.
- 5) Use of calculator is allowed.

- Q1)** a) Explain control registers of TMS320C67X. [6]
b) List out various interrupt control registers along with its uses. [6]
c) Contrast and compare parallel and pipeline operations. [8]

OR

- Q2)** a) Draw the block schematic of functional units of TMS320C67XX. [8]
b) What are the parameter for selecting the DSP Processors. [6]
c) Discuss the interrupts of TMS320C67XX processors. [6]

- Q3)** a) Explain power-down mode in DSP processor TMS320C67X [9]
b) Explain PLL controller registers used in TMS320C67X. [9]

OR

- Q4)** a) Explain the features of the McASP and protocols the McASP supports. [9]
b) Explain 12C Module Conceptual Block Diagram for TMS320C67X DSP processor. [9]

- Q5)** a) Explain windowing in TMS320C67X DSP. [8]
b) Explain waveform generation using TMS320C67X DSP processor. [8]

OR

P.T.O.

Q6) a) Explain convolution implementation using TMS320C67X DSP processor. [8]

b) Explain FFT implementation using TMS320C67X DSP processor. [8]

Q7) a) Explain how TMS320C67X is used in Numeric control. [8]

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

OR

Q8) Write a short note on use of TMS320C67X DSP processor in [16]

a) Robotics

b) Power line Monitoring



Total No. of Questions :8]

SEAT No. :

P3950

[5561]-635

[Total No. of Pages :2

B.E. (Electronics Engineering)

COMPUTER NETWORKS & SECURITY

(2015 Pattern) (404209) (Semester-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Illustrate with neat sketch & describe in brief OSI reference model. [8]
b) Describe in brief data link layer in 802.11 LAN. [8]
c) Compare between structure of circuit switch & Packet switch networks. [4]

OR

- Q2)** a) Describe in brief SDSL & ADSL technologies. [8]
b) Describe in brief HDLC frame format. Also explain Information supervisory & unnumber control frames in detail. [8]
c) Compare OSI & TCP/IP reference model. [4]

- Q3)** a) What is use of IP address? Explain in brief IPV4 classful addressing technique. [6]
b) What is adaptive routing algorithm? Describe in brief Distance vector Routing algorithm. [6]
c) Illustrate with neat sketch & describe in brief use of port address for process to process communication. [6]

OR

P.T.O.

- Q4)** a) Describe in brief use of address mapping. Also describe ARP & RARP required for Address mapping. [9]
b) Describe in brief functions of transport layer. Also explain how congestion control is done by transport layer. [9]

- Q5)** a) Illustrate with neat sketch & describe in brief protocol used for remote login. [8]
b) With suitable example explain HTML programming useful in web page creation. [8]

OR

- Q6)** a) Explain in detail DNS protocol. [8]
b) Describe in brief http & www application layer protocols & their applications respectively. [8]

- Q7)** a) What is use of cryptography? Explain secret key & public key algorithm. [8]
b) Why network administration is important in computer Network? Describe in brief protocol analyzer. [8]

OR

- Q8)** a) What are network security attacks? Describe in brief security mechanism & solutions to security attacks. [8]
b) Describe in brief asymmetric key cryptography. Illustrate with neat sketch & describe in brief RSA algorithm. [8]



Total No. of Questions : 8]

SEAT No. :

P3951

[5561]-636

[Total No. of Pages : 2

B.E. (Electronics)

**PROCESS INSTRUMENTATION
(2015 Pattern) (Semester - II) (404210)**

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) Figures to the right side indicate full marks.

- Q1)** a) List types of process and explain any one of them. [6]
b) Explain how to control the temperature by process control using process equation, also explain operation of it. [6]
c) Explain composite controller modes in electronic controller. [8]

OR

- Q2)** a) Explain the following terms: [6]
i) Process gain.
ii) Process Time.
b) Draw schematic diagram of a PI and PD controller using OP-Amps. [6]
c) Why tuning is required for controller? Which are common methods of controller tuning? Explain process reaction method in detail. [8]

- Q3)** a) Explain feed forward control system for distillation column. [8]
b) Write short note on split-range control system. [8]

OR

- Q4)** a) Draw generalised block diagram of adaptive control & explain. [8]
b) Draw structure of model based control & explain the concept of MBC. What are the different methods of modelling approaches for MBC. [8]

- Q5)** a) What is set-point Ramping in process instrumentation? [8]
b) What are the customary batch procedures in Batch reactors. Explain temperature control process. [8]

OR

P.T.O.

- Q6)** a) Discuss Discrete state process control system also explain characteristics of the system. [8]
b) What is Batch Distillation & Explain how to maintain constant Distillation Rate with an example. [8]

- Q7)** a) Explain with design chemical reactor mechanism. [9]
b) Explain control design sequence in detail. [9]

OR

- Q8)** a) Explain with block diagram the process decomposition process. [9]
b) What are various safety layers? Explain. [9]



Total No. of Questions : 8]

SEAT No. :

P4782

[Total No. of Pages : 2

[5561]-637
B.E. (Electronics)
AUTOMOTIVE ELECTRONICS
(2015 Pattern) (Semester - II) (Elective - III)

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, and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain engagement and disengagement of clutch when pulling away from standstill and gear change. [8]
b) Draw and explain conventional automobile ignition system in brief. [8]
c) Explain the term air/fuel ratio. Also explain its effect performance of SI engine. [4]

OR

- Q2)** a) Explain the phenomenon of knock in SI engine and Compare it with CI engine with suitable diagrams. [8]
b) What are the key drivers that forces to use advanced technologies in Automotive systems. [8]
c) Explain the detailed architecture of Infineon's Tricore family processor. [4]

- Q3)** a) What way FlexRay is more superior to CAN? State key features of it. [6]
b) Discuss in detail about D2B and DSI communication protocol. [6]
c) Explain open issues for Automotive communication systems. [4]

OR

- Q4)** a) Why Ethernet protocol is important in automotive systems? Explain the frame structure for the same. [6]
b) Compare types of automotive buses based on technical specifications and applications. [6]
c) Compare CAN and LIN protocol. [4]

P.T.O.

- Q5)** a) How to analyze the costs and benefits of model-based software development in automotive industry. [6]
b) Explain the concept of steering control and rain operated wiper control. [6]
c) Enlist guidelines for adopting model based development in automotive industry. [4]

OR

- Q6)** a) Define Model based Development. Explain the role of Model based development in Automotive embedded systems development. [6]
b) Discuss superstition of variables sensed in engine control system. [6]
c) Write a note on transient operation of engines. [4]

- Q7)** a) Compare active safety & passive safety with suitable examples. [6]
b) What do you mean by multiplexed wiring? Explain with diagram how it is implemented. [6]
c) Enlist various diagnostic tools & equipment. State the two main pieces of knowledge necessary to diagnose the fault. [6]

OR

- Q8)** a) Describe how color of smoke from a diesel engine can be used as an aid to fault diagnosis. [6]
b) What are the safety features in today's automotive cars? Explain anyone in detail. [6]
c) Draw & explain anti collision warning system. [6]



Total No. of Questions : 10]

SEAT No. :

P5581

[Total No. of Pages : 2

[5561]-638

B.E. (Electronics)

**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(2015 Pattern) (Elective - III) (End Semester)**

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, Q.9 or Q.10.
- 2) Figures to the right side indicate full marks.

- Q1)** a) With the help of suitable example explain A* search algorithm. State the characteristics of A* algorithm. [5]
- b) Explain the structure of utility based agent used in AI. State the advantages of Utility based agent over goal based agent. [5]

OR

- Q2)** a) Explain the issues in implementing knowledge in Artificial intelligence. [5]
- b) Explain simulated annealing search algorithm. [5]

- Q3)** a) Compare A*, Simulated annealing and Hill climbing search algorithms. [5]
- b) With the help of examples compare unobservable, partially observable and fully observable environment. [5]

OR

- Q4)** a) Explain Breadth first search algorithm. [5]
- b) Explain any five properties of Environments used in AI. [5]

- Q5)** a) What is Machine learning? Explain different perspectives and issues in machine learning. [8]
- b) Explain basic decision tree algorithm with suitable example. [8]

OR

P.T.O.

Q6) a) Explain Back propagation algorithm. What are its limitations. [8]

b) Compare following : [8]

i) Parametric and Non parametric machine learning algorithms.

ii) Classification and Regression.

Q7) a) Draw the perception model to implement or logic and explain its training steps. [8]

b) Draw and explain the architecture of convolution neural network. State its advantages over conventional neural network. [10]

OR

Q8) a) State and explain any four activation functions used in neural network? [8]

b) Draw the schematic diagram of biological neuron and explain its working. Also compare conventional computer system with Artificial neural network. [10]

Q9) a) Explain support vector machine learning algorithm. Explain the maximum margin linear separation concept. [8]

b) Draw and explain the architecture of multilayer feed forward neural network. State its advantages over single layer.neural network. [8]

OR

Q10) a) What are the basic steps to solve classification problem in machine learning? Explain with suitable example. Also explain any three performance measure parameters used in machine learning. [8]

b) Describe K means clustering algorithm. Compare it with KNN algorithm. [8]



Total No. of Questions : 8]

SEAT No. :

P3952

[5561]-639

[Total No. of Pages : 2

B.E. (Electronics Engg.)

**OPTICAL AND MICROWAVE COMMUNICATION
(2015 Pattern) (Elective - III) (Semester - II)**

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.

Q1) a) What does Snell's law state? With the diagram explain the law. [8]

- b) Compute the angle of incidence, the critical angle and numerical aperture of an optical fiber that has a core refractive index 1.4 and cladding refractive index of 1.35. [6]
- c) List out the causes of losses in fiber. [6]

OR

Q2) a) Compare step index fiber and graded index fiber. [4]

- b) Explain the working of Block diagram of optical fiber communication system with diagram. [8]
- c) What are the different type of fibers and write their characteristics. [8]

Q3) a) With the assistance of diagram explain fabry-perot LASER. [8]

- b) Explain in detail the nature and performance characteristics of PIN photodetectors in terms of response time. [10]

OR

Q4) a) Explain the concept of wavelength Division multiplexing along with neat diagram. State key features. [10]

- b) Explain :
- | | |
|-----------------------|-----------------------|
| i) Cutoff wavelength. | ii) Guide wavelength. |
| iii) Phase velocity. | iv) Wave impedance. |

P.T.O.

- Q5)** a) With the neat diagram explain microwave circulator and microwave isolator. [8]
b) Explain the working and construction of Directional coupler. State advantages of same. [8]

OR

- Q6)** a) What are the limitations of conventional tubes at microwave frequencies? [8]
b) Explain the construction and working of Travelling wave Tube in detail. [8]

- Q7)** a) What is varactor diode? Give its construction, working principle and explain one application. [8]
b) Explain Power frequency limitation of Microwave BJT. [8]

OR

- Q8)** a) Write in detail of Gunn diode with diagram. [8]
b) A two cavity Klystron amplifier has $f = 3 \text{ GHz}$, $V_0 = 1000\text{V}$, $R_0 = 40 \text{ K}\Omega$, $I_0 = 25 \text{ mA}$ having gap spacing (d) = 1 mm, spacing between two cavity (L) = 4 cm and shunt impedance (R_{Sh}) = 30 K Ω . [8]
Find :
i) Input Gap Voltage.
ii) Voltage gain.
iii) Efficiency of amplifier.



Total No. of Questions : 10]

SEAT No. :

P3953

[5561]-640

[Total No. of Pages : 2

B.E. (Electronics)

AUDIO VIDEO ENGINEERING

(2015 Pattern) (404211D) (Semester - II) (Elective - III)

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) Assume suitable data, if necessary.

- Q1)** a) With suitable block diagram explain IF modulated TV transmitter. [5]
b) Explain PAL encoder with necessary diagram. [5]

OR

- Q2)** a) Explain channel bandwidth of TV using VSB modulation with diagram. [5]
b) Explain additive and subtractive mixing of colours with neat diagram. [5]

- Q3)** a) Explain working of IPTV in detail. [5]
b) Explain the working of video intercom system. [5]

OR

- Q4)** a) Explain 3DTV in detail. [5]
b) Give the features of H.264. [5]

- Q5)** a) Explain MAC encoding in digital TV with suitable diagram. [8]
b) Explain with block diagram working of digital TV receiver. [8]

OR

- Q6)** a) Explain different video compression standards in detail. [8]
b) Explain the terms in brief:
i) CAS and
ii) DTH.

P.T.O.

- Q7)** a) Explain with neat diagram working of condenser microphone? State its applications. [8]
- b) Explain working principle of cone type loudspeaker with neat diagram. [8]

OR

- Q8)** a) Explain PA system installation plan for an auditorium having large capacity. Also explain Sabine's equation. [8]
- b) What is Reverberation? Define reverberation time? Explain growth and decay of sound in an enclosure. [8]

- Q9)** a) Explain the basic principle of optical recording and reproduction with suitable diagram. [10]
- b) Differentiate between CD and DVD. [8]

OR

- Q10)** a) Explain the playback process of compact disc with necessary diagram. Explain steps involved in the preparation process of CD. [10]
- b) Compare DVD and Blue Ray disc on the basis of their working. [8]



Total No. of Questions : 8]

SEAT No. :

P4765

[Total No. of Pages : 2

[5561]-641

B.E. (Electronics)

**TESTING AND VERIFICATION FOR SOC DESING
(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.*

Q1) a) Explain VLSI Analog and Digital Testing Processes. [7]

b) Discuss various Fault models and its level in details. [7]

c) Design algorithm for True Value Simulation with example. [6]

OR

Q2) a) Explain in brief statistical models used for fault simulation. [7]

b) Give steps required to enhance Testability of circuit. [7]

c) Explain following Testing techniques with respect to test equipment: [6]

i) Electrical parameter Testing

ii) Automatic Test equipment

iii) Chip testing technique

Q3) a) Elaborate redundancy identification for combinational and sequential circuit. [8]

b) Explain testing methodology for Combinational and sequential circuits.

[9]

OR

Q4) a) Give significance for Combinational ATPG program. [8]

b) Explain Simulation-Based Sequential Circuit ATPG in detail. [9]

P.T.O.

Q5) a) Explain DFT methods for Scan design. [8]

b) Explain Built in self test (BIST) for VLSI chip in brief. [9]

OR

Q6) a) Explain Random Logic Built in self test (BIST). [8]

b) Explain the importance of Digital DFT scanning methods. [9]

Q7) a) Give different Description languages for boundary scan. [8]

b) Explain system configuration steps with boundary scan. [8]

OR

Q8) a) Explain the factors responsible for the selection of scanning Memory BIST. [8]

b) Discuss the process to configure a system for BIST. [8]



Total No. of Questions : 10]

SEAT No. :

P5145

[Total No. of Pages : 2

[5561]-642
B.E. (Electronic Engineering)
ROBOTICS (Elective - IV)
(2015 Pattern)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume suitable data wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) a) Define and specify measurement units of following specifications of robot. [5]

- i) Accuracy.
- ii) Repeatability

b) Draw work envelop and explain merits and demerits of following geometries of robot: [5]

- i) Cylindrical Co-ordinate system.
- ii) Cartesian Co-ordinate system.

OR

Q2) a) What is working principle of touch sensor? With the help of one example, explain how touch sensor is used in a robot. [5]

b) Differentiate between: (Solve any two) [5]

- i) Reach & Stroke
- ii) Revolute joint & prismatic joint
- iii) Soft & Hard automation

Q3) a) Write short note on any two [6]

- i) range sensors
- ii) Robotic vision sensor
- iii) Pressure sensors

b) Explain the Slider - Crank mechanism with neat diagram. Comment on work envelopes traced by it. [4]

P.T.O.

OR

- Q4)** a) Explain the forward & backward kinematics solution. What is its significance? Give typical set of forward & backward equations. [6]
b) What is difference between Euler and RPY angle representation? [4]

- Q5)** a) Explain the term - Robot arm dynamics. List the methods used for analysis of robot dynamics? What is difference between dynamics and kinematics of robot. [8]

- b) What are different parameters involved in Trajectory Planning? How trajectory planning is different for flexible joint than rigid joint. [8]

OR

- Q6)** a) Discuss the E-L formulation used for a robotic manipulator. [8]
b) Explain method of Cubic polynomial linear segments with parabolic blending. [8]

- Q7)** a) How a robot is controlled with computer. List different software used in control of robot. [8]

- b) A robot arm is to be moved from location A to location B. The trajectory of the robots a straight line. In how many ways can this be done? Write steps involved in accomplishing this. [10]

OR

- Q8)** a) How skew line motion is different than straight line motion as far as path planning is concerned. [9]

- b) Which different aspects must be taken into consideration while planning trajectory of robot so that it can overcome obstacles in its path. Elaborate your answer. [9]

- Q9)** a) Draw neat block diagram of neural controller. Explain importance of each block and its working in detail. [8]

- b) Explain with neat block diagram how vision system is used in complex control system. [8]

OR

- Q10)**a) What is fuzzy logic? Draw the block diagram of fuzzy controller and explain it in detail. Draw appropriate waveforms. [8]

- b) Draw Architecture of robot human interaction. Explain importance of each element. [8]



Total No. of Questions :8]

SEAT No. :

P3954

[5561]-643

[Total No. of Pages :2

B.E. (Electronics Engineering)
WIRELESS SENSOR NETWORKS
(2015 Pattern) (Semester - II) (End semester)
(404212B) (Elective-IV)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define sensor node (Mote) of WSN. State the features of sensor node. Draw hardware block diagram of for sensor node. [6]
- b) Explain how to estimate the quality of individual links with various metrics in Wireless Sensor Networks. [6]
- c) State key features of Bluetooth Low Energy (BLE) protocol. State advantages, disadvantages and applications of Bluetooth Low Energy (BLE) protocol. [8]

OR

- Q2)** a) Explain the different types of wireless Sensor Networks. [6]
- b) With the help of flow diagram CSMA with collision detection (CSMA-CD) protocol. [6]
- c) Write short note on:
i) ANT protocol
ii) Wibree protocol/ Standard [8]

- Q3)** a) Explain the proximity schemes and ranging schemes for localization in Wireless Sensor Network. [8]
- b) Explain collection tree routing protocol and Zigbee routing protocol in wireless Sensor Networks. [8]

OR

- Q4)** a) What is localization in wireless Sensor Networks? Explain need of localization in WSN. Explain the localization challenges/ performance metrics. [8]

P.T.O.

- b) Define routing protocol in wireless Sensor Networks. Explain need of routing in Wireless Sensor Networks. with the help of diagram explain various routing scenarios in Wireless Sensor Networks. [8]

Q5) a) Explain need of clustering in wireless Sensor Networks. Explain design challenges of clustering in WSN. [6]

- b) With the help of diagram explain random clustering technique in WSN.[6]
- c) Explain statistical analysis in WSN. Explain compressive sampling in statistical analysis in Wireless Sensor Networks. [6]

OR

Q6) a) Explain goal oriented attacks and layer oriented attacks in Wireless Sensor Networks. [6]

b) Explain security issues in wireless Sensor Networks. [6]

c) Explain defensive measures for layer oriented attacks in wireless Sensor Networks. [6]

Q7) a) Explain topology problems, lifetime problems and semantic problems in Wireless Sensor Networks deployment. [8]

- b) Explain the Top-down design process of deployment of WSN. [8]

OR

Q8) a) Explain the different steps to design and implement a new WSN application. [8]

b) Explain the requirement analysis in WSN with respect to environmental life time, energy and required data. [8]



Total No. of Questions : 10]

SEAT No. :

P5582

[Total No. of Pages : 2

[5561]-644

B.E. (Electronics)

**RENEWABLE ENERGY SYSTEMS & DSM
(2015 Pattern) (Elective - IV)**

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 and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is the principle of solar photovoltaic power generation? What are the main elements of a PV system? [5]

b) Write a note on : Safety systems of wind turbine. [5]

OR

Q2) a) Explain with neat sketch construction and working of fixed dome type biogas plant. [6]

b) How are WEC systems classified? Discuss in brief. [4]

Q3) a) Explain the principle of conversion of solar energy into heat. [4]

b) Describe with neat sketch the main components of WECS. [6]

OR

Q4) a) What is the difference between a Pyrheliometer and a Pyranometer? Describe the principle of Angstrom compensation Pyrheliometer. [5]

b) How are Gasifiers classified? What is Pyrolysis? [5]

P.T.O.

Q5) a) What is Demand Side Management (DSM)? Briefly list down the benefits of DSM with examples. [8]

b) Write a note on : “India’s Energy Scenario”. [8]

OR

Q6) a) Explain briefly about Energy efficient equipments. [8]

b) What are the technology options for DSM in Lighting? [8]

Q7) a) Write a short note on “Smart Building”. [8]

b) Comments on : “Demand Response as an apart of smart grid initiative”. [8]

OR

Q8) a) What are the different types of DR programs? Explain each in brief. [8]

b) What are the requirements of “DRAS” [8]

Q9) a) Explain the working of following instruments : [10]

- i) Thermocouples
- ii) Lux meters
- iii) Watt Meter
- iv) Data logger
- v) Applications of Plc.

b) Write the ten steps to be carried out in Detailed Energy Audit. [8]

OR

Q10) a) What is the need of energy Audit. [6]

b) Write a short note on “Energy Action Planning”. [6]

c) Explain the different maximum demand control methods. [6]



Total No. of Questions : 10]

SEAT No. :

P5583

[Total No. of Pages : 2

[5561]-645

B.E. (Electronics)

MICROCONTROLLER

TM4C123GH6PM

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume suitable data, if necessary.*

Q1) a) Draw and explain the block diagram Trace Port Interface Unit (TPIU) of Cortex-M4F Processor. **[8]**

b) List Cortex-M4F System Component. **[2]**

OR

Q2) Explain the features of Cortex-M4F Processor. **[10]**

Q3) Draw and explain the register map of TM4C123GH6PM Microcontroller. **[10]**

OR

Q4) What are the memory barrier instructions of Cortex-M4F and in which situation these instruction is used. **[10]**

Q5) a) What is the role of system timer and what are the types of different timer. **[8]**

b) Explain the Floating-Point Unit (FPU) of controller. **[8]**

OR

Q6) a) Explain System Control Block (SCB) and its Register. **[8]**

b) Explain in details General-Purpose Input/Outputs (GPIOs). **[8]**

P.T.O.

Q7) a) Write short note on Universal Asynchronous Receivers/Transmitters (UARTs). [8]

b) Describe the Controller Area Network (CAN) Module. [8]

OR

Q8) a) How the important Universal Serial Bus (USB) Controller in controller. [8]

b) Explain Inter-Integrated Circuit (I2C) Interface [8]

Q9) a) Write short note on Remote monitoring [9]

b) Write short note on electronic point-of-sale machines. [9]

OR

Q10) a) Write short note on factory automation. [9]

b) Write short note on motion control. [9]



Total No. of Questions : 8]

SEAT No. :

P4766

[Total No. of Pages : 2

[5561]-650
B.E. (E & TC)
VLSI Design & Technology
(2015 Pattern)

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) Explain procedure with the help of VHDL code. [6]
b) Explain clock skew and methods to minimize the effect of clock skew. [7]
c) Explain any four important specifications of FPGA. Also explain CLB's in FPGA. [7]

OR

- Q2)** a) Explain VHDL attributes with example. [6]
b) Explain interconnect Routing Techniques. [7]
c) Explain in detail architecture of Macrocell in CPLD. [7]

- Q3)** a) Explain the following : [8]
i) Body Effect
ii) Hot Electron Effect
b) Derive the expression for static & Dynamic power dissipations. Compare them. [8]

OR

- Q4)** a) Design CMOS logic for $\gamma = ABC + D$. Calculate W/L ratio for NMOS & PMOS area needed on chip. [8]
b) Draw & explain CMOS transfer characteristics. [8]

P.T.O.

Q5) a) Explain cross talk and drain punch through. [8]

b) Explain fabrication method of CMOS using n well process. [10]

OR

Q6) a) Explain Design issues like antenna effect and electro migration effcct.[8]

b) Draw stick diagram for CMOS inverter, NAND, NOR gate. [10]

Q7) a) Explain TAP controller with state diagram. [8]

b) Write short note on BIST. [8]

OR

Q8) a) Explain JTAG in detail. [8]

b) Explain in detail stuck at fault model. [8]

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Total No. of Questions : 10]

SEAT No. :

P3956

[5561]-651

[Total No. of Pages : 2

B.E. (E&TC)

COMPUTER NETWORKS & SECURITY

(2015 Pattern) (404182) (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) Assume suitable data, if necessary.

- Q1)** a) Explain basic service set and Extended service set in WLAN? [6]
b) Write short note on Gigabit Ethernet. [4]

OR

- Q2)** a) Draw Bluetooth architecture explain function of different layer in Bluetooth? [6]
b) Write short note on congestion control. [4]

- Q3)** a) Give general format of ICMP and explain different types of error reporting messages used in ICMP? [6]
b) Compare IPV4 and IPV6? [4]

OR

- Q4)** a) Draw and explain IPV6 format? [6]
b) What is IGMP? How does it used? [4]

- Q5)** a) Explain Flow control in Transport Layer protocols? [7]
b) What are differences in IP address and Port number? [6]
c) Explain Process to Process delivery? [4]

OR

- Q6)** a) Enlist and explain SCTP services? [7]
b) Draw TCP header and explain function of each field? [6]
c) Draw and explain UDP header in details? [4]

P.T.O.

- Q7)** a) What are various components of DNS, explain in brief. [5]
b) Explain URL and operating principal of COOKIES? [6]
c) Explain types of Web Documents in detail? [6]

OR

- Q8)** a) Explain basic functions of Electronic mail. [5]
b) Write short note on :
 i) FTP,
 ii) SNMP
c) Enlist and explain functions of Network Management System? [6]

- Q9)** a) Define cryptography and explain all types of Ciphers? [8]
b) Generate the Public Key and Secret Key for following prime number using RSA algorithm?
 P=3, Q=11, take E = 5. [8]

OR

- Q10)** a) What is SSL? How does it provide security at Transport Layer? [8]
b) Write short note on :
 i) PGP.
 ii) Firewalls.



Total No. of Questions : 10]

SEAT No. :

P3958

[5561]-653

[Total No. of Pages : 2

B.E.(E&TC)

**DIGITAL IMAGE AND VIDEO PROCESSING
(2015 Pattern) (Semester - I) (Elective - I) (404184A)**

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 and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain following terms related to digital image processing : [6]

- i) Image digitization
- ii) Mach Bands and simultaneous contrast
- iii) Gray Level Resolution

b) State the significance of color spaces in image processing. Give applications of RGB, HSI and YIQ color models. [4]

OR

Q2) a) Draw neat block schematic different steps in image processing state & explain any two applications of digital image processing for Smart City development. [6]

b) Write the equation for 2D DFT. Compare LPF and HPF in frequency domain and spatial domain with relevant example. [4]

Q3) a) Compare image enhancement and image restoration. For the image given below apply median filter and explain noise removal process. [6]

$$F = \begin{bmatrix} 22 & 24 & 30 & 25 & 27 & 23 \\ 30 & 25 & 255 & 27 & 0 & 21 \\ 25 & 27 & 30 & 32 & 20 & 22 \end{bmatrix}$$

b) With relevant example explain Arithmetic Coding and state its application image processing. [4]

OR

P.T.O.

Q4) a) A 2×2 block of image is given as $\begin{bmatrix} 30 & 20 \\ 10 & 30 \end{bmatrix}$. Determine DCT coefficients of this image. [6]

- b) Explain following image enhancement operations with applications [4]
- Unsharp masking
 - Power law transformation

Q5) a) Describe following morphological operations with suitable example[8]

- Dilation process
- Erosion process

b) Compare image segmentation using thresholding and region-growing. Explain in detail algorithm of Otsus method of thresholding. [10]

OR

Q6) a) Describe edge-linking using Hough Transform. State difference between an Edge and boundary using suitable example. [8]

b) With suitable example, explain Prewitt, Sobel and Canny Edge detectors. Compare performance of above methods. [10]

Q7) a) State various methods of image representation. Explain Fourier descriptors with its properties and application. [8]

b) Explain Principal Component Analysis (PCA) with mathematical treatment. Compare statistical descriptors and PCA. [8]

OR

Q8) a) Explain with suitable example, boundary representation using chain codes. State the method of normalization for chain codes. [8]

b) Define ‘texture’ with reference to image processing. Explain descriptors using texture and statistical moments. [8]

Q9) a) State difference between analog and digital video. Explain basic video codec with suitable block diagram. [8]

b) Explain block-based motion estimation and compensation technique. State advantages and disadvantages of this technique. [8]

OR

Q10)a) State the relationship between RGB to $Y\text{C}_b\text{Cr}$ and $Y\text{C}_b\text{Cr}$ to RGB color space. [8]

b) What are the requirements of digital video? Why video compression is required? Explain with suitable example. [8]



Total No. of Questions : 8]

SEAT No. :

P3959

[5561]-654

[Total No. of Pages : 2

B.E.(E&TC)

**INDUSTRIAL DRIVES AND CONTROL
(2015 Course) (Elective - I) (404184B)**

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 indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Define and classify electrical drives. [6]

b) What are the advantages of electrical braking? Explain the regenerative braking of dc motor drives. [6]

c) Explain the operation of the closed loop controlled 3 phase current source inverter drive. State the advantages of three phase CSI drives over three phase VSI drives. [8]

OR

Q2) a) List out and explain the factors that influence the choice of electrical drives. [6]

b) Draw and explain the operation of I phase full converter, fed dc drive for separately excited dc motor. Draw output waveforms for firing angle of 60°. [6]

c) What is the need of vector control? Explain in detail the implementation of direct vector control for 3 phase induction motor drive. [8]

Q3) a) Mention various types of stepper motors. Explain the operation of any one stepper motor driver circuit. Enlist the applications and advantages of stepper motors. [10]

b) With the help of block schematic explain working of typical switched reluctance motor drive. [8]

OR

P.T.O.

Q4) Write short notes on [18]

- a) Three phase BLDC drive
- b) Permanent magnet synchronous motor drive
- c) Servo motor drive

Q5) a) What is the need of charge controller in Photovoltaic Power Systems? Explain the working type of charge controller with suitable circuit diagram. [8]

- b) Explain following mechanical controls used in Wind Energy Conversion System(WECS)
 - i) Pitch Control
 - ii) Yaw Control

OR

Q6) a) Explain the applications of solar power system in water pumping application. [6]

- b) List the various types of Wind Energy Conversion System (WECS). Explain Hybrid WECS System in detail. [6]
- c) Compare vertical and horizontal wind power system. [4]

Q7) a) Enlist different applications of neural network in drives and control, Explain the operation of Fuzzy logic based Induction motor drive. [8]

- b) With the help of block diagram, explain the application of Fuzzy logic in Wind power system for achieving maximum output power. [8]

OR

Q8) a) What is Neuro fuzzy system? Explain adaptive network based fuzzy interface system. [8]

- b) Explain the operation of vector controlled induction motor drive with neural network based estimator. [8]



Total No. of Questions : 10]

SEAT No. :

P3960

[5561]-655

[Total No. of Pages : 2

B.E.(E&TC)

EMBEDDED SYSTEM & RTOS

(2015 Pattern) (Semester - I) (Elective - I) (End Sem.) (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) How waterfall model is helpful in design and development of Embedded System. [5]

b) Explain the following design metrics. Time to market, NRE cost, maintainability. [5]

OR

Q2) a) Explain Typical process for Embedded System development. [5]

b) Explain the characteristics of Embedded System. [5]

Q3) a) What are the types of Real Time System? [5]

b) Compare Monolithic RTOS with Micro kernel RTOS. [5]

OR

Q4) a) Draw and explain µcosII Kernel Structure. [5]

b) What is significance of Interprocess communication? [5]

Q5) a) Explain any four features of Cortex Architecture with advantage of each. [8]

b) How CMS is standards helps in development of cortex based Embedded System? [8]

OR

P.T.O.

- Q6)** a) How interrupt structure of cortex is different from ARM7? [8]
b) Draw interfacing diagram of motor control using PWM with LPC1768. Write down program or algorithm for the same. [8]

- Q7)** a) Explain linux file system. What is journaling flash file system? What are advantages of the same? [9]
b) Explain any three device driver utilities with an example. [9]

OR

- Q8)** a) Explain the role of boot loader in Embedded linux system? What are the characteristics of the same? [9]
b) Explain the following tool utilities Minicomp, BusyBox, Red Boot. [9]

- Q9)** a) With the help of any case study, explain an application Development on Arduino platform w.r.t. [8]
i) Algorithm
ii) Library usage
iii) Source code/algorith
b) Explain typical structure of Arduino program. [8]

OR

- Q10)** a) Write a program for Arduino board to read analog input and convert it into digital. [8]
b) What is power Down and Sleep Mode of Power Management in embedded architecture? State its merit and Demerits. [8]



Total No. of Questions : 8]

SEAT No. :

P3961

[5561]-656

[Total No. of Pages : 2

B.E.(E&TC)

INTERNET OF THINGS

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

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 is IoT? Explain: Things in IoT. [6]

b) What are various components of RFID? Explain any two. [6]

c) Write a note on Topology models of IEEE 802.15.4 and PAN Coordinator. [8]

OR

Q2) a) Compare IoT and M2M services. [6]

b) How sensors and actuators work? Explain with practical example. [7]

c) Explain working of Zigbee protocol. [7]

Q3) a) What is REST protocol? Explain characteristics of REST based API.[8]

b) Explain CoAP messaging format. [8]

OR

Q4) a) Explain IPv6 packet format in detail. [8]

b) What is RPL? Explain DODAG and DIO with respect to RPL. [8]

P.T.O.

- Q5)** a) What are various types of Big Data? Explain in detail. [8]
b) Explain types of Data Analytics in detail. [8]

OR

- Q6)** a) What are various characteristics of Hadoop? [8]
b) What is precision? Explain different types of errors. [8]

- Q7)** a) Explain Smart home and smart city applications in view of IoT. [10]
b) How IoT will be used to protect environmental loss? [8]

OR

- Q8)** a) Explain application of IoT in agriculture field. Explain it with a case study. [10]
b) Write a note on Industrial IoT. [8]



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

Time : 2½ 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) If $f_1(n) = \begin{cases} 1, & n=1 \\ 2, & n=2 \\ 3, & n=3 \\ 1, & n=4 \end{cases}$

& $f_2(n) = \begin{cases} 3, & n=1 \\ 2, & n=2 \\ 1, & n=3 \\ 1, & n=4 \end{cases}$

find i) $\langle f_1(n), f_2(n) \rangle$

ii) norm of $f_1(n)$ [10]

- b) What are the limitations of fourier transform. Explain nonstationary signal with example. [10]

OR

Q2) If $x(t) = \begin{cases} 1-t^2, & -1 \leq t \leq 1 \\ 0, & \text{otherwise,} \end{cases}$ find

i) Time Bandwidth product of $x(t)$ [10]

ii) $\langle x(t), \phi(t) \rangle$ $\phi(t)$ is Haar scaling function. [10]

- Q3)** a) Derive the conditions for alias cancellation for 2 Band Haar filter bank. [12]

- b) Compare Haar wavelet with Daubechies wavelet. [6]

OR

- Q4)** Given $x[n] = \{8, 6, 8, 2\} \in V_2$. Perform wavelet lifting scheme on $x[n]$. Show decomposition and reconstruction phase. [18]

- Q5)** a) Explain MPEG coding for audio. [8]
b) Compare JPEG and JPEG 2000. How wavelets are used in compression. [8]

OR

- Q6)** a) Explain with mathematical equations, compression of image using wavelets. [8]

- b) Explain video coding using multi resolution technique. [8]

- Q7)** a) How Wavelets are used in watermarking. Explain the same with example. [8]

- b) With example explain how wavelets are used in communication domain.[8]

OR

- Q8)** a) What is denoising. How wavelets are used for denoising application.[8]

- b) Explain Discrete Wavelet multitone modulation. [8]



Total No. of Questions : 8]

SEAT No. :

P3963

[5561]-658

[Total No. of Pages : 2

**B. E. (Electronics & Tele Communication)
ELECTRONIC PRODUCT DESIGN
(2015 Pattern) (Elective-II) (Semester - I)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers the 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) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Write a short note on following: [12]

- i) Cognition
- ii) Safety
- iii) Grounding

b) Explain in detail system partitioning. [4]

c) Discuss in brief about risk management in software testing. [4]

OR

Q2) a) Write short notes on: [12]

- i) Black box test.
- ii) White box test.
- iii) Gray box test.

b) Discuss in detail user centered design. [4]

c) Explain in detail Ergonomics. [4]

Q3) a) Explain models, metrics and software limitations. [8]

b) What are the different types of PCB? Explain one. [5]

c) Explain grounding methodologies. [5]

OR

P.T.O.

- Q4)** a) Discuss about PCB partitioning Design Rules for EMC improvement. [8]
b) Explain waterfall model of software development. [5]
c) What is Defect/Bug? What is defect life cycle? [5]
- Q5)** a) Explain EMI & EMC issues in detail. [8]
b) Differentiate between active components & passive components. [4]
c) Explain techniques for Troubleshooting. [4]

OR

- Q6)** a) Explain Analog-Digital conversion in detail. [8]
b) Define debugging process and explain steps of debugging. [8]
- Q7)** a) Define documentation & Explain the need of documentation. [8]
b) Write a short note on following:
i) Records
ii) Accountability

OR

- Q8)** a) Discuss in detail visual techniques with example. [8]
b) Write short note on any two of the following: [8]
i) Liability
ii) Bill of material



Total No. of Questions : 8]

SEAT No. :

P3964

[5561]-659

[Total No. of Pages : 2

B.E. (E & TC)

**OPTIMIZATION TECHNIQUES
(2015 Pattern) (Elective-II) (Semester - I)**

Time : 2½ 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) Maximize $f = 8x_1 + 4x_2 + x_1x_2 - x_1^2$

$$\text{subject to } 2x_1 + 3x_2 \leq 24$$

$$-5x_1 + 12x_2 \leq 24$$

$$x_2 \leq 5$$

using KKT conditions.

[10]

b) Solve graphically and also find the dual of $f = -3x_1 + 2x_2$

$$\text{subject to } 0 \leq x_1 \leq 4$$

[10]

$$1 \leq x_2 \leq 6$$

$$x_1 + x_2 \leq 5$$

OR

Q2) a) Maximize $f = 19x + 7y$

$$\text{Subject to } 7x + 6y \leq 42$$

$$5x + 9y \leq 45$$

$$x - y \leq 4$$

$$x \geq 0, y \geq 0$$

using simplex method

[10]

b) State and explain transportation problem with example.

[10]

Q3) a) Find the minimum $f(x) = (100 - x)^2$ over the interval $60 \leq x \leq 150$ using interval Halving method. Show computations for three iterations/stages.

[8]

P.T.O.

- b) Find the minimum of $f = x(x - 1.5)$ in the interval $(0, 1)$ using Dichotomous search approach. The number of experiments to be considered are $n = 6$. [8]

OR

Q4) Solve the problem using quadratic interpolation method

$$\text{Minimise } f(\lambda) = \lambda^4 - 4\lambda^3 - 6\lambda^2 - 16\lambda + 4$$

Also determine the error involved in optimization. [16]

Q5) a) Minimize $f = 2x_1^2 + x_2^2$ from the starting point $(1, 2)$ using the univariate method (two iterations only). Also solve the problem using classical optimization technique. [9]

b) Minimize $f = x_1^2 - x_1x_2 + 3x_2^2$ using Newton Raphson method (two iterations only). Take starting point $(1, 2)$. [9]

OR

Q6) a) Minimize $f = 2x_1^2 + x_2^2$ using the steepest descent method with the starting point $(1, 2)$ upto two iterations only. Also solve the problem using classical optimization technique. [9]

b) Minimize $f = y_1 - y_2 + 2y_1^2 + 2y_1y_2 + y_2^2$ with starting point $y_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Fletcher Reeves method (three iterations only). [9]

Q7) a) Write down the steps involved in GA method. Explain crossover operation with example. [8]

b) Compare particle Swarm optimization with Ant Colony method. [8]

OR

Q8) a) Implement ‘AND’ & ‘OR’ gate using Neural network method. [8]

b) Compare Fuzzy with crisp set theory. Explain Fuzzy union and intersection with example. [8]



Total No. of Questions : 8]

SEAT No. :

P3965

[Total No. of Pages : 2

[5561]-661

B.E. (E & T.C.)

**ELECTRONICS IN AGRICULTURE
(2015 Pattern) (Semester-I) (Elective-II)**

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) Draw the block diagram of Data Acquisition System and explain Function of each block in brief. [8]
- b) Draw and explain architecture of Foundation Field bus with general and design consideration. [6]
- c) What are the considerations while designing pH meter? How is the pH of soil measured. [6]

OR

- Q2)** a) Draw the architecture of Virtual instrument and explain in brief, also mention advantages of virtual instrumentation. [8]
- b) What is HART Network? How it can be used in Agriculture? [6]
- c) What are different techniques for humidity measurement? Explain anyone. [6]

- Q3)** a) What is Precision farming? Comment on precision farming in India. [8]
- b) Enlist various types of farm machinery & their use in agriculture sector. [8]

OR

P.T.O.

- Q4)** a) How GIS/GPS can be used for yield monitoring in precision farming? [8]
b) Explain Role of electronics in farm machinery for precision farming. [8]

- Q5)** a) Which are different soil properties and meteorological parameters? Explain any one soil-moisture measurement technique in brief. [8]
b) Explain how irrigation system works in agriculture field? [8]

OR

- Q6)** a) Why site specific spraying is required? Explain it's necessity in brief. Also explain crop handling processing. [8]
b) Explain in brief instruments used for protection of cultivation. [8]

- Q7)** a) How the drying process is used for preservation? Compare the process of natural drying and field drying. [8]
b) Describe various Governance services in agriculture sector. [10]

OR

- Q8)** a) Explain E-Governance in agriculture sector. [8]
b) Enlist the parameters to be measured for monitoring environmental conditions within greenhouse. Explain the effect of excess CO₂ levels on plant health. [10]



Total No. of Questions :8]

SEAT No. :

P3966

[5561]-662

[Total No. of Pages :2

B.E. (E & TC)

MOBILE COMMUNICATION

(2015 Course) (404189) (Semester-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 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) Compare Circuit switching, Message switching and Packet switching techniques. [10]
- b) Describe the working operation of Electronic switching system with diagram. [10]

OR

- Q2)** a) Explain Impulse response model of multipath channel. [10]
- b) With neat diagram, describe co-channel and adjacent channel interference in GSM. [10]
- Q3)** a) Explain with neat diagram various interfaces used in GSM. [8]
- b) List out various radio transmission parameters in GSM system. [8]

OR

- Q4)** a) With neat diagram describe GSM system Architecture. [8]
- b) Explain in detail the significance of GSM frame structure. [8]
- Q5)** a) Explain channel concept in GSM system and classify them. [9]
- b) Explain with neat diagram Intra-BSC and Inter-BSC hand over in GSM. [9]

OR

P.T.O.

- Q6)** a) With neat block diagram explain architecture of SMS for point to point service. [9]
b) Explain HSCSD Architecture for enhancement of GSM circuit switched data transmission. [9]

- Q7)** a) Compare 1G to 5G mobile generation. [8]
b) Draw LTE frame structure and list out LTE design parameters. [8]

OR

- Q8)** a) List out and explain in brief Disruptive technologies for 5G. [8]
b) With the help of Layers, explain 5G concept in wireless technology.[8]



Total No. of Questions : 8]

SEAT No. :

P3967

[5561]-663

[Total No. of Pages : 3

B.E. (E&TC)

BROADBAND COMMUNICATION SYSTEMS (2015 Pattern) (Semester - II)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and 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, electronics pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain three windows of transmission for optical fiber based on fiber attenuation characteristics what is scattering? Explain various types of scattering. [7]
- b) When the mean optical power launched into an 8km length of fiber is $120\mu\text{W}$, the mean optical power at the fiber output in $3\mu\text{W}$. [7]
- Determine :
- i) The overall signal attenuation or loss in decibels through the fiber assuming no connectors or splices.
 - ii) The signal attenuation per km for the fiber.
 - iii) Overall signal attenuation for a 10km optical link using same fiber with splices at 1 km intervals each giving an attenuation of 1dB.
 - iv) Input/output power ratio in (iii)
- c) Explain with block diagram DWDM system and enlist DWDM components. [6]

OR

- Q2)** a) i) Find approximate value of normalized frequency (V) for a fiber with $n_1 = 1.46$, $\Delta = 0.005$, $a = 5\mu\text{m}$ for wavelength $\lambda_0 = 1500\text{nm}$.[7]
- ii) A step index multimode fiber with NA = 0.3 supports approximately 1000 modes at 980nm wavelength. What is core diameter.
- iii) For the same fiber in (ii) estimate number of modes supported by the fiber at 1550nm wavelength.
- iv) What is approximate value of (v) for single mode fibers.
- b) Explain rise time budget for digital link in optical fiber. Write expressions for total system rise time and bandwidth for NRZ and RZ data formats.[7]
- c) Enlist types of optical amplifiers. Explain working principle of EDFA.[6]

P.T.O.

- Q3)** a) State kepler's three laws of planetary motion. Give mathematical formulation. Draw necessary diagrams. [8]
- b) Explain the terms centrifugal and centripetal with regard to a satellite orbit around the earth A satellite is in a circular orbit around the earth the altitude of the satellite's orbit above the surface of earth is 1,400km [8]
- What are the centripetal & centrifugal accelerations acting on the satellite in its orbit? Give answer in m/s^2 .
 - What is the velocity of the satellite in this orbit in km/s ?
 - What is orbital period of the satellite in this orbit? Give answer in hours minutes and seconds.

Assume kepler's constant = $\mu = 39.8 \times 10^{13} \text{ Nm}^2/\text{kg}$ Radius of Earth = 6400 km.

OR

- Q4)** a) Explain with diagram following satellite orbits and their applications. [8]
- Polar
 - Inclined
 - Equitorial
- b) An earth station needs to calculate the 100K angle to a geostationary satellite in the Indian ocean operated by Intelsat. The details of the earth station site and the satellite are as follows. Earth station latitude & longitude are 52.0°N & 0° satellite longitude (sub satellite point) in 66.0°E Earth station is in Northern Hemisphere. [8]

Calculate :

- Central angle
- Elevation angle
- Intermediate angle &
- Azimuth angle

- Q5)** a) Explain with help of block diagram of typical Telemetry, Tracking, Command and Monitoring (TTC & M). [8]
- b) Draw and explain single conversion transponder for 6/4 GHz band. Specify frequencies at each stage. [8]

OR

- Q6)** a) Explain all four types of antennas used for satellite communication. What are their applications. [8]
 b) Write short notes on power systems used in satellite. [8]

- Q7)** a) Explain the following terms with mathematical equations w.r.t. satellite. [8]
 i) Path loss
 ii) EIRP
 iii) C/N Ratio
 iv) G/T Ratio
 b) Design a transmitting earth station to provide a clear air C/N of 26 dB in a C-band transponder at 6.285 GHz. Use an uplink antenna with a diameter of 9m and aperture efficiency of 68% find the uplink transmitter power required to achieve the required C/N.

The uplink station is located on the 2dB contour of the satellite footprint. Allow 0.5 dB for clear air atmospheric attenuation & other losses. [10]

OR

- Q8)** a) What are different steps required for satellite uplink design. [8]
 b) In a link budget calculation at 3.95 GHz for the parameters given below, calculate the downlink carrier to noise power ratio [10]

Transmit power \Rightarrow 10 dBW

Transmit waveguide losses \Rightarrow 1.5 dB

Transmit Antenna Gain \Rightarrow 27 dBW

Free space loss \Rightarrow 196 dB

Atmospheric Absorption \Rightarrow 0.1 dB

Receiver Antenna gain \Rightarrow 40.2 dB

Receive waveguide loss \Rightarrow 0.5 dB

System Noise Temperature (140k) \Rightarrow 21.5 dBK

Boltzmann constant \Rightarrow - 228.6 dBW/Hz/K

Bandwidth (25 MHz) \Rightarrow 74 dBHz



Total No. of Questions : 8]

SEAT No. :

P3968

[5561]-664

[Total No. of Pages : 3

B.E. (E&TC)

MACHINE LEARNING

(2015 Course) (Elective - III) (Semester - II) (404191(A))

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

- Q1)** a) What do you mean by linear regression? With suitable example, describe how linear regression is used to predict the output for test example/input sample. What is non linear regression? [8]
- b) Why Support vector machines are called as Kernel Machines? Using Gaussian Kernel, describe how non-linear decision boundaries are obtained in SVM. [6]
- c) What is the need of Dimensionality Reduction in machine learning? How PCA is used for dimensionality reduction? [6]

OR

- Q2)** a) Describe Parametric and non parametric learning with their advantages and limitations. State any four applications where machine learning is used? [8]
- b) What is over fitting in machine learning? What are the different methods to overcome the over fitting problem. Describe in brief. [6]
- c) What is Gaussian Mixture Model or Mixture of Gaussian (GMM)? Compare GMM with Clustering (any 3 points). [6]

- Q3)** a) Describe with the help of suitable example, the algorithm for Hebbian learning rule. [8]

P.T.O.

- b) What is the significance of bias in perceptron networks? Obtain the output of neuron Y for the given network if binary sigmoid activation function is used. (Refer figure 1). [8]

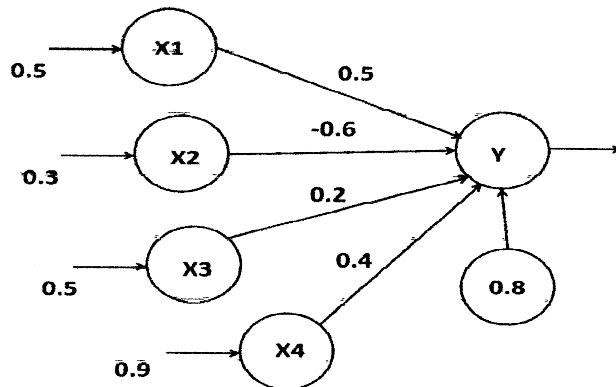


figure - 1

OR

- Q4)** a) What are the various features of ANN? With the help of neuron architecture, state and explain the resemblance (similarity) of ANN to biological neural network. [8]
 b) Using McCulloch-Pitts Neuron (MP) neuron model, implement ANDNOT function. [8]

- Q5)** a) What is Learning vector Quantizer (LVQ)? How target values in the data are used while training in LVQ? How the code vectors are obtained in LVQ? [8]
 b) Describe the learning algorithm for Radial Basis Function network (RBFN). Explain with suitable example how radial basis functions are used in training. [8]

OR

- Q6)** a) Refer the neural network given in the figure. Determine the updated weight w_5 using backpropagation algorithm. Consider the learning rate $\alpha = 0.5$. (Refer figure - 2). [8]

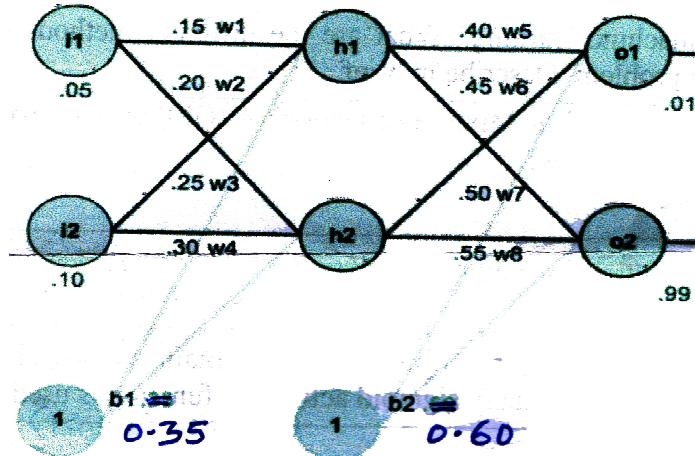


figure - 2 .

- b) Why kohonen networks are called as Self organizing Feature Maps? Justify with suitable example that, 'SOFMs are topology preserving networks'. [8]

- Q7)** a) What are pre-trained networks used in deep CNN? List the features of Alex network. In Alex net, the size of the input RGB image is 227×227 . This is filtered using 96 different filters of $11 \times 11 \times 3$ size in first convolution layer without padding and stride of 4. Determine the size of output image. [10]
b) What is Dropout? How it solve problem of over fitting? Give the process of implementing dropout in deep neural networks. [8]

OR

- Q8)** a) How deep learning overcomes the challenges in conventional machine learning techniques? Draw and explain the architecture of Convolutional Neural networks. [10]
b) What is vanishing gradient problem in multilayered neural networks? Explain how the saturation in activation affects the gradients? [8]



Total No. of Questions : 10]

SEAT No. :

P6094

[Total No. of Pages : 2

[5561]-665

B.E. (E&TC)

**PLCS & Automation (Elective - III)
(2015 Pattern) (Semester - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No. 1 or Q.No. 2; Q. No. 3 or Q.No. 4; Q.No. 5 or Q.No.6; Q.No.7 or Q.No. 8, Q.No.9 or Q. No. 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the process control elements with the help of process control system. [5]
b) Explain the DPT with its applications. [5]

OR

- Q2)** a) Explain Regulatory Control and Human Aided Control systems with suitable examples. [5]
b) Write short note on Control System Stability. [5]

- Q3)** a) Write a short note on BLDC. [5]
b) Explain electrical signal transmission systems along with advantages and disadvantages. [5]

OR

- Q4)** a) Explain with neat diagram stepper motor as an actuator? Explain its advantages and applications. [5]
b) What is sensor compensation and linearization technique? Why it is necessary? [5]

- Q5)** a) Explain following terms with respect to PLC. [8]
i) Input Scan Time ii) Output Scan Time
iii) Timers iv) Counters
b) Draw and explain block diagram for elevator systems? Develop the ladder diagram of the same? (Assume Suitable data necessary). [10]

P.T.O.

OR

- Q6)** a) What you will consider to select PLC for an application? [8]
b) Draw and Explain bottle filling plant, construct ladder diagram for the same? (Assume Suitable data necessary). [10]
- Q7)** a) Explain MTU and RTU along with their functions. [8]
b) Explain architecture of DCS in detail. [8]

OR

- Q8)** a) Explain the elements of SCADA. [8]
b) Compare PLC and SCADA. [8]
- Q9)** a) Compare NC, CNC and DNC. [8]
b) Write short note on :
i) CAN bus
ii) Ethernet

OR

- Q10)** a) What is the role of Panel Engineering in automation? [8]
b) Write short note on:
i) Foundation Fieldbus
ii) TCP/IP Protocol



Total No. of Questions : 8]

SEAT No. :

P4783

[Total No. of Pages : 2

[5561]-666

B.E. (E & TC) (Semester - II) (Elective - III)
Audio and Speech Processing
(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, and Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) What is a phoneme? Explain in detail

- i) vowels
- ii) semivowels
- iii) diphthongs and
- iv) consonants

Give suitable example word and highlight underlined phoneme. [8]

- b) Describe the sequences of events leading to auditory nerve spiking when acoustic pressure wave appears on the ear. [6]
- c) Explain the AMDF method to estimate the Pitch period of speech signal. [6]

OR

Q2) a) Explain anatomy of human auditory system. Explain the role of cochlea in perception of sound. [8]

- b) Draw and explain discrete-time LTV model of speech production. [6]
- c) Explain the terms with mathematical equations :

- i) short time energy
- ii) short time average magnitude and
- iii) short time average zero crossing rate.

[6]

Q3) a) Explain the procedure for computation of pitch and formants based on cepstral analysis of speech. [8]

- b) Explain the basic principal of linear predictive analysis? Explain the method of finding LPC coefficients using autocorrelation method. [8]

OR

P.T.O.

- Q4)** a) With the help of a block diagram explain how MFCC coefficients are obtained from given speech signal. [8]
b) What is homomorphic processing of speech signal? How it is useful separation of vocal tract filter response and vocal excitation signal. [8]

- Q5)** a) Describe sub band coding of speech. What are QMFs? How are QMFs used in sub band coding? [8]
b) What is DPCM? Explain in detail the comparison of DPCM and PCM. Comment on bit rate and SNR. [8]

OR

- Q6)** a) Explain channel vocoder in detail with block diagram. [8]
b) Explain Linear predictive coder in detail. [8]

- Q7)** a) Draw and explain the block schematic of spectral subtraction method for wide band noise removal. With the help of spectrum how to estimate noise are suppress it from speech signal. [9]
b) Explain HMM based isolated word recognition system (Explain feature extraction, training and testing). [9]

OR

- Q8)** a) Explain in detail speaker identification and verification system. Also explain with block diagram and the signal processing aspects (important features) for the speaker verification system. [9]
b) Explain ADSR envelope. What are temporal features of musical wave? Explain in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P5146

[Total No. of Pages : 2

[5561]-667
B.E. (E & Tc)

SOFTWARE DEFINED RADIO (Elective - III)
(2015 Pattern) (Semester - II)

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) Compare analog Radio with SDR. List the Differences. [6]

b) Explain block of Duplexer and Diplexer in SDR. in Dual MODE cellular Phone. [8]

c) Draw and explain the block diagram of DUC used in SDR. [6]

OR

Q2) a) Draw and explain Dual conversion Transmitter. [6]

b) State and explain applications of FPGA in SDR. Comment on power management. Issues in DSP/ FPGA/ASIC based SDR. [8]

c) What is the benefit of using multistage structures of a decimotor when large sampling rates are required. [6]

Q3) a) Explain the architecture of smart Antenna and state its benefits. [9]

b) State the need of MIMO. Explain the principles of MIMO-OFDM (case study) [9]

OR

Q4) a) State the Relative benefits and trade off, of SWITCH BEAM and adaptive Antenna array. [9]

b) With the help of mathematical expression explain VECTOR CHANNEL MODELLING. [9]

Q5) a) List the 4 capabilities in cognitive radio to enable dynamic use of spectrum. [8]

b) Summarise the application and benefits of OFDM. [8]

P.T.O.

OR

- Q6)** a) List and explain in detail the 3 types of basic assignment methods for spectrum allocation. [8]
b) Draw the block diagram of OFDM transmitter. Explain the role of symbol mapping and cyclic prefix. [8]

Q7) Write a short note on any two: [16]

- a) Operating modes of PSCR.
- b) Beagle Board based SDR.
- c) Role of SDR & C.R. in advanced wireless communication system.

OR

Q8) Write a short note on any two: [16]

- a) Application of C.R. in Mobile Communication.
- b) Embedded PSCR using GNU Radio.
- c) Challenges and issues in implementing C.R. in advance wireless communication system.



Total No. of Questions : 10]

SEAT No. :

P3969

[5561]-668

[Total No. of Pages : 2

B.E. (Electronics & Telecommunication)

AUDIO VIDEO ENGINEERING

(2015 Pattern) (Semester-II) (Elective-III (c)) (404191E)

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

Q1) a) Explain CCIR-B standard in detail. [5]

b) Draw a neat block diagram of PAL encoder and explain function of each block. [5]

OR

Q2) a) Why is the (G-Y) difference signal not chosen for transmission? How this signal is obtained at the receiver? [5]

b) Draw a detailed composite video signal with all details. [5]

Q3) a) With a block diagram explain the MAC DTV transmitter. [5]

b) Explain the construction and operating principle of OLED display? [5]

OR

Q4) a) Explain the terms: [5]

- i) Conditional Access System.
- ii) 3D TV

b) Draw and explain the block diagram of a component encoded advanced HDTV transmitter. [5]

P.T.O.

Q5) a) Explain video transmission in 3G/4G mobile system. [8]

b) Compare IPTV and Internet TV. [8]

OR

Q6) a) Explain principles of DVR. How it is differing from VCR. [8]

b) Write short notes on Mobile TV. [8]

Q7) a) Discuss the various methods of optical recording of sound. Explain optical recording on CD in detail. [10]

b) Write short note on MPEG 2 standard. [8]

OR

Q8) a) Write a short note on: Variable area method of optical recording. [10]

b) Write short note on Blue Ray DVD player. [8]

Q9) a) Draw the block diagram of PA system and explain. [8]

b) State the various types of microphones. Explain any one microphone showing construction details, working, specifications and applications in detail. [8]

OR

Q10)a) Discuss acoustic chamber in detail. [8]

b) Explain the requirement for a good auditorium for pleasant listening. Discuss salient features of acoustical design for an auditorium. [8]



Total No. of Questions : 10]

SEAT No. :

P5147

[Total No. of Pages : 2

[5561]-669

B.E. (E & TC) (Elective - IV)
ROBOTICS
(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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the basic structure of robot. [6]
b) Explain the Electric, hydraulic drives for robot. [4]

OR

- Q2)** a) Write a note on industrial Applications of Robots. [6]
b) Explain the Torque, proximity and range sensor. [4]

- Q3)** a) What is mean by Image acquisition and processing? [5]
b) What are the three different types of grippers? Explain in brief. [5]

OR

- Q4)** a) Explain the characteristics of Stepper motors and AC motors. [6]
b) Explain the terms with reference to sensor. [4]
i) Velocity
ii) Force

- Q5)** a) Explain the Newton -Euller formulation for RP manipulators? [8]
b) Explain the direct and inverse velocity for robot [8]

P.T.O.

OR

Q6) a) Explain the trajectory planning for flexible robots? [8]

b) Define following terms [8]

- i) Static force
- ii) Moment transformation
- iii) Solvability
- iv) Stiffness

Q7) a) How does line follower robot work? Write any one Line Following Algorithms in detail. [8]

b) Write a note on [8]

- i) Robot language classification.
- ii) Robot language structure.

OR

Q8) a) How direction is sensed by robot? What are different algorithms available for sensing direction? Write any one algorithm in detail. What is the computational complexity of this algorithm? [8]

b) What are recent advances in the field of robotics? What are the challenges in this field? [8]

Q9) a) What are the different components and structure are present in robotics arms? [6]

b) What are different types of joints? Describe the workspace formed by these joints or combination of joints. [6]

c) Write a case study on Human Robot Interaction. [6]

OR

Q10)a) How will you develop a models of robots with the help of flexible links and joints. [6]

b) What are different design models for mechanical arms and lifting systems. [6]

c) Describe giving appropriate examples, how robots can be used for material handling and assembly [6]



Total No. of Questions : 10]

SEAT No. :

P5148

[Total No. of Pages : 2

[5561]-670

B.E. (E & TC) (Elective - IV)
BIOMEDICAL ELECTRONICS
(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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain the motion artifact? How to remove the motion artifact? [5]
b) What is Bio electrode? Explain the micro electrode. [5]

OR

- Q2)** a) Explain the term Superior and Inferior vena cava.
b) Explain in detail sensor used for measurement of body temperature.

- Q3)** a) Explain SA node and AV node in electro conduction system of heart. [5]
b) State the signification of each waveform generated during EEG. [5]

OR

- Q4)** a) Explain ECG lead configuration.
b) Explain the EEG application for Epilepsy.

- Q5)** a) Write the requirement of basic amplifier. Explain the use of instrumentation amplifier in ECG acquisition. [8]
b) Explain the technique to cancel out maternal ECG from fetal ECG. [8]

P.T.O.

OR

- Q6)** a) Explain in detail the active filter to remove noise from ECG signal.
b) What is important of grounding and shielding? Explain grounding & shielding techniques for medical equipment.

- Q7)** a) What are the objectives of Biomedical signal analysis? Explain ECG signal processing for base line interference. [8]
b) Write down the algorithm for QRS detection. [8]

OR

- Q8)** a) Explain ECG classification for normal and abnormal state using Multilayer Perceptron.
b) Explain in detail the method for muscle noise filtering.

- Q9)** a) Explain the working principle of MRI Scanner. Explain with Block Diagram the working of MRI Scanner. [10]
b) Write short note on Dental instruments. [8]

OR

- Q10)** a) Draw & explain the Block Diagram of Central Monitoring System.
b) Explain CT scanner working principle and scanning system.

⊖ ⊖ ⊖

Total No. of Questions :8]

SEAT No. :

P3970

[5561]-671

[Total No. of Pages :2

B.E. (E & TC)

WIRELESS SENSOR NETWORKS

(2015Course) (Semester - II) (End Semester) (Elective-IV)

Time : 2:30Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagram must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*

Q1) a) What are the performance metrics of WSN, Explain. [8]

b) Explain B.MAC protocol. [6]

c) Explain 6LOWPAN protocol. [6]

OR

Q2) a) Write a short note on sensor Network Communication stack. [8]

b) What is significance of naming and addressing in WSN. [6]

c) Explain in detail Insteon protocol. [6]

Q3) a) What are challenges in localization, explain. [8]

b) Explain what are different ranging schemes. [8]

OR

Q4) a) Explain what are routing metrics in WSN. [8]

b) What is location based routing explain. [8]

Q5) a) What are different clustering techniques Explain any two. [10]

b) Explain communication security in WSN. [8]

OR

P.T.O.

Q6) a) Explain the Denial of- service attack at each layer. [10]

b) What is data aggregation in WSN. explain. [8]

Q7) a) Explain design and deployment w.r.t any one WSN application. [8]

b) What is testing and validation in WSN application [8]

OR

Q8) a) Explain top down approach in design. [8]

b) Write a short note on requirement analysis. [8]



Total No. of Questions : 8]

SEAT No. :

P3971

[5561]-672

[Total No. of Pages : 2

**B.E. (Electronics & Telecommunication)
RENEWABLE ENERGY SYSTEMS**

(2015 Pattern) (Semester - II) (404192 D) (Elective - IV)

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 non programmable calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) What are the renewable energy sources? Discuss their importance in Indian power generation context. [8]
b) List the important methods for storing the solar energy. Explain any one method in brief. [6]
c) Explain the Grid-interactive (On Grid) solar PV system with suitable diagram. [6]

OR

- Q2)** a) For a two bed rooms, one hall and one kitchen flat system, various appliances has to work for 12 hours per day, design the Grid-interactive (On Grid) solar PV system. The various appliances with required load are as given below: [8]

Sr. No.	Name of the Appliance	Quantity	Load in Watts
1	Fan	03	60
2	LEDTV	01	150
3	LED bulb	04	9
4	Frieze	01	500

Note: Assume suitable data if required and show the detailed calculations.

- b) List different types of Solar Thermal collector? Compare them. [6]
c) Explain renewable and conventional forms of energy. Highlights their merits and Demerits. [6]

- Q3)** a) Explain the different types of wind turbines used to extract the wind energy. [8]
b) What do you mean by power density duration curve? Explain it. [6]
c) Wind speed at 12 m/s at standard atmospheric pressure. Calculate (i) the total power density in wind stream, (ii) the total power produced by turbine of 120 meter diameter with efficiency of 45%. Assume Air density=1.226J/Kg.K/m³. [4]

OR

P.T.O.

- Q4)** a) How much energy can be extracted from the wind? Give the detail analysis with power coefficient and available efficiency. [8]
- b) Draw the wind power generation curve and explain it. [6]
- c) Define the following terms in correlation with wind energy: [4]
- i) Airfoil
 - ii) Chord line
 - iii) Propeller
 - iv) Yaw Control

- Q5)** a) What are the different types of Tidal power plants? Explain them in brief. [8]
- b) List the Geothermal resources and explain any three in brief. [8]

OR

- Q6)** a) How the tidal energy is estimated? Explain in brief. [8]
- b) List the various ways of geothermal power generation and explain any one method. [8]

- Q7)** a) Explain the working principle of an Acidic Fuel cell. [8]
- b) List the different types of fuel cell types. Explain any two types in detail. [8]

OR

- Q8)** a) Draw and explain the operating characteristics of fuel cell. [8]
- b) Give the advantages of fuel cell power plants. [8]



Total No. of Questions : 8]

SEAT No. :

P4784

[Total No. of Pages : 2

[5561]-673

B.E. (E & TC)

**ADVANCED AUTOMOTIVE ELECTRONICS
(2015 Pattern) (Semester - II) (Open Elective - IV)**

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) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) With the help of schematic diagram, explain battery charging and its application in automotive system. [8]
b) Draw and explain conventional automobile ignition system in brief. [8]
c) Write a short note on automotive grade processors. [4]

OR

- Q2)** a) With suitable block diagram explain automatic cruise control system. List sensors used in such system. [8]
b) Write a short note on :
 - i) Electric motors used in automobiles
 - ii) Emission control in vehicles.
c) Explain the detailed architecture of Infineon's Tricore family processor. [4]

- Q3)** a) Comment on recent trends in automotive buses and explain buses such as ODBII, MOST. [6]
b) What are GPS & GPRS? State its uses in automotive. [6]
c) Compare CAN and LIN protocol. [4]

OR

- Q4)** a) What way FlexRay is more superior to CAN? State key features of it. [6]
b) Describe internet protocols such as TCP/IP and state its use in automotive applications. [6]
c) Explain different communication interface with ECUs. [4]

P.T.O.

- Q5)** a) Write a short note automotive control systems through various analog and digital control methods involved. [6]
b) How to analyze the costs and benefits of model-based software development in automotive industry. [6]
c) State features and specifications of Raspberry Pi. [4]

OR

- Q6)** a) Write a short note on Arduino and explain how it assists in real-time simulations of automotive systems. [6]
b) Define Model based Development. Explain the role of Model based development in Automotive embedded systems development. [6]
c) Discuss superset of variables sensed in engine control system. [4]

- Q7)** a) Enlist various diagnostic tools & equipment. State the two main pieces of knowledge necessary to diagnose the fault. [6]
b) Draw & explain traction control integrated with ABS. [6]
c) Enlist various types of Noise you come across during diagnosis & state possible sources of noise. [6]

OR

- Q8)** a) Draw & explain electrical diagnosis procedure in detail. [6]
b) Compare active safety & passive safety with suitable examples. [6]
c) State various driver assistance systems and explain any two in detail. [6]



Total No. of Questions : 8]

SEAT No. : _____

P4785

[Total No. of Pages : 2

[5561]-674

B.E. (E & TC)

Industrial Internet of Things

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

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 is hype cycle? Describe it with reference to IoT and IIoT. [8]
b) What is role of cloud in IoT? Explain. [6]
c) What is use of IIoT in plant maintenance? [6]

OR

- Q2)** a) Explain any one IoT platform. [8]
b) Explain Role of Sensors in IIoT? [6]
c) What is NFC? How is it useful in IoT/M2M applications? [6]

- Q3)** a) Wha is 6LowPAN? Write a brief overview of 6LowPAN adaptation Layer. [8]
b) Explain the AMPQ protocol and its use in IIoT systems. [8]

OR

- Q4)** a) What is RPL? Explain how it is useful in IIoT implementations. [8]
b) What are the various features of CoAP?Explain any two types of Messages in CoAP. [8]

- Q5)** a) Explain the relationship between web technology and IIoT. [8]
b) Security is a key issue in IIoT. Justify. [8]

OR

P.T.O.

- 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 Cloudbased IoT platform. [8]
- b) Elaborate on any one quantitative data analytics technique. [8]

- Q7)** a) What is use of R Programming in data analytics? Explain in detail. [10]
- b) Elaborate on how you will use IoT for remote healthcare. [8]

OR

- Q8)** a) Explain smart metering system. [10]
- b) What is role of IIoT in plant automation. [8]



Total No. of Questions : 8]

SEAT No. :

P4767

[Total No. of Pages : 2

[5561]-675

B.E. (Electronics) (E & TC)

PROGRAMMABLE SYSTEM ON CHIP

(2015 Pattern) (Semester - VIII)

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.*

- Q1)** a) Explain Microsystems technology and its application in detail. [7]
b) Explain the significance of RTL design flow for chip design. [7]
c) Compare edge triggering and Level triggering with suitable examples. [6]

OR

- Q2)** a) Describe compilation techniques required for SoC design. [7]
b) Explain and draw flowchart for the design flow of RTL. [7]
c) Discuss the effects of clocking parameters over SoC design? [6]

- Q3)** a) Explain Wet & Dry Etching for MEMS in detail. [8]
b) Explain Lithography mechanism and its different processes. [9]

OR

- Q4)** a) Explain various types of Deposition processes in brief. [8]
b) Describe exotic processes in MEMS Design. [9]

- Q5)** a) Explain testability of ASIC micromachining process. [8]
b) Explain lithography method for FPGA design. [9]

OR

P.T.O.

- Q6)** a) Explain how synthesis of FPGA will be affected if the number of transistors increases? [8]
- b) Explain Deposition process of FPGA in detail. [9]

- Q7)** a) Draw a block diagram of Hardware software Co-design. Explain in brief. [8]
- b) Discuss various design techniques of Integrated Circuits. [8]

OR

- Q8)** a) Explain the effects of testing steps on the flexibility of SOC design. [8]
- b) Explain Memory Packaging for SOC in detail. [8]



Total No. of Questions : 10]

SEAT No. :

P3972

[5561]-676

[Total No. of Pages : 2

**B.E. (Electronics & Telecommunication)
DATA SCIENCE & ANALYTICS
(2015 Pattern) (Semester - II) (404192DD) (Open Elective)**

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

- Q1)** a) What is Key Value store Database? Explain how it works? [6]
b) Compare between Business Intelligence and Data Science [4]

OR

- Q2)** a) Explain Creation Modification and Deletion of Table in SQL with Example? [6]
b) Differentiate between Structured and Unstructured Data? [4]

- Q3)** a) Explain Different SQL Data Types and Literals? [6]
b) Explain PL/SQL triggers with suitable Example. [4]

OR

- Q4)** a) With the help of Diagram Explain Big Data Ecosystem. [6]
b) Explain PL/SQL Procedures and Functions with suitable Example. [4]

- Q5)** a) What is Data Analytics Life Cycle? Explain its need? [6]
b) Explain in Detail how Operationalization is done in Data Analytics Life Cycle? [6]
c) Explain the Role of Data Scientist for successful analytic project? [6]

OR

P.T.O.

- Q6)** a) Explain in Detail how results communication phase is executed in Data Analytics Life Cycle? [6]
b) Explain the Role of Platform Architect for successful analytic project? [6]
c) What is Model Building elaborate this phase of data analytics with the help of suitable example? [6]

- Q7)** a) Describe with suitable example and methods how Data import is done Using R? [8]
b) With the help of Example explain how model can be built using statistics? [8]

OR

- Q8)** a) Explain what are different data types available in R? [8]
b) Describe with suitable example Basic Operations Using R programming? [8]

- Q9)** a) What are Decision Trees? Explain with the help of example. [8]
b) Explain with the help of example explain Text Analysis. [8]

OR

- Q10)** a) What is Logistics Regression? Explain with the help of Example? [8]
b) What is Naïve Bayesian classifier? Explain with the help of Example? [8]



Total No. of Questions : 8]

SEAT No. :

P3973

[5561]-677

[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) Attempt 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) Neat diagrams must be drawn whenever necessary.
- 4) Make suitable assumptions whenever necessary.

- Q1)** a) Explain Store - and - Forward and packet routing with its communication cost. [6]
- b) Differentiate between Static and Dynamic mapping techniques for load balancing. [6]
- c) Explain Circular shift operation on mesh and hypercube network. [8]

OR

- Q2)** a) Discuss the applications that benefit from multi - core architecture. [6]
- b) Define and explain the following terms. [6]
- i) Granularity
 - ii) Task interaction graph
 - iii) Degree of Concurrency
- c) How to improve speed of communication operations? [8]

- Q3)** a) Explain performance matrices of parallel systems. [8]
- b) Explain the effects of granularity on the performance of a parallel system. [8]

OR

- Q4)** a) Explain Matrix - matrix multiplication in detail. [8]
- b) Write a note on minimum and cost optimal execution time. [8]

P.T.O.

Q5) a) Explain compare - exchange and compare - split operation on parallel computers. [8]

b) Explain odd - even transportation on bubble sort using parallel formulation. [8]

OR

Q6) a) Explain parallel Depth First Search for solving 8 puzzle problem. [8]

b) Explain Dijkstra's algorithm in parallel formulation. [8]

Q7) a) What is CUDA? Draw and explain CUDA architecture in detail. [9]

b) Explain how the CUDA C program executes at the kernel level with example. [9]

OR

Q8) a) Describe CUDA communication and synchronization along with CUDA C functions. [9]

b) Write a short note on: Managing GPU memory. [9]



Total No. of Questions : 10]

SEAT No. :

P3974

[5561]-678

[Total No. of Pages : 2

B.E. (Computer Engineering)

ARTIFICIAL INTELLIGENCE AND ROBOTICS

(2015 Pattern) (410242) (Semester - I) (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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Justify your answer with an example wherever necessary.

- Q1)** a) With an example explain A star algorithm. State the properties of A star algorithm. [6]
b) Compare and explain Depth First search and Breadth First search methods. [6]

OR

- Q2)** a) Comment on Backtracking and look ahead strategies in constraint satisfaction problems. [6]
b) Explain goal stack planning with an example of blocks world. [6]

- Q3)** a) What are the drawbacks of propositional logic used in representation of facts? [6]
b) Draw the architecture of an expert system. Explain each functional block in detail. [6]

OR

- Q4)** a) Explain the process of resolution with proper example. [6]
b) Describe PEAS for WUMPUS world problem. [6]

- Q5)** a) What is Artificial Neural Network? Give two applications of artificial neural networks in detail. [6]
b) Explain any two types of learning. [6]
c) Comment on the hardware components of a mobile robot. [6]

OR

P.T.O.

Q6) a) Comment on the methodologies on which laser rangefinders are based. [6]

b) Explain machine translation using natural language processing (NLP). [6]

c) Comment on sonar sensing. [6]

Q7) a) Explain the architecture of information retrieval system. [6]

b) Compare the various weighting functions used in pose estimation. [4]

c) Comment on vertical decomposition in robotics. [4]

OR

Q8) a) Explain any two sensors used in robots. [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) Explain localization and comment on any two types of localization. [6]

b) Comment on the fundamental problem in robotics. [4]

c) With the help of an architecture diagram explain feed forward artificial neural network. [4]

OR

Q10)a) Comment on how robots can be used for mining automation. [6]

b) Comment on issues regarding natural language processing in information retrieval. [4]

c) Explain use of robots in agriculture and forestry. [4]



Total No. of Questions : 10]

SEAT No. :

P3976

[5561]-680

[Total No. of Pages : 2

B.E.(Computer)

DIGITAL SIGNAL PROCESSING

(2015 Pattern) (Semester - I) (Elective - I) (410244-A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any 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) Choose suitable data wherever required.

Q1) a) Explain the aliasing effect in ADC process which is sampled below/ above the nyquist rate? [8]

b) Test the following system for causality, linearity and stability? [6]

$$Y(n) = x(-n + 2)$$

OR

Q2) a) Obtain DTFT and sketch the magnitude spectrum for [8]

$$x(n) = u(n) - u(n-4).$$

b) Explain time Invariance property with suitable example? [6]

Q3) a) Obtain Linear Convolution for the sequence of $x(n)=\{1,2,3,1\}$ and $h(n)=\{4,3,2\}$? [6]

b) Explain various methods of Circular Convolution in detail? [8]

OR

Q4) a) Explain the procedure to 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 ROC? Also Explain the Various ROC for Single/
Both sided sequence? [8]
 b) Explain the PFE method in obtaining the IZT? In brief long divion
method? [6]

- Q7)** a) Explain various properties of LTI system? Enlist types of LTI Systems?[8]
 b) Explain the N-th order general Difference Equation in brief? [6]

OR

- Q8)** a) Obtain the ROC for the Causal system with DE as follows [6]

$$Y(n) = 0.5Y(n - 1) - 0.25Y(n - 2) + x(n)$$

- b) Explain the method to determine the system characterized by [8]

$$H(Z) = (3 - 4Z^{-1})/(1 - 3Z^{-1} + 2Z^{-2})$$

is Causal, Stable and non-causal?

- Q9)** a) Explain any two methods for digitizing the transfer function of an analog
filter? [8]
 b) Explain the BLT Transform with its advantages?Also Explain Frequency
Warping Effect? [6]

OR

- Q10)**a) Give any two properties of Butterworth LPF? Explain the equation for
Order N? [6]

- b) Explain pipelining concept, MAC unit and Barrel Shifter of ADSP 21XX
Processor with Block Diagram? [8]



Total No. of Questions : 10]

SEAT No. :

P3977

[5561]-681

[Total No. of Pages : 2

B.E. (Computer Engg.)

**SOFTWARE ARCHITECTURE AND DESIGN
(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 indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Who are the stakeholders that exert the most influence over the architecture of systems in organization? [5]
b) Describe the different views (structures and relations) inherent in architecture? [5]

OR

- Q2)** a) What are different Business quality-attributes? Explain with suitable examples. [5]
b) Explain Architecture qualities in detail. [5]

- Q3)** a) How to prevent ripple effects in Modifiability Tactics? Discuss with the various types of dependencies that one module have on another. [5]
b) How to address resource demand in Performance tactics? How resource arbitration is done? [5]

OR

- Q4)** a) What are the different modules of the air vehicle model executive? Explain with suitable UML diagram. [5]
b) How does the use of skeletal system restrict the designer? How is this beneficial and how is it detrimental? [5]

- Q5)** a) What do you mean by creational pattern? Explain with suitable example. [8]
b) Write a note on Adapter pattern. Why is it a structural pattern? [8]

OR

P.T.O.

- Q6)** a) Describe the concept of Behavioral pattern? Discuss chain of responsibility as a Behavioral pattern? [8]
b) What are the expectations from Design Patterns? [8]

- Q7)** a) Discuss three-tier architecture? Explain the role of each tier in this architecture? [8]
b) Write a short note on [8]
i) DOM
ii) AJAX

OR

- Q8)** a) What is Active X control? Explain with suitable example. [8]
b) Discuss HTML and DHTML as client side technologies with suitable examples. Compare and Contrast HTML and DHTML. [8]

- Q9)** a) Establish the need of Server side technologies in multi tiered architectures? Discuss Java Web Services. [9]
b) What is middleware? What are the types of middleware? [9]

OR

- Q10)** a) Describe EJB 3.0 Architecture in detail? [9]
b) Explain XML and XSLT. [9]



Total No. of Questions : 10]

SEAT No. :

P3978

[Total No. of Pages : 2

[5561]-682

B.E.(Computer Engg.)

PERVASIVE & UBIQUITOUS COMPUTING

(2015 Course) (Semester - I) (Elective - I) (410244(C))

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) *Assume suitable data, if necessary.*

- Q1)** a) What is Pervasive Computing? Describe any two applications of Pervasive Computing. [6]
b) Comment on Improvement in device technology how devices can be more suitable for pervasive computing? [4]

OR

- Q2)** a) Brief about device connectivity with suitable examples and available technologies for. [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 & explain the Jini service discovery technology in detail. What are the advantages and Disadvantages of Jini technology? [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 : 10]

SEAT No. :

P3979

[5561]-683

[Total No. of Pages : 3

B.E. (Computer Engg.)

DATA MINING AND WAREHOUSING

(2015 Course) (Semester - I) (Elective - I) (410244D)

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) *Assume suitable data, if necessary.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*

- Q1)** a) How to compute dissimilarity for categorical attributes with examples. [4]
b) Explain data cleaning techniques. [6]

OR

- Q2)** a) Explain types of attributes with examples. [4]
b) Suppose a group of 12 sales price records has been sorted as follows:[6]
5, 10, 11; 13; 15, 35, 50; 55; 72; 92; 204; 215:
Partition them into three bins by each of the following methods.
i) equal-frequency partitioning
ii) equal-width partitioning

- Q3)** a) Explain data discretization techniques. [4]
b) Explain OLAP operations in Multidimensional data model. [6]

OR

- Q4)** a) Explain following : [4]
i) Minskowski Distance
ii) Euclidean distance
b) Briefly compare the following concepts. You may use an example to explain your point(s). [6]
Snowflake schema, fact constellation, star network query model

P.T.O.

Q5) a) Explain Steps of Apriori Algorithm and Steps of FP Growth Algorithm. [6]

b) Explain mining Multilevel association rules. What is Uniform support? [6]

c) Compare and contrast FP-Frowth algorithm with Apriori algorithm. [4]
OR

Q6) a) Consider an example with following set of transactions [6]

TID	Items bought
T1	A,B,C
T2	A,B,C,D,E
T3	A,C,D
T4	A,C,D,E
T5	A,B,C,D

Assume that we wish to find the association rules with at least 40% support and 40% confidence. Find the frequent itemsets and then association rule using Apriori algorithm.

b) Explain the following terms: [6]

- i) Constraint based rule mining
- ii) Closed and maximal frequent itemsets

c) What do you mean by frequent item set, Closed item set? Explain with example. [4]

Q7) a) Define Classification and Prediction. Explain decision tree based Classification method with suitable example. [8]

b) Write and explain K-Nearest-Neighbour Classification algorithm with suitable example. [6]

c) Write short note on Rule Induction Using a Sequential Covering Algorithm. [4]

OR

Q8) a) Explain the following : [8]

- i) Gini index
- ii) Gain ratio
- iii) Information gain

b) Differentiate between Supervised and unsupervised Learning. [6]

c) What are Bayesian classifiers? [4]

- Q9)** a) Explain following with example [8]
i) Accuracy
ii) Error Rate
iii) Sensitivity
iv) Specificity
b) Describe following. [8]
i) Multiclass classification
ii) Reinforcement learning

OR

- Q10)**a) Explain in detail following techniques to evaluate the accuracy of a Classifier. [8]
i) Holdout method
ii) Random subsampling
b) Explain following. [8]
i) Multi-perspective learning
ii) Wholistic learning



B.E. (Computer Engineering)
DISTRIBUTED SYSTEMS

(Semester - I) (2015 Pattern) (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, 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 scalability in distributed system? What are the challenges to design scalable distributed system? [5]
- b) Define transparency in distributed system with it's type. [5]

OR

- Q2)** a) Differentiate between central scheduler Vs distributed scheduler. [5]
- b) Explain happened before relationship in a distributed system for logical clock. [5]
- Q3)** a) Explain fundamental models in distributed systems. [5]
- b) Explain the problems in the area of physical clock synchronization. [5]

OR

- Q4)** a) Explain properties of consistent snapshots in distributed system. [5]
- b) Explain Lai-Yang algorithm in detail. [5]
- Q5)** a) Explain the problems of distributed consensus in the presence of failures. [9]
- b) Explain PAXO's algorithm in detail. [8]

OR

- Q6)** a) What is distributed transaction? How the transactions are classified? What are the properties that all transactions must satisfy? [9]
- b) Explain the methods of implementing transactions. [8]

Q7) a) What is an atomic multicast? Discuss the feasibility of implementing atomic multicast using unicast. [8]

b) Explain client centric consistency protocol in detail. [9]

OR

Q8) a) Write short note on IP multicast. [8]

b) Discuss in brief, main types or orderings in the context of ordered multicast. Explain how to implement any one of the ordered multicast in detail. [9]

Q9) a) Explain the challenges for distributed simulation. [8]

b) Explain the security mechanism to thwart various attacks in distributed system. [8]

OR

Q10)a) Explain in detail skip graph for P2P applications. [8]

b) Explain what is Bit-torrent and free riding. [8]



Total No. of Questions : 12]

SEAT No. :

P3981

[5561]-685

[Total No. of Pages : 4

B.E. (Computer)

**SOFTWARE TESTING & QUALITY ASSURANCE
(2015 Pattern) (Semester - I) (Elective - II)**

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) What is software testing process? Why do we have to test the software? Explain the reasons with respect to quality view, financial aspect, customers suppliers and process. [2+4=6]

OR

Q2) Identify the software quality attributes for the following scenarios:[2+2+2=6]

- a) Now a days most of the peoples are using internet banking for online transaction. What could be the top 2 architectural drivers (quality attributes) for this system? Justify your answer.
- b) Company want build a game for the children's which they should play from any device. Also various input devices (i.e. mouse, joystick, touch screen etc...) may also integrated for playing a game.
- c) A software company is in a process of building social networking site which will have very large number of users in near future. Also company wish to add new features in this site and during addition of new features site should provide all the current features without any disturbance. What top 2 quality attribute is being addressed by this tactic? Justify your answer.

Q3) Explain the following example for software testing and Develop test strategy, Test planning, Testing process and number of defects found. [3+4=7]

Ex : One of your friend has written a program to search a string in a string and

P.T.O.

requested you to test the below function.

function strpos_generic (\$haystack, \$needle, \$nth, \$insensitive)

following are terminology definitions.

- \$haystack = the string in which you need to search value.
- \$needle = the character that needs to be searched, the \$needle should be a single character.
- \$nth = occurrence you want to find, the value can be number between 1,2,3
- \$insensitive = 1-case insensitive, 0 or any other value is case sensitive
- Passing as Null as parameter in haystack or needle is not a valid scenario and will return Boolean false.
- The function will return mixed integer either the position of the \$nth occurrence of \$needle in \$haystack, or Boolean false if it can't be found.

OR

Q4) a) What are the different errors in software testing? [3+4=7]

b) What is process for Mutation testing? Apply mutation testing on following code.

Read Age

If Age > 14

Doctor = General Physician

End if

And Data set is 14, 15, 0, 13

Q5) a) Explain features of J unit software testing tool. [3+4=7]

b) Discuss the test Automation for XP/Agile model.

OR

- Q6)** a) What is data Driven testing (DDT)? Explain data driven testing framework. [4+3=7]
b) List features of J Meter software testing tool.

- Q7)** a) What is Selenium? What are different fetures of selenium IDE? [6+5+5=16]
b) List automation tools for software testing. Describe QTP in detail.
c) What are selenium test design considerations?

OR

- Q8)** a) State & explain the components of selenium tool. [6+5+5=16]
b) What is selenium Grid? What is the purpose of selenium Grid?
c) What is Selenium RC? Explain its features.

- Q9)** a) Discuss Principles of Quality management. [6+6+5=17]
b) Explain Software Quality Assurance and elements of SQA.
c) Write short note on ISO 9000 quality standards.

OR

- Q10)** a) What is Six Sigma? Explain the terms DMAIC & DMADV. [6+6+5=17]
b) Define Software Quality & Software Quality Assurance. List the various objectives of SQA.
c) Mean: Avearge, Median : Mid point values in series, Mode : Most repetitive values and Range : difference between highest and lowest value.

Q11)a) Enumerate Ishikawa's seven basic quality tools. Explain any two in detail.
[6+6+5=17]

- 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 approach.
[6+6+5=17]

- b) Explain following terms (any two)
 - i) Checklists
 - ii) Histogram
 - iii) Run charts
- c) Describe in detail defect injection & defect removal activities for a development process.



Total No. of Questions : 8]

SEAT No. :

P3982

[5561]-686

[Total No. of Pages : 4

B.E. (Computer Engineering)
OPERATION RESEARCH

(2015 Pattern) (410245C) (Semester - I) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat and clear diagrams must be drawn whenever 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]

$$\text{Minimize } Z = 8x_1 + 10x_2$$

Subject to constraints :

$$2x_1 + 4x_2 \geq 5$$

$$3x_1 - 5x_2 \leq 3$$

$$x_1, x_2 > 0$$

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. [6]

$$\text{Maximize } Z = 30x_1 + 40x_2$$

Subject to constraints :

$$3x_1 + 2x_2 \leq 600$$

$$3x_1 + 5x_2 \leq 800$$

$$5x_1 + 6x_2 \leq 1100$$

$$x_1, x_2 \geq 0$$

P.T.O.

- c) A salesman has to travel between cities selling products. He visits cities A, B, C, D and E. The distances between the cities is as given in the table below. Solve the Travelling Salesman problem,
- Indicate the route followed
 - Mention the distance travelled in kilometers.
- [8]

		To City				
		A	B	C	D	E
From City	A	-	17	16	18	14
	B	17	-	18	15	16
	C	16	18	-	19	17
	D	18	15	19	-	18
	E	14	16	17	18	-

Q3) a) Solve the following 2xm game using the graphical method. [8]

	B1	B2	B3	B4	B5
A1	2	-2	5	-2	6
A2	-2	4	-3	1	0

- b) Solve the following game using linear programming. [8]

	B1	B2	B3
A1	1	-1	3
A2	3	5	-3
A3	6	2	-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	70	80	50
A2	90	60	95
A3	105	90	65

- Q5) a)** The following details are available regarding a project. Draw the Network Diagram. Identify the critical path, the criticle 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)	Time Duration (Weeks)
A	A	12
B	A	7
C	A	11
D	A	8
E	A	6
F	B	10
G	C	9
H	D, F	14
I	E, G	13
J	H, I	16

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	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D, E	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.

Path	Predecessor (Activity)	Time Duration (Weeks)
A	-	15
B	A	17
C	A	21
D	B	19
E	B	22
F	C, D	18
G	E, F	15

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 3000, 6000 or 9000 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	Fixed Cost (Rs.)	Variable Cost per Unit (Rs.)
A	20,000	15
B	30,000	12
C	50,000	8

OR

Q8) a) A 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. 2700 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 3000, 6000 or 9000 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.)	Variables Cost per Unit (Rs.)
A	20,000	15
B	30,000	12
C	50,000	8



Total No. of Questions : 10]

SEAT No. :

P3983

[5561]-687

[Total No. of Pages : 2

**B.E. (Computer Engineering)
MOBILE COMMUNICATION**

(2015 Pattern) (Semester-I) (End Sem) (Elective-II) (410245D)

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 is MAC? Describe Hidden and Exposed Terminal. [6]

b) Define Aloha. Explain slotted Aloha. [4]

OR

Q2) a) Definition line of sight transmission. Explain in detail. [6]

b) Give detail Fading in mobile Environment. [4]

Q3) a) What is Hand off. Give its types. [6]

b) Explain GMSK Modulation. [4]

OR

Q4) a) Explain Mobile Station and SIM. [6]

b) Short Note on HLR and VLR. [4]

Q5) a) Describe in detail Logical Channel for GSM. [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) Explain GSM channel. Define frames and Multi-Frames. [6]

c) Write short note on MSISDN and IMSI. [6]

Q7) a) Explain block diagram for UMTS in detail [6]

b) Write short note on 3GPP2 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 in detail. [8]

b) Write short note on - [8]

i) LTEA (Advanced)

ii) 5 GAA (Autonomous Automation)



Total No. of Questions :8]

SEAT No. :

P3984

[5561]-688

[Total No. of Pages :2

B.E. (Computer Engineering)
MACHINE LEARNING
(2015 Course) (410250) (Semester-II)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8,*
- 2) *Assume suitable data if necessary.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*

Q1) a) With reference to machine learning, explain the concept of adaptive machines. [6]

b) Explain the role of machine learning algorithms in following applications. [6]

- a) Spam filtering.
- b) Natural Language processing.

c) Explain role of machine learning the following common un-supervised learning problems: [8]

- a) Object segmentation
- b) Similarity detection

OR

Q2) a) Explain Data formats for supervised learning problem with example.[6]

b) What is categorical data? What is its significance in classification problems? [6]

c) Explain the Lasso, and ElasticNet types of regression. [8]

Q3) a) What problems are faced by SVM when used with real datasets? [3]

b) Explain the non-linear SVM with example. [5]

c) Write shorts notes on: [9]

- i) Bernoulli naive Bayes.
- ii) multinomial naive Bayes.
- iii) Gaussian naive Bayes.

P.T.O.

OR

- Q4)** a) Define Bayes Theorem. Elaborate Naive Bayes Classifier working with example. [8]
b) What are Linear support vector machines? Explain with example. [4]
c) Explain with example the variant of SVM, the Support vector regression. [5]

- Q5)** a) Explain the structure of binary decision tree for a sequential decision process. [8]
b) With reference to Clustering, explain the issue of “Optimization of clusters” [5]
c) Explain Evaluation methods for clustering algorithms. [4]

OR

- Q6)** a) With reference to Meta Classifiers, explain the concepts of Weak and eager learner. [8]
b) Write short notes on:
a) Adaboost.
b) Gradient Tree Boosting.
c) Voting Classifier.

- Q7)** a) With reference to Hierarchical Clustering, explain the issue of connectivity constraints. [8]
b) What are building blocks of deep networks, elaborate. [8]

OR

- Q8)** a) With reference to Deep Learning, Explain the concept of Deep Architectures? [8]
b) Justify with elaboration the following statement: [8]
The k-means algorithm is based on the strong initial condition to decide the Number of clusters through the assignment of ‘k’ initial centroids or means.



Total No. of Questions : 10]

SEAT No. :

P3985

[5561]-689

[Total No. of Pages : 2

B.E. (Computer Engineering)
INFORMATION AND CYBER SECURITY
(2015 Pattern) (Semester - II) (410251)

Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

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

Q1) a) List and explain various elements of Information security. [5]

b) Using Hill Cipher encrypt the message ‘ESSENTIAL’. The key for encryption is ‘ANOTHERBZ’. [5]

OR

Q2) a) What is steganography? What are the applications and limitations of steganography? [5]

b) Use Transposition Cipher to encrypt plain text ‘I Love my India’ and use the key ‘HEAVEN’. [5]

[Use single columnar transposition]

Q3) a) Discuss elliptic curve cryptography in detail. [5]

b) What is block Cipher? Explain counter mode of block Cipher. [5]

OR

Q4) a) What is authentication? Explain various methods authentication. [5]

b) Explain working of AES in detail. [5]

Q5) a) Discuss the working of IPSec. What are the benefits of IPSec. [6]

b) What is VPN? Explain types of VPN. [6]

c) Compare PGP, MIME and S/MIME. [6]

OR

P.T.O.

- Q6)** a) Differentiate between IP-V4 and IP-V6. [4]
b) Explain secure socket layer handshake protocol in detail. [7]
c) Explain ISAKMP protocol of IPSec with header format. [7]

- Q7)** a) What are the various types of firewall. Discuss limitations of firewall. [8]
b) Explain any two password management practices. [4]
c) What is trusted system. [4]

OR

- Q8)** a) Explain need and challenges of intrusion detection system. Define signature based IDS. [8]
b) What is access control security services. [4]
c) Explain packet filtering firewall. [4]

- Q9)** a) Explain personally identifiable information PII. Describe PII impact levels with examples. [8]
b) What is cyber stalking? How to identify and detect cyber stalking. [8]

OR

- Q10)** a) What are different phases of cyber forensics? Explain with suitable diagram. [8]
b) Discuss PII confidentiality safeguards. [8]



Total No. of Questions : 10]

SEAT No. :

P4787

[Total No. of Pages : 2

[5561]-690

B.E. (Computer Engineering)

Advanced Digital Signal Processing

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

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, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) How 2-D DFT can be used for linear filtering? [5]

b) Discuss the use of Adaptive FIR filter in echo cancellation. [5]

OR

Q2) a) Compare Steepest Descent algorithm with Newton's algorithm used in adaptive FIR filter design. [5]

b) Define and compare 1-D DFT with 2-D DFT. State its applications. [5]

Q3) a) What is multi rate digital signal processing? State any two applications of multi rate signal processing. [5]

b) Explain the process of sampling rate conversion by a factor I/D. [5]

OR

Q4) a) Explain the algorithmic steps for the LMS algorithm. [5]

b) Derive transfer function of a decimator or Interpolator. [5]

Q5) a) Define energy density spectrum and power density spectrum. How to estimate energy density spectrum? [9]

b) How DCT is different than DFT? Define and state the properties of DCT. [9]

P.T.O.

OR

- Q6)** a) What is periodogram? With block schematic explain how it is obtained using Welch method? [9]
b) Describe the MA and ARMA models for power spectrum estimation. [9]

- Q7)** a) Explain the terms Speech Synthesis, Speech Recognition and Feature Extraction w.r.t. Speech processing. [8]
b) What is the necessity of speech coding? Explain the working of LPC coding with example. [8]

OR

- Q8)** a) What is the difference between Speaker Identification and Speaker Verification? What features are extracted from a speech signal in both the cases. [8]
b) Explain the use of Vector Quantization in speech processing. [8]

- Q9)** a) What is the role of Order statistics filter in image enhancement? Explain the median filter with mathematical model and applications. [8]
b) What is image enhancement in digital image processing? Explain any two gray level transforms used for image enhancement. [8]

OR

- Q10)**a) How digital image is represented by means of digital computer? How gray scale image is different than colour image? Explain the terms Histogram and Histogram equalization of an image. [8]
b) With mathematical models state the use of LPF and HPF for image smoothing and sharpening. [8]



Total No. of Questions : 10]

SEAT No. :

P3986

[5561]-691

[Total No. of Pages : 2

B.E. (Computer Engineering)
COMPILERS
(2015 Pattern) (Elective - III) (Semester - II)

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) Assume suitable data if necessary.

- Q1)** a) Write Lex Specification to count lines, spaces, tabs and words from given input. [6]
b) Explain Error recovery strategies in Parser. [4]

OR

- Q2)** a) Compute FIRST and FOLLOW for the following grammar [6]
- $$\begin{aligned} E &\rightarrow E + T \mid T \\ T &\rightarrow T * F \mid F \\ F &\rightarrow (E) \mid id \end{aligned}$$
- b) Write Syntax Directed Definition for constructing syntax tree for arithmetic expressions. [4]

- Q3)** a) Test whether following grammar is LL(1) [6]
- $$\begin{aligned} S &\rightarrow i E t S S' \mid a \\ S' &\rightarrow eS \mid \text{empty}, \\ E &\rightarrow b \end{aligned}$$
- b) What is Three Address Code? Generate three address code for
 $a = b * -c + d$ [4]

OR

- Q4)** a) Explain the need of symbol table in Compiler. List and explain any two operations carried on Symbol table. [6]
b) Explain following terms with suitable examples S-attributed Grammar, L-attributed Grammar. [4]

P.T.O.

- Q5)** a) What is activation record? List and explain its fields. [6]
 b) Explain any two Storage allocation strategies. [6]
 c) Explain following terms
 Call by Value and Call by reference [4]

OR

- Q6)** a) Explain Display Mechanism. How Display is used to access non-local data. [6]
 b) What are the Source Language issues? Explain any two. [6]
 c) Compare Static Scope and Dynamic Scope. [4]

- Q7)** a) List the issues in Code Generation. Explain any two of them. [6]
 b) Explain the decisions of Code Generator function/procedure for the statement $x = y \text{ op } z$ [6]
 c) Construct the DAG for following assignment statement
 $a + b * c + b * c + d$ [4]

OR

- Q8)** a) What is Basic Blocks? Explain the algorithm used to partition three address code into Basic Block. [6]
 b) Explain the term Register Descriptor and Address Descriptor along with suitable example. [6]
 c) Explain labelling algorithm used in Code Generator. [4]

- Q9)** a) Explain following optimization techniques along with suitable example. [6]
 Common Sub-expression Elimination,
 Dead Code Elimination
 b) Write Data Flow Equations for
 If E then S1 else S2
 Do S while E [6]
 c) Explain Following Loop Optimization Techniques [6]
 Code Motion
 Strength Reduction

OR

- Q10)a)** Why Code Optimization is required? Differentiate Local and Global Optimization. [6]
 b) Draw a Sample Flow Graph and Explain Generation and Killing of expression with respect to it. [6]
 c) List and Explain loops in Flow Graph. [6]



Total No. of Questions : 10]

SEAT No. :

P3987

[5561]-692

[Total No. of Pages : 2

B.E. (Computer Engineering)

EMBEDDED AND REAL TIME OPERATING SYSTEM

(2015 Course) (Elective - III) (Semester - II) (410252(C))

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) Assume suitable data if necessary.

- Q1)** a) What is the use of ROM image in Embedded system? Draw a structure of ROM image and explain various components embedded inside it. [5]
b) How does ARM micro-controller differ from a SHARC processor? Justify your answer. [5]

OR

- Q2)** a) Describe in detail different forms of memories and their use in embedded systems. [5]
b) To design sophisticated embedded systems for high computing performance, which performance metrics are used? Explain. [5]

- Q3)** a) Explain types of serial communication with examples. [5]
b) Enlist various Internet enabled system protocols and explain one with its features. [5]

OR

- Q4)** a) Explain why PCI/X buses are used for high speed data transfer? List the major features of PCI/X bus. [5]
b) Describe and compare RS232C and SDIO Devices. [5]

- Q5)** a) How to represent Precedence constraints and data dependency among real-time tasks? Explain with diagram. [6]
b) How Rate Monotonic (RM) algorithm checks the schedulability of tasks? What are limitations of RM algorithm. [6]
c) What is RTOS? Differentiate Hard versus soft real-time systems and their timing constraints. [4]

OR

P.T.O.

- Q6)** a) Differentiate between fixed priority and dynamic priority scheduling algorithms in real-time systems. Give one example of each. [6]
b) What are various Temporal parameters of real-time processes? List and explain. [6]
c) What are various Real-time requirements in the domain of Signal processing or Multimedia. [4]

- Q7)** a) With the help of example, demonstrate the concept of critical section. [6]
b) What is priority inversion problem in real-time systems? How this problem can be solved? Give details. [6]
c) What is interrupt latency? Justify its role in handling interrupts in RTOS environment. [4]

OR

- Q8)** a) Explain with example Resource conflicts and blocking. [6]
b) What is Semaphore? How does it help in resource sharing in RTOS Kernel? [6]
c) How interrupts are handled in RTOS environment? [4]

- Q9)** a) Draw and explain model of real-time communication with related terminologies. [6]
b) Explain priority-based service disciplines for switched networks in multiprocessor systems for real-time communication. [6]
c) Describe the embedded software development process. [6]

OR

- Q10)** a) What are issues in resource reservation. Explain Resource reservation protocol with diagram. [6]
b) Explain with example Validation and debugging in an embedded system. [6]
c) List capabilities of commercial real-time operating systems. Enlist the features of RTLinux. [6]



Total No. of Questions : 10]

SEAT No. :

P3988

[5561]-693

[Total No. of Pages : 2

B.E. (Computer Engineering)

SOFT COMPUTING AND OPTIMIZATION ALGORITHMS

(2015 Pattern) (410252(D)) (Elective - III)

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) Assume suitable data if necessary.

- Q1)** a) What is soft computing? Indicate biological analogies of basic techniques of soft computing. Describe why soft computing is particularly useful in representing and reasoning with human-oriented knowledge. [5]
- b) Define the following for membership functions : [5]
- i) Core.
 - ii) Support.
 - iii) Boundary.
 - iv) Fuzzy singleton.
 - v) Convex Fuzzy set.

OR

- Q2)** a) Define Artificial Neural networks. State various advantages of working with ANN. [5]
- b) Explain in detail singleton method for fuzzification. [5]

- Q3)** a) Explain in detail following two modes of approximate reasoning. [5]
- i) Categorical reasoning.
 - ii) Qualitative reasoning.
- b) What is meant by linguistic hedges? What are characteristics of a linguistic variable? [5]

OR

- Q4)** a) Define Crisp and Fuzzy relation. Describe fuzzy max-min composition and fuzzy min-max composition. [5]
- b) Describe methods of aggregation of fuzzy rules. [5]

P.T.O.

- Q5)** a) List out the features of biological evolution of Evolutionary Computing. Explain applications of Evolutionary Computing. [8]
b) How evolutionary strategies are different from Genetic algorithms? Explain various applications of Evolutionary Strategies. [8]

OR

- Q6)** a) What are the components of evolutionary algorithms? What is the role of fitness function and population in evolutionary algorithms? [8]
b) Summarise three steps of evolutionary programming. List out possible mutation operators for the same. [8]

- Q7)** a) Describe Selection and Crossover operators in Genetic Algorithms in detail. [8]
b) Compare traditional algorithms with genetic algorithms. Explain various application of GA. [10]

OR

- Q8)** a) Explain Messy genetic algorithms and adaptive genetic algorithms. [8]
b) What is genetic programming? Write and explain the executional steps of GP. [10]

- Q9)** a) Explain basic flow of Particle Swarm Optimization. Compare PSO and Genetic Algorithms. [8]
b) Explain similarities and differences between Real Ants and artificial Ants. [8]

OR

- Q10)** a) Explain characteristics of Ant Colony Optimization. [8]
b) Write a generic Ant algorithm. Describe applications of particle swarm optimization. [8]



Total No. of Questions : 12]

SEAT No. :

P3989

[Total No. of Pages : 2

[5561]-694

B.E. (Computer Engineering)

SOFTWARE DEFINED NETWORKS

(2015 Pattern) (Semester - II) (Elective-IV) (410253A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is SDN? Explain SDN architecture. [4]

b) What are the fundamental characteristics of SDN? Explain in brief. [4]

OR

Q2) a) What are challenges of traditional networks? Do you think SDN will overcome? Justify it. [4]

b) Is there any difference in ONF and SDN Devices? Justify your answer. [4]

Q3) Explain message types and how pipeline processing is carried out in Open Flow. [6]

OR

Q4) Explain functionality open flow switch, controller & protocol in SDN. [6]

Q5) In SDN “Open Flow Protocol plays an important role”. Justify this statement. [6]

OR

Q6) Define use of POX, Beacon, Floodlight, Ryu and Open Daylight. [6]

Q7) a) Define Data Centre & Explain in detail demands of Data Center. [8]

b) SDN Use Cases in the Data Center. Explain with architecture. [8]

OR

P.T.O.

Q8) a) Differentiate between Open SDN, Overlays, and APIs [8]

b) Who implemented Real-World Data Center? Does it run in real time?
Justify your answer. [8]

Q9) a) Are SDN and network virtualization the same? Differentiate them. [8]

b) Enlist benefits of Network Functions Virtualization. [6]

c) Difference between NFV and NV. [4]

OR

Q10)a) Why we need NV? What is relation of SDN to network virtualization and NFV? [8]

b) What is Mininet? Explain basic commands of Mininet. [6]

c) Explain SDN Future? [4]

Q11)a) What are SDN Open source controllers? Explain in Detail. [8]

b) What is an In-line network function? [4]

c) Which are different leading NFV Vendors? [4]

OR

Q12)a) Write a short note on following use cases. [8]

i) Wide Area Networks

ii) Service Provider and Carrier Networks

b) In case you want to implement the following networks how you will implement it using software defined networks. [8]

i) Campus Networks

ii) Hospitality Networks



Total No. of Questions : 8]

SEAT No. :

P3990

[5561]-695

[Total No. of Pages : 2

B.E. (Computer Engineering)

**HUMAN COMPUTER INTERFACE (Elective - IV)
(2015 Pattern) (Semester - II) (410253B) (End Sem.)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to right indicate the marks to the question.
- 3) Assume suitable data whenever necessary.

Q1) a) What is HCI? What is role of Psychology, Ergonomics, and Understanding in HCI? [8]

b) Discuss about software life cycle in HCI? [6]

c) What is a prototype? Explain different approaches to prototyping. Describe with suitable figures. [6]

OR

Q2) a) What are the basic human and computer abilities required for HCI? Explain any three of each in detail. [8]

b) What is GOMS model? Explain it in detail. [6]

c) Which are the various Implementation tools and Technologies used in HCI? Explain any two in detail. [6]

Q3) a) Discuss about Evaluation through user participation in details. [6]

b) What are the requirements of user support system. [6]

c) Explain Web Browsers by Considering following Terms: [6]

- i) Fonts
- ii) Color Pallet
- iii) Resolution
- iv) Layout
- v) Size
- vi) Orientation

OR

P.T.O.

- Q4)** a) Explain Heuristic evaluation in detail? [6]
b) Which are the different approaches to user modeling in knowledge representation in adaptive help system of user support. [6]
c) Explain role of HCI in design of mobile device. [6]

- Q5)** a) Discuss about Predictive model in detail. [8]
b) Discuss about CUSTOM and OSTA in context with social technical models in capturing requirements in an organization [8]

OR

- Q6)** a) Discuss about Cognitive model in detail. [8]
b) What do you mean by stakeholders in any organization ? Which are the different categories of stakeholder? Classify stakeholders in airline booking system accordingly. [8]

- Q7)** a) What do you mean by Task Analysis? Which are three different approaches to task analysis ? Explain each with suitable example. [8]
b) Name any five diagrammatic notations used in dialog design? Explain any 2 in details with suitable example and figures. [8]

OR

- Q8)** a) Which are the sources of information and data collection in task analysis? What are the uses of task analysis ? Explain all in detail. [8]
b) Write short note on any two of following [8]
i) User Testing
ii) Usability Testing
iii) User Acceptance Testing



Total No. of Questions : 10]

SEAT No. :

P3991

[5561]-696

[Total No. of Pages : 2

**B.E. (Computer Engg.)
CLOUD COMPUTING**

(2015 Pattern) (Semester - II) (410253 (C)) (Elective - IV)

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) Draw neat diagram wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

Q1) a) Explain in detail the benefits and limitations that are offered by the cloud to organizations when they hire cloud services. Also, explain about the security concerns for the organisations while using cloud services. [5]
b) Write a note on cloud file systems with architecture. [5]

OR

Q2) a) Write a note on multitenant nature of SaaS solutions. [5]
b) Explain open cloud consortium. [5]

Q3) a) Explain the following threats related to cloud computing. [5]
i) Disk failure
ii) Disgruntled Employees
iii) Network failure
b) Explain the solution stack: LAMP. Also, explain how LAPP is considered as more powerful alternative to the more popular LAMP stack. [5]

OR

Q4) a) Explain the following. [5]
i) CPU virtualization
ii) Memory virtualization
b) How to improve performance through load balancing? Explain how load balancing takes help of a server to route traffic to other servers which share the workload. [5]

- Q5)** a) Explain the steps for configuring a server for EC2. [9]
b) What are AWS load balancing services? Explain the Elastic load Balancer and its types with its advantages. [8]

OR

- Q6)** a) Explain the steps to create an Amazon S3 Bucket and managing associated objects. [8]
b) What is an Amazon EBS snapshot? Give steps to create EBS snapshot. [9]

- Q7)** a) Describe cloudlets for mobile cloud computing with neat diagram and differentiate between cloudlets and clouds. [8]
b) Write a note on Innovative applications of IoT. [9]

OR

- Q8)** a) Explain performance metrics for HPC/HTC systems. [9]
b) Explain the cyber Physical system [CPS]. Explain CPS components. [8]

- Q9)** a) Explain the client server architecture of Docker? What are Network ports and unix sockets? [8]
b) What is Energy aware cloud computing? Explain in detail. [8]

OR

- Q10)** a) What is the impact of cloud on operating systems in future? [8]
b) Explain Docker with respect to process simplification. Broad support and Adoption, Architecture. [8]



Total No. of Questions : 10]

SEAT No. :

P4786

[Total No. of Pages : 3

[5561]-697

**B.E. (Computer Engineering)
BUSINESS INTELLIGENCE (Theory)
(2015 Pattern) (Open Elective - IV) (Semester - II)**

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.*
- 3) *Assume suitable data if necessary.*
- 4) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*

Q1) a) Describe the role of Business Intelligence in making a business successful. [5]

b) Explain with diagrammatic representation the main components of Business Intelligence system. [5]

OR

Q2) a) Explain how Business Intelligence system is beneficial, by considering the case study of Super Market. [5]

b) Enlist the various business intelligence user types and explain their roles in business intelligence process. [5]

Q3) a) Explain any two visualization techniques with an application example. [5]

b) Compare operational versus information data. State the applications of Decision Support System. [5]

OR

Q4) a) Mention three main types of analysis which can be performed using any DSS system. Explain any two analysis with applications. [5]

b) Explain role of BI in decision support system. [5]

P.T.O.

- Q5)** a) Explain the need of data pre-processing in BI. Explain various data reduction techniques. [5]
- b) Explain data normalization in data pre-processing. Explain following data normalization techniques with example : [6]
- Min-Max normalization
 - Z-score normalization
- c) Explain techniques of data discretization and data transformation. [6]

OR

- Q6)** a) Explain phases of data pre-processing. [6]
- b) Explain OLAP and Roll-up and Slice operations with example. [6]
- c) Suppose that the data for analysis includes the attribute age. The age values for the data tuples are (in increasing order) 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. [5]
- Apply smoothing by bin means
 - Smoothing by bin boundaries
- to smooth the above data, using a bin depth of 3. Illustrate your steps. Comment on the effect of these techniques for the given data.

- Q7)** a) Explain Decision Tree Induction algorithm with example. [8]
- b) Database has five transactions as specified in following table. Let $\text{min_sup} = 60\%$ and $\text{min_conf} = 80\%$. [6]

TID	items _ bought
T100	{M,O,N,K,E,Y}
T200	{D,O,N,K,E,Y}
T300	{M,A,K,E}
T400	{M,U,C,K,Y}

Find all frequent itemsets using Apriori Algorithm.

- c) Enlist any two clustering approaches with example of one technique.[3]

OR

- Q8)** a) Explain K-Means Clustering algorithm with example. [8]
- b) Explain any two Attribute Selection measures with example. [6]
- c) Compare Apriori algorithm and FP-Growth algorithm. [3]

- Q9)** a) Consider the database of an online retail Shoppe like Big Bazar. Use suitable business intelligence techniques and derive discounts for various items in the shop, for a particular week, to increase the profitability. Explain the techniques used for the same. [6]
- b) Explain Data analytics life cycle with suitable diagram. [6]
- c) Explain various Business Intelligence applications in Telecommunications. [4]

OR

- Q10)** a) Explain the application of Business Intelligence in banking. [6]
- b) Explain the application of Business Intelligence for Finance management in an organization. [6]
- c) Write a short note on ERP and Business Intelligence. [4]



Total No. of Questions : 10]

SEAT No. :

P4788

[Total No. of Pages : 3]

[5561]-698

B.E. (Computer Engineering)

Open Elective - Enterprise Resource Planning (2015 Pattern) (Semester - II)

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 whenever necessary.
 - 3) Assume suitable data if necessary.

- Q1)** a) Draw a block diagram showing a logistic & finance company for Enterprise Resource Planning being implemented showing Master data and transactional data in an Infor LN? [4]

b) What are the different jobs based DEM roles in a Production Department in Infor LN? Explain the organization chart and duties of the various members in a typical Production Dept. [6]

OR

- Q2)** a) List down the typical routing components of a routing operation in a Manufacturing organization and explain how it is managed? [4]
b) List the roles of a business partner as a customer and a supplier. What is the use of defining a Purchase Office, Sales office and purchase and sales user profiles in Infor LN? Explain. [6]

- Q3)** a) What are the sub-entities of an Item Data record in Infor LN? [4]
b) What is a session and what are session components in Infor LN?
Describe session flow with a flow chart diagram. [6]

QR

- Q4)** a) What are the typical modules made available in an ERP application?
Explain the function of any two modules. [4]
b) Explain any three : [6]
i) Routing ii) Work Centers
iii) Warehouse iv) Projects

PTQ₃

- Q5)** a) In a Procure to Pay cycle, list out the various departments and activities that are encountered (both external and internal) using a small flowchart in Infor LN. [4]
- b) Reorder following steps in the purchase order procedure in Infor LN.[2]
- i) Transfer the delivered purchase orders to the purchase order history database.
 - ii) Create the purchase order.
 - iii) Send the purchase order to the buy-from business partner.
 - iv) Pay for the received goods.
 - v) Receive the purchased goods.
- c) Explain followings: [4]
- i) ATP/CTP
 - ii) Cost Price of an item
- d) Write down the steps required to complete Reverse Logistics in Infor LN. [6]

OR

- Q6)** a) Draw and explain Purchase Agreement Process in Procure to Pay process in Infor LN. [4]
- b) List and explain the steps required to complete Procure to Pay Process in Infor LN. [6]
- c) Explain role of Warehousing department in Procure to Pay Process of Infor LN in details. [6]

- Q7)** a) In an Order to Cash cycle, list out the various departments and activities that are encountered (both external and internal) using a small flowchart in Infor LN. [4]
- b) Explain followings : [6]
- i) Sales user profile.
 - ii) Sales order fulfilment workbench.
- c) Explain Order to Cash Process using a Real time Scenario in Infor LN. [6]

OR

- Q8)** a) Expand the following Acronyms : [2]
- | | |
|-----------|----------|
| i) IaaS | ii) PaaS |
| iii) SaaS | iv) SOA |
| v) EAI | vi) WOA |

- b) Reorder the following steps in the sales order process in the correct sequence [2]
- Print sales order acknowledgements
 - Release sales order to the warehouse
 - Deliver the sold goods
 - Invoice sold Goods
 - Approve the sales order
- c) Explain goods (Out) in shipping process in Infor LN. [6]
- d) Explain the Central invoicing in the Order to Cash Process in Infor LN. [6]

- Q9)** a) What is the difference between a trial balance and a balance sheet? [6]
- b) Which are the key Managers that report to a Chief Finance Officer (CFO)? Give an organization chart and explain their roles. [6]
- c) List down the steps in short which are executed in the Design to deploy process from the engineering department to the Planner, Supervisor, Operator &Production Manager converting from E-BOM to P-BOM in Infor LN. [6]

OR

- Q10)a)** Draw and explain a department structure in any 3 of the following departments. [6]
- | | |
|---------------------------|-------------------------------|
| i) Purchase Department | ii) Sales Department |
| iii) Warehouse Department | iv) Production Department |
| v) Accounts Payable Dept. | vi) Accounts Receivable Dept. |
- b) In Enterprise application parlance, expand MTS, MTO, ATO, ETO and give an example of each where this is applicable. [4]
- c) Explain the difference between Raw Material, Work-in-Process and Finished good with an example. [2]
- d) Explain the golden rules of accounting with their examples. [6]



Total No. of Questions : 8]

SEAT No. :

P3992

[5561]-699

[Total No. of Pages : 3

B.E. (Computer Engineering)

BIG DATA AND DATA ANALYTICS

(2015 Pattern) (Semester - II) (Open Elective) (End Sem.) (410253DC)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain with the given dataset how Decision Support System will help, Laptop shop to predict whether the customer will buy or not buy laptop. [8]

ID	Age	Income	Gender	Martial Status	Buys
1	<21	High	Male	Single	No
2	<21	High	Male	Married	No
3	21-35	High	Male	Single	Yes
4	>35	Medium	Male	Single	Yes
5	>35	Low	Female	Single	Yes
6	>35	Low	Female	Married	No
7	21-35	Low	Female	Married	Yes
8	<21	Medium	Male	Single	No
9	<21	Low	Female	Married	Yes
10	>35	Medium	Female	Signle	Yes
11	<21	Medium	Female	Married	Yes
12	21-35	Medium	Male	Married	Yes
13	21-35	High	Female	Single	Yes
14	>35	Medium	Male	Married	No

- b) Differentiate Operational data and Informational data. [6]
- c) Explain following phases of data Analytics lifecycle with example. [6]
- i) Data Discovery
 - ii) Model Building

OR

P.T.O.

- Q2)** a) Explain Hadoop Eco system with diagram. [8]
 b) Smoothen the following data set using binning 3,12,1,7,8,5. [6]
 c) Justify Snow-Flake schema is better than Star schema. [6]

- Q3)** a) What is linear regression? Explain with Example. [8]
 b) What is the significance of Support Vector Machine Classifier Model with example. [5]
 c) Differentiate between supervised and unsupervised learning. [4]

OR

- Q4)** a) What is logistic regression? Explain with example. [8]
 b) Explain with suitable example to predict whether a student will pass or not using Support vector machine. [5]
 c) What is Time series analysis ? Give example. [4]

- Q5)** a) A database has 6 transactions. Let minimum support = 60% and Minimum confidence = 70%. Find all frequent item sets and association rules using Apriori algorithm [8]

Transaction ID	Toys Bought
T1	{A,B,C,E,F}
T2	{A,C,D,E}
T3	{B,C,E,F}
T4	{A,C,D,E}
T5	{C,D,E,F}
T6	{A,D,E}

- b) What is agglomerative clustering. Give example. [5]
 c) Explain the role of Bayes theorem in decision making. [4]

OR

- Q6)** a) What is Bayesian Classifier? Elaborate the training process of a Bayesian classifier with suitable example. [8]
- b) Explain with example following terms: [4]
- Lexicographic order
 - Confidence
- c) Differentiate between single link and complete link methods used in Hierarchical Clustering. [5]

- Q7)** a) Write and explain R code for Naive bayes classification. [8]
- b) Differentiate between Data Frames and data lists. [4]
- c) What is the role of R in machine learning? [4]

OR

- Q8)** a) Explain data processing with R? [8]
- b) How data is Exported from R. [4]
- c) Write short notes on Handling Data in R Workspace. [4]



Total No. of Questions : 10]

SEAT No. :

P3993

[Total No. of Pages : 2

[5561]-700

**B.E. (Information Technology)
INFORMATION AND CYBER SECURITY
(2015 Pattern) (414453)**

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) Assume Suitable data, if necessary.

- Q1)** a) What is an Intrusion Detection System? Describe types of IDS based on method of Detection? [6]
b) Differentiate between Substitution Cipher and Transposition Cipher. [4]

OR

- Q2)** a) What is digital signature? Which security goals are met by signing a document using digital signature? [6]
b) What is malicious code? State few types and how each one damage or disrupt a computer system. [4]

- Q3)** a) Explain Elliptic Curve Cryptography. [6]
b) What is the role of X.509 in cryptography? [4]

OR

- Q4)** a) Describe CBC, ECB, CFB & OFB with the help of block diagram. [6]
b) Solve if $p = 7$, $q = 17$ using Diffie Hellman algorithm, select $a = 6$, $b = 4$. [4]

- Q5)** a) List the steps for risk identification and assessment in risk management for Information Security. [8]
b) What are the types of Laws? Differentiate between Law and Ethics. [8]

OR

P.T.O.

Q6) a) State the commandments for computer ethics. [8]

b) What are the objective and pros and cons of Quantitative and Qualitative risk Assessment? [8]

Q7) a) Discuss SSL with respect to four phases. [8]

- i) Establish security capabilities
- ii) Server authentication & key exchange
- iii) Client authentication & key exchange
- iv) Finish

b) Explain IP security protocols AH and EPS. [8]

OR

Q8) a) Explain the types of Cyber - Crimes. [8]

b) What are challenges in Social engineering? Explain Cyber Stalking? [8]

Q9) a) Write a short note on Indian IT act 2000 and amendments in 2008. [9]

b) Explain working of Proxy Servers and Anonymizers? [9]

OR

Q10)a) What is DoS & DDoS Attacks? Explain with suitable examples? [9]

b) Write short note on any three: [9]

- i) Nmap
- ii) Wireshark
- iii) Nikto
- iv) Metasploit
- v) Aircrack



Total No. of Questions : 10]

SEAT No. :

P3994

[5561]-701

[Total No. of Pages : 3

B.E. (IT)

MACHINE LEARNING AND APPLICATIONS
(2015 Course) (414454) (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 side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) What is the need of dimensionality reduction? Explain subset selection. [6]
b) Write short note on PCA. [4]

OR

Q2) a) Compare Supervised, Unsupervised, Semi-Supervised Learning with examples. [6]
b) What is training, testing and cross validation of machine learning models. [4]

Q3) a) What are the support vectors and margins? Explain soft SVM and hard SVM. [6]
b) What is overfitting and underfitting? What are the catalysts of overfitting? [4]

OR

Q4) a) Elaborate Bias Variance dilemma. [6]
b) How the performance of regression is assessed? Write various performance metrics used for it. [4]

Q5) a) Consider following 8 points $P_1 = [0.1, 0.6]$, $P_2 = [0.15, 0.71]$, $P_3 = [0.08, 0.9]$, $P_4 = [0.16, 0.85]$, $P_5 = [0.2, 0.3]$, $P_6 = [0.25, 0.5]$, $P_7 = [0.24, 0.1]$, $P_8 = [0.3, 0.2]$.
Apply K-Means clustering with initial centroids m_1 & m_2 where $m_1 = P_1$, $m_2 = P_8$ and clusters are C1 & C2. Which cluster point P_6 belongs to? What is updated value of m_1 & m_2 . [10]
b) Write short note on feature tree & write best split algorithm. [6]

OR

P.T.O.

- Q6) a)** Apply apriori algorithm for following set of transactions and find all the association rules with min support = 1 and min confidence = 60%. [10]

Tr. ID	Transactions
1	1,3,4
2	2,3,5
3	1,2,3,5
4	2,5

- b) Explain following impurity measures of classifiers. [6]
- i) Gini Index.
 - ii) Entropy.

- Q7) a)** Consider following dataset and predict the class of new instance X using Navie Bayes Classification algorithm. [10]

Tid	Refund	Marital Status	Taxable Amount	Evade
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

X = (Refund = No, Marital Status = Married, Income = 120K).

- b) Explain Expectation - maximization algorithm. [8]

OR

- Q8) a)** Consider following dataset and predict the class of new instance X using Navie Bayes. [10]

Day	Outlook	Temperatuer	Humidity	Wind	Play Tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

Classification algorithm.

X = (Outlook = Sunny, Temp = Cool, Humidity = High, Wind = Strong).

- b) Explain one dimensional and N-dimensional Gaussian Mixture. [8]

- Q9) a)** Implement AND function using perceptron network using following bipolar inputs and target. [8]

X1	X2	T
1	1	1
1	-1	-1
-1	1	-1
-1	-1	-1

- b) Explain deep learning with applications. [8]

OR

- Q10)a)** What is ensemble learning? Explain bagging and boosting, stacking in brief. [8]

- b) Explain the architecture of feed forward neural network. Give its limitations. [8]



Total No. of Questions : 10]

SEAT No. :

P3996

[5561]-703

[Total No. of Pages : 2

B.E. (I.T.)

WIRELESS COMMUNICATION
(2015 Course) (Semester - I) (Elective - I) (414456A)

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) Assume suitable data, if necessary.

Q1) a) Compare Cellular Network Generations - 1G,2G,3G [6]

b) Define any four characteristics of Antenna. [4]

OR

Q2) a) Explain concept of cell sectoring and cell splitting. [6]

b) Write a short note on Blue Tooth. [4]

Q3) a) With diagram Explain Digital Cellular System [6]

b) Explain Rayleigh fading. [4]

OR

Q4) a) Explain Indoor path loss Model. [6]

b) List different types of Diversity. Explain Space Diversity. [4]

Q5) a) Compare FDMA, TDMA and CDMA. [10]

b) Explain with neat diagram FHSS. [6]

OR

Q6) a) Explain the concept of Spread Spectrum. Write down its features, advantages and disadvantages. [8]

b) With Block diagram explain GMSK. Compare it with QPSK. [8]

P.T.O.

Q7) a) Draw the Diagram and explain GSM Architecture. [8]

b) Elaborate a call establishment procedure for [8]

i) call from a Mobile

ii) call to Mobile

OR

Q8) a) Explain various types of interfaces used in GSM system for Interconnecting its subsystems. [8]

b) Describe inter BSC handoff procedure and Intra BSC handoff procedure. [8]

Q9) a) Discuss about Wi-Fi and the standards used. [6]

b) Write short note on

i) Wi-Max [6]

ii) Wireless adhoc network [6]

OR

Q10)a) What is Zig Bee? With diagram explain Zig Bee network. [6]

b) Write short note on

i) Software defined Radio [6]

ii) UWB Radio [6]



Total No. of Questions : 10]

SEAT No. :

P3997

[5561]-704

[Total No. of Pages : 2

B.E.(Information Technology)

NATURAL LANGUAGE PROCESSING

(2015 Course) (Semester - I) (Elective - I) (414456B)

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.

Q1) a) Explain text-based applications and dialogue-based applications with examples. [5]

b) Explain black box evaluation and glass box evaluation of language understanding systems. [5]

OR

Q2) a) Explain the working of a Bottom-up Chart Parser using suitable examples. [5]

b) What is Top-Down Chart Parsing? How is it different from simple Top-Down Parsing? [5]

Q3) a) Explain the working of a Shift-Reduce Parser using an example. [6]

b) Which are the general principles that appear to predict when ‘garden - paths’ arise? [4]

OR

Q4) Write short notes on the following :

- a) Adjective Phrases & Adverbial Phrases. [4]
- b) Feature systems & Augmented Grammars. [4]
- c) Partial Parsing. [2]

Q5) a) Explain semantic interpretation and contextual interpretation using an example. [6]

b) What is quasi-logical form? Explain various techniques to resolve ambiguities? [10]

OR

P.T.O.

Q6) Write short notes on the following :

- a) Meaning postulates [4]
- b) Agent role [4]
- c) Instrument role [4]
- d) Theme role [4]

Q7) a) Explain how selectional restrictions are used by semantic interpreters for disambiguation? [10]

- b) Explain the concept of semantic networks? [8]

OR

Q8) a) Explain how statistical methods can be used for word sense disambiguation. [10]

- b) Explain collocations and mutual information using examples. [8]

Q9) a) What are the different properties of aspectual classes? [8]

- b) Explain the significance of reference time in encoding tenses? [8]

OR

Q10) a) How to interpret logical form expressions as procedures? [8]

- b) Explain how knowledge representation systems attempt to gain the advantages of using efficient procedural inference for some tasks while retaining theoretical framework of theorem-proving systems. [8]



Total No. of Questions :10]

SEAT No. :

P3998

[5561]-705

[Total No. of Pages : 2

B.E. (I.T.)

**USABILITY ENGINEERING
(2015 Course) (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) How novice user becomes an expert user using learnability attributes [6]
b) How interfaces are helpful to reduce user memory load [4]

OR

- Q2)** a) Explain parallel design of interface with example [6]
b) Write a short note on Batch System [4]

- Q3)** a) Explain with example importance of short cut keys in user interface [6]
b) How Good error messages helpful to users to understand the system problems. [4]

OR

- Q4)** a) Explain with example the importance of accelerators in user interface [6]
b) Write a short note on : Meta-Methods. [4]

- Q5)** a) Explain the importance of user satisfaction questionnaire for interface testing [10]
b) What is the role of Experimenter in usability testing [8]

OR

P.T.O.

- Q6)** a) Explain any two usability assessment methods beyond testing [10]
b) Why user feedback is important in usability testing [8]

- Q7)** a) How Multilocale interfaces are more useful to the users [8]
b) How user & Vendor Benefits from Consistency and Standards [8]

OR

- Q8)** a) Explain with example International and National standard for interfaces [8]

- b) Write a short note on : International graphical interfaces [8]

- Q9)** a) Explain Organizational role and structure in usability. [8]
b) Describe GOMS Model with diagram [8]

OR

- Q10)** Write a short note on (Any 2) [16]

- a) Intelligent User Interfaces
b) Ubiquitous Computing
c) Simulation



Total No. of Questions :10]

SEAT No. :

P3999

[5561]-706

[Total No. of Pages : 2

BE (Information Technology)

**MULTICORE AND CONCURRENT SYSTEMS (Elective - I)
(2015 Pattern) (END SEM-MAY 2019 Semester I) (414456D)**

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 whenever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Explain intrusion detection system (IDS) : and its type types with example. [5]

b) Explain Task parallelism, Divide-and-conquer decomposition patterns [5]

OR

Q2) a) What does Security Architecture mean? Explain operation models [5]

b) Explain Master-worker, Map-reduce Program structure patterns [5]

Q3) a) Explain Geometric decomposition, Recursive data decomposition [5]

b) Explain how semaphore is used to solve Bounded Buffer (or Producer and Consumer) Problem [5]

OR

Q4) a) Differentiate between Dynamic vs. static thread management [5]

b) Explain Fork/join, Loop parallelism Program structure patterns [5]

Q5) a) Explain any four open MP Synchronization directives used for mutual exclusion [8]

b) Explain any four open MP Synchronization directives used for event synchronization [8]

OR

P.T.O.

- Q6)** a) Explain the sections directive with example program used for task parallelism in Open MP [8]
b) Explain the task directive with example program used in task parallelism in Open MP [8]

- Q7)** a) Write a program for parallel implementation of bucket sort in MPI using collective communications [8]
b) Explain RMA Communication Functions with correct syntax [8]

OR

- Q8)** a) Explain procedure for conducting RMA operations. [8]
b) Explain RMA Synchronization Functions with correct syntax [8]

- Q9)** a) Explain CUDA model for Program execution with diagram [9]
b) Explain process behind the compilation of a CUDA program with diagram [9]

OR

- Q10)** a) Explain in detail GPU memory hierarchy with neat diagram. [8]
b) Write a short note on (5×2 Marks) [10]
i) Debugging CUDA programs
ii) Profiling CUDA programs



Total No. of Questions :10]

SEAT No. :

P4000

[5561]-707

[Total No. of Pages : 2

B.E. (Information Technology)
BUSINESS ANALYTICS AND INTELLIGENCE
(2015 Pattern) (Semester - I) (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) *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 types of decisions? Explain the process through which the decisions are done by Managers. [6]
- b) What are different Factors Responsible for successful BI project, 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) Explain 5 different stages of business intelligence. Also discuss functionality and objective of each stage. [6]
- b) What are different types of dashboards, and list attributes of metrics usually included in dashboards. [4]

OR

- Q4)** a) Describe the approaches of decision makers. [6]
- b) What are various tools that are used in visualization of big data? [4]

- Q5)** a) Explain the purpose of Performance Measurement System and how organizations need to define the key performance indicators (KPIs) [8]
- b) Explain the Four balanced scorecards perspectives. Differentiate between dashboards and scorecards. [8]

OR

P.T.O.

- Q6)** a) What are the main components of BPM and Explain the four phases of BPM cycle. [8]
b) Explain the benefits of using balanced scorecards. [8]

- Q7)** a) How various forms of BA are supported in practice? Briefly explain? [8]
b) List and explain the different ways Business Intelligence Software can help in improving sales and marketing process. [8]

OR

- Q8)** a) Explain in detail the role of Business Intelligence in Finance Sector. [8]
b) What are the various domains where BI can be used and explain any four BI applications in detail with an example. [8]

- Q9)** a) Explain the main challenges and the potential solutions for the pervasive BI maturity. [10]
b) What is Big Data systems? Explain its applications in Education, Manufacturing, Media and Internet of Things. [8]

OR

- Q10)** a) Write a short note on any two [10]
i) Open Source BI
ii) Geographic BI System
iii) Social BI System
b) Explain with an example, How customer experience will help in building an effective BI system. [8]



Total No. of Questions : 10]

SEAT No. :

P4001

[Total No. of Pages : 2

[5561]-708

B.E. (I.T.)

SOFTWARE DEFINED NETWORKS

(2015 Pattern) (Semester-I) (Elective-II) (End Sem) (414457A)

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) Assume Suitable data if necessary.

- Q1)** a) Describe SDN. Comment on the need of SDN. [5]
b) Give details of the open flow forwarding model with a sketch in SDN. [5]

OR

- Q2)** a) Summarize the different SDN devices and List out the functions of SDN controller analyze the following sentence with proper arguments. [5]
b) “Network can be implemented as a Service”. [5]

- Q3)** a) Sketch and describe key components of open flow controller. [5]
b) Define Network Virtualization (NV). Elaborate any one applications of NV. [5]

OR

- Q4)** a) Sketch and Elaborate open flow packet Header. [5]
b) List out merits and demerits of idealized controller/framework of SDN. [5]

- Q5)** a) Illustrate with an example Peer-Peer controller coordination in SDN. [8]
b) Elaborate the salient features of control plane in SDN. List out the existing SDN controllers. [8]

OR

P.T.O.

Q6) a) Describe the meaning of “Customization of Control Plane in SDN” with an example. [8]

b) Describe functional components, shared resources in connection with SDN controller. [8]

Q7) a) Sketch & elaborate spectrum of control and data plane distribution in SDN. [8]

b) Elaborate the working of Northbound APIs? [8]

OR

Q8) a) Distinguish between software-based data plane and hardware-based data plane. [8]

b) Classify different programming languages for SDN. Review any one. [8]

Q9) a) Elaborate in detail the concept of service engineered path. [10]

b) Differentiate between NFV and NV. [8]

OR

Q10)a) Comment on the meaning of network device capabilities in SDN. Elaborate Link Layer Discovery Protocol. [10]

b) Sketch and describe the wireless architecture in Data Center Network. [8]



Total No. of Questions : 10]

SEAT No. :

P4002

[Total No. of Pages : 2

[5561]-709

B. E. (I. T.)

SOFT COMPUTING

(2015 Pattern) (Semester - I) (End Sem) (Elective -II) (414457B)

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) Assume Suitable data if necessary.

Q1) a) Explain in brief evolutionary computing approach of soft computing.

[6]

b) Explain any four application areas of soft computing. **[4]**

OR

Q2) a) Explain in brief feed forward and recurrent neural networks with suitable diagram. **[6]**

b) Explain Basic components of Biological neurons. **[4]**

Q3) a) Explain working of Bayesian Neural Networks with suitable diagram.

[6]

b) Explain kohonen self organizing Maps. **[4]**

OR

Q4) Write short Notes on following: (Any Two)

[10]

- a) ART
- b) Multi - layer feed forward Network.
- c) Boltzmann Machines.
- d) Probabilistic Reasoning Model.

P.T.O.

- Q5)** a) Explain the working of fuzzy inference system with suitable diagram. [8]
- b) What are fuzzy relations? Explain following operations on fuzzy relations
- i) Intersection
 - ii) Containment
- [8]

OR

- Q6)** a) What is Defuzzification? compare fuzzification and Defuzzification approaches with suitable egs. [8]
- b) Explain concept of conventional optimization Algorithms what are their limitations? [8]

- Q7)** a) Explain the concept of Ant colony optimization with suitable diagram. [8]
- b) Explain the cross over and Mutation with suitable eg. [8]

OR

- Q8)** a) Explain the concept of Mumdani fuzzy model with suitable diagram and eg. [8]
- b) With a neat flowcharts explain the operation of a simple Genetic Algorithms. [8]

- Q9)** a) Explain the concept of fuzzy ART Map with suitable diagram and eg. [10]
- b) Enlist and Explain in brief types of Genetic-Algorithms. [8]

OR

- Q10)** Write short notes on (Any three) [18]
- a) Fuzzy sets
 - b) Genetic programming
 - c) Neuro fuzzy hybrid systems
 - d) Fuzzy Tolerance Relation



Total No. of Questions : 10]

SEAT No. :

P4003

[Total No. of Pages : 2

[5561]-710

B.E. (I.T.)

**SOFTWARE TESTING & QUALITY ASSURANCE
(2015 Pattern) (Semester - I) (414457C) (Elective - II)**

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 right side indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) What is configuration testing? Explain its objectives. [5]

b) Write role of tester in software development organization. [5]

OR

Q2) a) Discuss Defect removal effectiveness. [5]

b) Explain Defect Bash Elimination. [5]

Q3) a) Explain role of process in software quality. [5]

b) What is test automation? Explain scope of automation. [5]

OR

Q4) a) Explain compatibility testing with example. [5]

b) Define the role of SQA Group. [5]

Q5) a) What is software quality assurance? Explain software quality assurance planning. [8]

b) Explain various components of the software quality assurance system. [8]

OR

P.T.O.

- Q6)** a) What is product quality? Compare product quality and process quality. [8]
b) Explain software process models in detail. [8]

- Q7)** a) Explain 7 Quality management Principles of ISO 9000 series in detail. [8]
b) Explain 5 levels of CMM & its Key Process Areas. [8]

OR

- Q8)** a) What is TMM? Explain various levels & benefits of TMM. [8]
b) Explain following in details. [8]
i) Principles behind the ISO/IEC 15504 assessment model.
ii) Structure of the ISO/IEC 15504 assessment model.
iii) Content of the ISO/IEC 15504 assessment model.
iv) ISO/IEC 15504 processes.

- Q9)** a) Explain in detail what is clean-room software engineering? [10]
b) Explain the process of Defect injection and prevention. [8]

OR

- Q10)** a) Explain Case Tools. Also explain their effect on Software Quality. [10]
b) What is Software Process? Explain PSP and TSP in detail. [8]



Total No. of Questions : 8]

SEAT No. :

P4004

[Total No. of Pages : 2

[5561]-711

B.E. (I.T.)

COMPILER CONSTRUCTION

(2015 Course) (Semester -I) (Elective-II) (414457D)

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.*
- 3) *Assume suitable data if necessary.*

Q1) a) Construct NFA of $(a/b)^*$ abb. [6]

b) What do you mean by elimination of left recursion? What is need of elimination of left recursion? Explain. [6]

c) Outline rules to be followed in FIRST () and FOLLOW () functions in parser. [8]

OR

Q2) a) What are canonical trees explain. [06]

b) What is DAG? Give suitable example to illustrate DAG. [06]

c) What do you mean by Activation record? Need of this? Give fields of the same. [08]

Q3) a) Describe various data flow analysis and comment on each methods. [09]

b) What are polymorphic variables? How are represented? [09]

OR

Q4) a) How static overloading problem can be resolved? Explain. [09]

b) What mechanisms you suggest to speed up data flow analysis explain. [09]

P.T.O.

- Q5)** a) What do you mean by control dependency? How it is achieved? [07]
b) Discuss optimization algorithm using SSA. [09]

OR

- Q6)** a) What is SSA form? Why do compiler writers use SSA? [06]
b) Explain method of dead code elimination in SSA. [04]
c) What is loop optimization? Explain. [06]

- Q7)** a) What is the advantage of Loop Interchange? Explain with example by taking at least three inner loops. [08]
b) Explain Garbage collection and Memory Hierarchy. [08]

OR

- Q8)** a) Give outlines for resource bounded loop pipelining scheduling algorithm. [08]
b) Explain the concept of data dependency of an instruction with proper example. [08]



Total No. of Questions : 10]

SEAT No. :

P4005

[Total No. of Pages : 2

[5561]-712

**B.E. (Information Technology)
GAMIFICATION**

(2015 Pattern) (Semester - I) (Elective - II) (414457E)

Time : 2½ Hours/

/Max. Marks : 70

Instructions to the candidates:

- 1) Attempt 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) Draw neat diagrams and assume suitable data wherever necessary.
- 3) Figures to the right indicates full marks.

Q1) a) Discuss Complementary model for quantitative approach? [5]

b) Write a note on Gamification and the life of things? [5]

OR

Q2) a) The role of bigdata in gamification? [5]

b) Differentiate between intrinsic versus Extrinsic Motivation? [5]

Q3) a) Write a note on fun Quotient? [5]

b) Important of flow in game mechanics? [5]

OR

Q4) a) Write a note on: The theory of playing by Jacques Henriot. [5]

b) List out any 4 best practices of gamification? Describe any one of them? [5]

Q5) a) Write the game mechanics techniques? Discuss about feedback and reinforcement? [10]

b) Write examples of game mechanics that leverage our desire to be heroes? [8]

OR

P.T.O.

- Q6)** a) Write examples of game mechanics that speak directly to the desire for fame and attention. [8]
b) Discuss your view on 8 queen's problem? [10]

- Q7)** a) Write a note on Badges? [8]
b) List the factor required to develop any game? Discuss any one of the factor? [8]

OR

- Q8)** a) How Yahoo! Answer is useful for asking and answering one of another's questions? [8]
b) How add scores and levels in user model? [8]
- Q9)** a) Write a short note on gamification server? [8]
b) List the key area for rewarding project? Discuss any one of them? [8]

OR

- Q10)** a) Write your view, How Badgeville publisher is used in analytics? [8]
b) Discuss Big Door platform? Explain any one usage of it? [8]



Total No. of Questions :10]

SEAT No. :

P4006

[5561]-713

[Total No. of Pages :2

B.E. (IT)

DISTRIBUTED COMPUTING SYSTEM
(2015 Course) (414462) (Semester-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

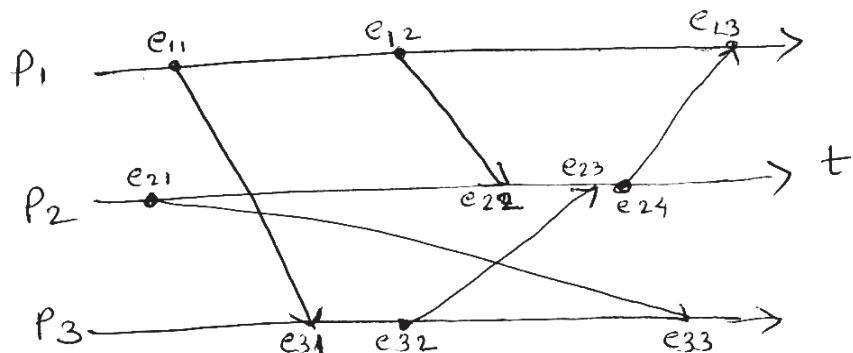
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Is it a good to aim at implementing the highest degree of transparency always? Justify your answer. [6]
- b) Rephrase the meaning of heterogeneity in distributed system and also show how it is overcome. [4]

OR

- Q2)** a) Discuss various RPC semantics in case of system failures. [6]
- b) Outline the goals of distributed systems. [4]

- Q3)** a) Consider the following event diagram for processes P1, P2 and P3 executing in a distributed system. Compute the vector clock that is carried on each message. [6]



- b) Discuss with real scenario IBM's web sphere message- queuing system. [4]

OR

P.T.O.

- Q4)** a) Explain in details with an example Ricart and Agrawala algorithm for distributed mutual exclusion. [6]
b) State and explain any one primary based consistency protocol. [4]

- Q5)** a) List and explain the design goals of the Sun NFS. [8]
b) Illustrate the concept of naming services and DNS in distributed systems. [8]

OR

- Q6)** a) Illustrate with an example how the BitTorrent is designed to provide support for downloading video files. [8]
b) Describe how the resources are managed to achieve QOS for an application in a distributed multimedia system. [8]

- Q7)** a) Draw and explain in detail architecture of web service and principle behind introducing the concept of web service. [8]
b) Discuss the structure of request and response messages of HTTP for communication between a client and server. [8]

OR

- Q8)** a) Draw and explain the general organization of an Apache web server. [8]
b) Give the disadvantage of using hierarchical caches for a web proxy. How can it be overcome through cooperative caching? [8]

- Q9)** a) How are digital signatures used for message authentication? Point out the generation and verification process of a digital signature using public key cryptography. [9]
b) Explain the secure mobile code in brief with reference to Java sandbox. [9]

OR

- Q10)** a) Discuss various security mechanisms in distributed systems? [9]
b) Describe the authentication process to log into a distributed system which uses Kerberos to setup a secure channel. [9]



Total No. of Questions : 10]

SEAT No. :

P4007

[5561]-714

[Total No. of Pages : 2

B.E. (Information Technology)
UBIQUITOUS COMPUTING
(2015 Pattern) (Semester - II) (414463)

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) What are the features of ubiquitous computing? [5]

b) Explain all core properties of pervasive computing? [5]

OR

Q2) a) List and explain three main types of environment context? [5]

b) Explain micro-actuation and sensing (MEMS) in detail? [5]

Q3) a) Explain smart devices under CPI and CCI? [5]

b) Explain types of transparency mobile services? [5]

OR

Q4) a) Explain proxy based service access and give its disadvantages? [5]

b) Explain three major types of robot? [5]

Q5) a) Explain human entered design lifecycle in detail with diagram? [8]

b) List out all handling limited key input and explain it in detail? [8]

OR

Q6) a) Write short note on : [9]

- i) Multi-modal visual interface
- ii) Gesture interface
- iii) Tangible interface

b) Describe user models and its acquisition and representation? [7]

P.T.O.

- Q7)** a) Define and explain all ways of addressing privacy in ubiquitous system? [8]
b) Explain Solov's taxonomy of privacy with diagram? [8]

OR

- Q8)** a) Describe all privacy difficulties and challenges of RFID tag? [8]
b) Describe all challenges to privacy for ubiquitous computing? [8]

- Q9)** a) Write short note on : [12]

- i) Network protocol suits
- ii) Routing and inter-networking
- iii) PSTN voice network
- iv) Configuration management

- b) Describe wireless data network with its types? [6]

OR

- Q10)** a) Write short on : [8]

- i) Personal area network
- ii) Body area network

- b) Explain multi-path routing in mobile ad hoc network (MANET) with neat diagram. [6]

- c) Explain mesh network and overlay network with diagram. [4]



Total No. of Questions : 10]

SEAT No. :

P4008

[5561]-715

[Total No. of Pages : 2

**B.E. (Information Technology)
INTERNET OF THINGS (IOT)**

(2015 Pattern) (414464(A)) (Elective-III) (Semester - II)

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) Assume suitable data if necessary.

- Q1)** a) Explain IOT architecture with neat diagram. [5]
b) Define IOT. Explain any one application of IOT. [5]

OR

- Q2)** a) Describe IOT level 6 with an example. [5]
b) Explain publish - subscribe model in detail. [5]

- Q3)** a) List and explain IOT functional stack along with its sub-layers. [5]
b) How do data collection and analysis approaches differ in M2M and IOT. [5]

OR

- Q4)** a) Write a short note on IEEE 802.15.4 access technology. [5]
b) Write in detail about classifications of sensors and actuators. [5]

- Q5)** a) Explain IPV6 address space & Transmission modes. [8]
b) Describe IPV6 packet format & compare IPV4 & IPV6 headers. [8]

OR

- Q6)** a) With neat diagram explain MIPV6 in detail. [8]
b) Write a short note on Goals & header stacks of 6LOWPAN. [8]

- Q7)** a) What is Raspberry Pi? Explain about its versions and various interfaces in detail. [8]
b) Draw and explain Raspberry Pi block diagram and its components. [8]

OR

P.T.O.

- Q8)** a) Draw diagram and write algorithm and Python code to control LED using Raspberry Pi. [8]
- b) Explain in brief: [8]
- i) PC Duino.
 - ii) Beaglebone Board.
 - iii) Cubie board.

- Q9)** a) What is cloud storage? Briefly discuss advantages of cloud storage. [8]
- b) What is WAMP? List the key components of WAMP. What is autobahn? [10]

OR

- Q10)** a) What is Django? Explain Django architecture and template system. [8]
- b) What is amazon services for IOT? Explain concept of amazon auto scaling. List advantages and functions of amazon EC2. [10]



Total No. of Questions : 10]

SEAT No. :

P4009

[5561]-716

[Total No. of Pages : 2

B.E. (Information Technology)

INFORMATION STORAGE & RETRIEVAL

(2015 Course) (414464B) (Semester - II) (Elective - III)

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.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) Differentiate between data retrieval and information retrieval. [6]
b) List with definition different measures of association. [4]

OR

- Q2)** a) Compare Boolean and vector model. [6]
b) List and explain steps of conflation algorithm. [4]

- Q3)** a) Explain the terms Harmonic mean, E measure, R precision, Precision histogram. [5]
b) Explain basic concept for Information Retrieval. Draw IR system block diagram. [5]

OR

- Q4)** a) Dissimilarity matrix is given as follows. [5]

1					
2	0.6				
3	0.6	0.8			
4	0.9	0.9	0.7		
5	0.9	0.6	0.6	0.9	
6	0.5	0.5	0.9	0.5	0.5
	1	2	3	4	5
					6

Threshold 0.4, 0.6, 0.8, 0.9.

Apply single link algorithm and calculate cluster for above 6 objects.

- b) Explain signature structure in detail. [5]

- Q5)** a) What do you understand by multimedia query language? Explain various query predictors. [9]

- b) Explain GEMINI approach for multimedia IR. [9]

OR

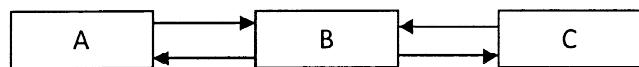
P.T.O.

- Q6)** a) Describe multimedia data support in commercial DBMS. [9]
b) Describe the architecture of distributed IR. [9]

- Q7)** a) What is web crawling? Explain techniques used by web crawlers to crawl the web. [8]
b) Write short note on web data mining. [8]

OR

- Q8)** a) Discuss the challenges involved in web search engine. [8]
b) What is page ranking? Calculate page rank of following web pages. Assume damping factor 7.0. [8]



- Q9)** a) Define Recommender system? Explain in brief collaborative filtering. [8]
b) Explain semantic web in detail. [8]

OR

- Q10)** a) Write a note on "Ontology languages for semantic web". [8]
b) Explain the method for extracting data from text. [8]



Total No. of Questions : 10]

SEAT No. :

P4010

[5561]-717

[Total No. of Pages : 2

B.E. (IT)

MULTIMEDIA TECHNIQUES
(2015 Course) (414464(C)) (Elective - III)

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.

- Q1)** a) Distinguish between author and audience and image and graphics, video and animation, production and playback. [4]
b) Calculate the audio-CD file size for [6]
i) 16-bit stereo mode.
ii) 8-bit mono mode.

OR

- Q2)** a) What do you mean by non-linearity in multimedia presentation? [4]
b) What is chroma subsampling technique? Explain with suitable diagrams. [6]

- Q3)** a) What are the specification parameters of a digital image? [4]
b) Explain MPEG-4 encoder with suitable diagram. [6]

OR

- Q4)** a) Differentiate between lossy and lossless compression types. [4]
b) Encode the text "TOBEORNOTTOBE" using LZW coding technique and find compression ratio. [6]

- Q5)** a) What is meant by keyframe and tweening? What are its roles in animation? [8]

- b) What is GLUT? Which are routines provided for various functions? [8]

OR

- Q6)** a) Explain any four principles of animation with suitable examples. [8]
b) Write a note on 1. VR Hand Gloves & Head Mounted Display. [8]

P.T.O.

- Q7)** a) What is the problem polygon mesh shading? How to solve that problem? [8]
b) What is ray-tracing? Explain direct and indirect illumination with suitable diagram. [8]

OR

- Q8)** a) Prove that "Whitted algorithm is recursive". [8]
b) What is difference between illumination and shading? What are types of illumination? [8]

- Q9)** a) Explain Resource ReSerVation Protocol (RSVP) in multimedia. [6]
b) What is meant by buffer management? How it can be beneficial for media transmission? [6]
c) What are the types of communication network which provides multimedia communication services? [6]

OR

- Q10)** a) Briefly explain following broadcast schemes for video on demand. [6]
i) Staggered broadcasting.
ii) Pyramid broadcasting.
b) Justify, "Gaming has changed its form of playing". [6]
c) What is GStreamer? Why to use GStreamer? [6]



Total No. of Questions : 10]

SEAT No. :

P4011

[5561]-718

[Total No. of Pages : 2

B.E. (IT)

**INTERNET AND WEB PROGRAMMING
(2015 Course) (Semester - II) (Elective - III(D))**

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) Assume suitable data if necessary.

- Q1)** a) Explain the features of HTML5. [4]
b) Write a program in HTML5 for creating table of IPL-2019 teams having serial number, name of team, name of caption, name of main coach, names of 3 key players. [6]

OR

- Q2)** a) What are data types in JavaScript? [4]
b) Write a program in JavaScript to generate prompt () and alert () messages. [6]

- Q3)** a) What are different selectors in jQuery? Explain them. [4]
b) Describe following functions used in PHP with example. [6]
i) Strlen(),
ii) Strpos(),
iii) Strcmp().

OR

- Q4)** a) Write a program to create 'Hello World' Servlet. [4]
b) What do you mean by JSON? What are different data types of JSON? [6]

- Q5)** a) What is CMS? Explain various types of CMS development tools. Also discuss its advantages. [8]
b) Explain architecture of Joomla. What are advantages and disadvantages of Joomla. [10]

OR

- Q6)** a) What is Web Service? What are general features of Web Services? [8]
b) What is JSF? Explain JSF architecture. Also discuss its advantages. [10]

P.T.O.

- Q7)** a) Explain different types of Mobile devices. [8]
b) What is jQuery Mobile? How to implement jQuery mobile. [8]

OR

- Q8)** a) What is Mobile Web? What are standards of Mobile Web? How do I access mobile? [8]
b) Explain how to write headers and footers in jQuery Mobile. [8]

- Q9)** a) What are the cyber ethics? Explain issues in cyber ethics. [8]
b) What is Web security? Explain need of Web security? [8]

OR

- Q10)** a) What do you mean by threat? What are the common threats on Web? [8]
b) Differentiate user level security with server level security. [8]



Total No. of Questions : 10]

SEAT No. :

P4012

[5561]-719

[Total No. of Pages : 4

B.E. (I.T.)

COMPUTATIONAL OPTIMIZATION
(2015 Course) (Semester - II) (Elective - III)

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 calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Determine initial basic feasible solution to the following transportation problem using Least cost method. [5]

5	2	4	3	22
4	8	1	6	15
4	6	7	5	8
7	12	17	9	

b) A company uses Rs. 10,000 worth of an item during the year. The ordering costs are Rs. 25 per order and carrying charges are 12.5% of average inventory values. Find the EOQ & no. of orders per year. [5]

OR

Q2) a) Draw the network diagram on the basis of following data. [5]

Activity : 1-2 1-4 1-7 2-3 3-6 4-5 4-8 5-6 6-9 7-8 8-9 9-10

Time (days) : 2 2 1 4 1 5 8 4 3 3 5 2

Find critical path and total duration.

b) Solve the following assignment problem : [5]

	A	B	C	D
1	12	10	10	8
2	14	12	15	11
3	6	10	16	4
4	8	10	9	7

Q3) a) Explain total float, free float and independant float. How they are determined? [5]

b) Explain EOQ. Derive the formula for EOQ when demand rate is uniform and replenishment rate is infinite. [5]

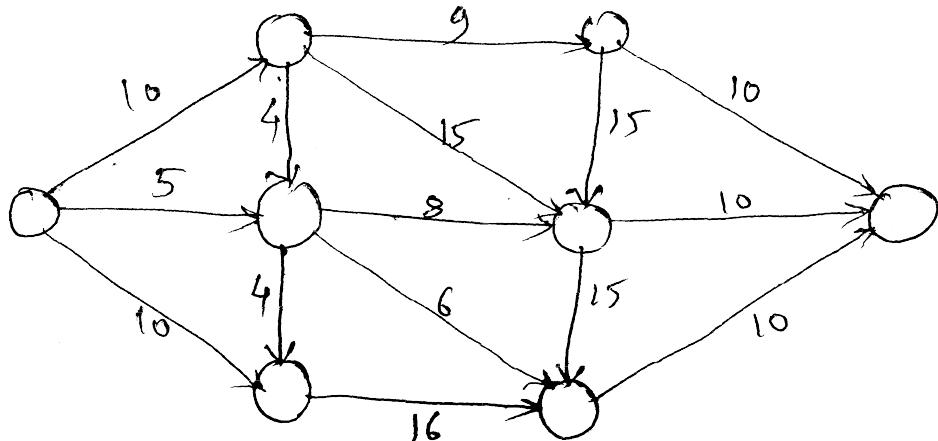
OR

P.T.O.

Q4) a) Define the following terms : [5]

- i) Slack variable.
- ii) Surplus variable.
- iii) Entering variable.
- iv) Leaving variable.
- v) Key column.

b) Determine max flow using ford Fulkerson's algorithm. [5]



Q5) a) Reduce the following game by dominance and find the value of game. [8]

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

b) Solve the following game by graphical method : [8]

		B			
		I	II	III	IV
A	I	3	3	4	0
	II	5	4	3	7

OR

Q6) a) Find the range of p&q so that entry (2, 2) is saddle point in the following games. [8]

i)

		B		
		2	q	4
A	p	6	11	
	7	3	4	

ii)

		B
A		
	0	2
	8	5
	2	p
		4

b) Solve the following using dominance method :

[8]

	I	II	III	IV	V	VI
I	4	2	0	2	1	1
II	4	3	1	3	2	2
III	4	3	7	-5	1	2
IV	4	3	4	-1	2	2
V	4	3	3	-2	2	2

Q7) a) In a populated state babies are born at the rate of 3 birth per hour. Determine : [10]

- The average no. of babies born in 5 hours.
- Probability that no babies are born in next four hours.
- Probability that time between two successive births is 3 hours.

b) With the help of neat diagram, explain major constituents of queuing systems. Also list and define operating characteristics of queuing system.

[8]

OR

Q8) a) In a clinic, the average rate of arrival of patients is 15 per hour. On an average a doctor serves the patient at the rate of one patient every three minutes. Assume the arrival follows a Poisson distribution and service to patients follow an exponential distribution. [8]

- Find average no. of patients in waiting line.
- Find average waiting time in waiting line.
- Find average waiting time in the clinic.

- b) At petrol pump, customers arrive according to Poisson process with an average time of 3 minutes between arrivals. The service time is exponentially distributed with mean time equal to 2 minutes. Find, [10]
- i) What will be average queue length?
 - ii) What would be average no. of customers in queuing system?
 - iii) What is average time spent by a car in pump?
 - iv) What is average waiting time of a car before receiving petrol?

- Q9)** a) Explain few real world applications of evolutionary approach. [8]
b) Write short note on genetic algorithm. [8]

OR

- Q10)** a) Write short note on simulated annealing. [8]
b) Explain in brief different methods of indirect search. [8]



Total No. of Questions : 10]

SEAT No. :

P4013

[5561]-720

[Total No. of Pages : 2

B.E. (Information Technology)

RURAL TECHNOLOGIES AND COMMUNITY DEVELOPMENT

(2015 Course) (Semester - II) (Elective-IV) (414465A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer the 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) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) What is the need of rural development? [6]

b) With the help of an example explain the difference between growth and development. [4]

OR

Q2) a) What are the environmental considerations to be taken care of when creating energy? [6]

b) What is the role of non-agricultural sub-sector in rural development? [4]

Q3) a) What are the measures of income distribution? [6]

b) How do we measure the quality of water? [4]

OR

Q4) a) Is the Gandhian Concept of Rural Development applicable in today's rural villages? [6]

b) What is head count index and poverty gap index? [4]

Q5) a) Explain key characteristics of community development? [10]

b) What are the community development issues? [6]

OR

P.T.O.

- Q6)** a) What are the various ways in which the knowledge base of community development can be enhanced? [10]
b) Write a note on International community development? [6]

- Q7)** a) Explain briefly the various forms of rural entrepreneurship. [10]
b) Explain the significance of rural entrepreneurship. [8]

OR

- Q8)** a) What are the various forms of business enterprise? [10]
b) For rural entrepreneurship what financial resources are available? [8]

- Q9)** a) Explain the role of micro finance institutions in rural development. [10]
b) What is watershed management? [6]

OR

- Q10)** a) What is the role of women self help group in development? [6]
b) What is the role of ICT in rural development and agriculture? [10]



Total No. of Questions : 10]

SEAT No. :

P4014

[5561]-721

[Total No. of Pages : 2

**B.E. (Information Technology)
PARALLEL COMPUTING**

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

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer the 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 necessary.

Q1) a) Explain Flynn's Classification? [5]

b) Differentiate between a multi-processor system and multi core system? [5]

OR

Q2) a) Explain dependency analysis. [6]

b) Explain shared memory Model. [4]

Q3) a) Explain the use of binary tree network? [4]

b) What are different techniques for parallelizing programs? [6]

OR

Q4) a) Explain how the snooping is used to maintain cache coherence on centralized multiprocessors? [6]

b) Define speedup and efficiency? [4]

Q5) a) Explain OpenMP Execution model with core syntax? [10]

b) Discuss different kinds of data dependencies. [6]

OR

Q6) a) Discuss four OpenMP directives with their constructs. [8]

b) Discuss OpenMP Integration with an example? [8]

P.T.O.

Q7) a) Explain MPI features in detail? [10]

b) Explain non blocking communication in MPI. [8]

OR

Q8) a) Explain GPU Architecture with neat diagram? [10]

b) Discuss various MPI collective operations? [8]

Q9) a) Explain working of CUDA programming Model? [8]

b) Write short note on “CUDA Threads and Memories” [8]

OR

Q10)a) Explain Thread/branch divergence in GPU Programming. [8]

b) Explain any one application of GPU Computing. [8]



Total No. of Questions : 10]

SEAT No. :

P4015

[Total No. of Pages : 2

[5561]-722

B.E. (Information Technology)

COMPUTER VISION

(2015 Pattern) (Semester - II) (End Semester) (Elective-IV) (414465C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer the 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 necessary.

Q1) a) Apply following image point processing and filtering operations on the given image? [6]

- i) Low pass smoothing filter $[3 \times 3]$
- ii) Image Thresholding with $t = 120$.

200	100	150	220	30
20	120	30	250	130
120	140	150	180	200
200	120	150	100	100
200	180	130	100	80

b) Elaborate chain codes as four directional boundary descriptor? [4]

OR

Q2) a) Demonstrate steps of Hough Transform for Line Detection? [6]

b) Differentiate between High Pass and High Boost Filtering in Image processing? [4]

Q3) a) Elaborate polygonal approximation for boundary description of shape in images? [6]

b) Elaborate steps of Generalized Hough transform for eclipse detection in Human Iris? [4]

OR

P.T.O.

- Q4)** a) Demonstrate all steps of ‘Hit or Miss’ Morphological Algorithm with help of an example for object detection? [6]
b) Elaborate Fourier Descriptors with examples? [4]

- Q5)** a) Differentiate between the surface representation & point based representation of 3D Vision? [8]
b) Elaborate the 3D vision projection scheme ‘Shape from shading’ and ‘Photometric stereo’? [8]

OR

- Q6)** a) Elaborate 3D Motion with help of transitional alignment and parametric motion? [8]
b) Differentiate between the Volumetric representation & point based representation of 3D Vision? [8]

- Q7)** a) Explain applicability of Motion Detection and Tracking in Computer Vision? [8]
b) Elaborate the Single and Multi object tracking process and applications in Computer Vision? [8]

OR

- Q8)** a) Elaborate the significance of Background subtraction in object detection and tracking with listing of algorithmic steps? [8]
b) Write short notes on Mixture of Gaussians (MoG) and Block Matching for Object Tracking? [8]

- Q9)** a) Elaborate the steps of Face detection and face recognition using Eigen Faces? [10]
b) Elaborate the steps of Foreground - Background separation in Surveillance with particle filters? [8]

OR

- Q10)** a) Elaborate the significance and steps of Human Gait Analysis in applications like in locating pedestrians for vehicle vision system? [10]
b) Enlist and Discuss the challenges faced in combining views from multiple camera in surveillance? [8]



Total No. of Questions : 10]

SEAT No. :

P4016

[5561]-723

[Total No. of Pages : 3

**B.E. (Information Technology)
SOCIAL MEDIA ANALYTICS**

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What is public and private data in Social media? Give example. [5]
b) Write a short note on Ontology based Visualization. [5]

OR

- Q2)** a) Explain different method of Data Gathering in Social Media. [5]
b) Explain hierarchical clustering algorithm with single linkage clustering. [5]

- Q3)** a) What do you mean by Sampling for Social Networks data? What is the need for sampling? [5]
b) Write about different social media platforms. [5]

OR

- Q4)** a) Which are the major methods used for data mining in social networks? [5]
b) Write a note on text mining in social networks. [5]

- Q5)** a) What is Centrality? Explain Degree Centrality and Katz Centrality with examples. [8]
b) Explain Transitivity and Reciprocity with equations. [8]

OR

- Q6)** a) How Similarity between two nodes can be computed using Structural Equivalence? [8]
b) Explain Balance and Status theory using proper examples. [8]

P.T.O.

Q7) a) Write major components of Behavior Analysis Methodology. [8]

b) Explain Collective Behavior Prediction using sample example. [8]

OR

Q8) a) What are the Node Neighborhood-Based methods? [8]

b) Explain how User Migration can be used in Collective Behavior Analysis. [8]

Q9) a) How would you define Twitter? Explain with different services. [9]

b) Explore Facebook's Social Graph API. [9]

OR

Q10)a) Write a note note on Mining Twitteer. [9]

b) Explain Facebook with analyzing social graph conections. [9]



Total No. of Questions : 10]

SEAT No. :

P4017

[Total No. of Pages : 2

[5561]-724

B.E. (Chemical)

PROCESS DYNAMICS AND CONTROL
(2015 Course) (409341)

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) Assume Suitable Data if necessary.

Q1) a) Derive transfer function of mercury thermometer. [5]

b) A mercury thermometer having a time constant of 1 minute is initially at 50°C. At time t = 0, thermometer is placed in a temperature bath maintained at 100°C. Determine thermometer reading at 1.2 minute. [5]

OR

Q2) a) Derive transfer function for servo problem for negative feedback control system. [5]

b) Explain control system of stirred tank heater. [5]

Q3) Sketch root locus and explain for the stability of [10]

$$GH = \frac{K}{(S+1)(S+2)(S+3)}$$

OR

Q4) a) Derive transfer function of pure capacitive process. [5]

b) Explain Routh theorems of stability. [5]

Q5) a) Draw asymptotic Bode diagram for $GH = \frac{800(S+2)}{S^2(S+10)(S+40)}$. Explain for stability. [12]

b) Explain Ziegler Nicholes tuning technique. [6]

OR

P.T.O.

- Q6)** a) Draw Bode diagram for
i) first order system
ii) PD controller
iii) PI controller [12]
b) Explain gain margin and phase margin. [6]

- Q7)** a) Explain cascade control system for CSTR. [8]
b) Explain ratio control system. [8]

OR

- Q8)** a) Explain split range control system. [8]
b) Explain inferential control system. [8]

- Q9)** a) Explain PLC and SCADA in detail. [8]
b) Explain use of digital computer in control of a process. [8]

OR

- Q10)** a) Explain plant wide control for plants with any suitable example. [8]
b) Explain sampling of continuous signals to discrete - time signals. [8]



Total No. of Questions : 10]

SEAT No. :

P4018

[5561]-725

[Total No. of Pages : 3

B.E. (Chemical Engineering)

**CHEMICAL REACTION ENGINEERING - 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, 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 the Shrinking Particle Model with a neat sketch. [5]

b) Explain the kinetic regimes in fluid-fluid non-catalytic reactions. [5]

OR

Q2) a) A batch of solids of uniform size is treated by gas in a uniform environment. Solid is converted to give a non-flaking product according to the shrinking core model. Conversion is about 7/8 for a reaction time of 1 h. Conversion is complete in two hours. What mechanism is controlling? Derive the relevant equation. [7]

b) What is the significance of Hatta number? [3]

Q3) The following data were obtained at -195.8°C for the equilibrium adsorption of nitrogen on 8.01 gm of glaucosil. [10]

PP of Nitrogen (mmHg)	6	25	140	230	285	320	430	505
Volume adsorbed, cm ³ at 0°C and 1 atm.	61	127	170	197	215	230	277	355

The vapour pressure of nitrogen at -195.8°C is 1 atm. Estimate the surface area of the sample in m² per gram.

OR

P.T.O.

- Q4)** a) Describe the nitrogen desorption method for the determination of pore size distribution. [5]
- b) Explain the combined mercury-penetration and nitrogen-desorption method. [5]

- Q5)** a) Derive an equation for the drop in concentration of a cylindrical pore in a porous catalyst and define effectiveness factor. [8]
- b) A reaction $A \rightarrow R$, is to take place on a porous catalyst pellet ($d_p = 6 \text{ mm}$, $D_e = 10^{-6} \text{ m}^3/\text{m cat. s}$). How much is the rate slowed down by pore diffusion resistance if the concentration of the reactant bathing the particle is 110 mol/m^3 and the diffusion free kinetics are given by

$$-r_A''' = 0.1 C_A^2 \frac{\text{mol}}{\text{m}^3 \text{cat.s}}. \quad [8]$$

OR

- Q6)** a) Derive the equation for temperature drop across the film and across the particle and explain the effect of the two on reaction rate. [6]
- b) The catalytic decomposition of reactant $A \rightarrow R$ is studied in a packed bed reactor filled with 2.4 mm pellets and using a very high recycle rate of product. Find the kinetics of reaction and deactivation both in diffusion free and in strong pore resistance regime. The results and data : $D_e = 5 \times 10^{-10} \text{ m}^3/\text{m cat. s}$, $\rho_s = 1550 \text{ kg/m}^3$ cat., $\tau' = 4000 \text{ kg. s/m}^3$. [10]

t, hr	0	2	4	6
X _A	0.75	0.64	0.52	0.39

- Q7)** a) A reaction $A \rightarrow 4R$ is studied in a plug flow reactor using various amounts of catalyst. 20 l/h of pure A is fed to the reactor at 3.7 atm. and 125°C . The concentration of A in various runs is as follows : [10]

Runs	1	2	3	4
Cat. kg	0.02	0.04	0.08	0.16
C _{A,out} , mol/l	0.074	0.06	0.044	0.029

Find the rate equation using the integral method of analysis.

- b) Derive an equation for determining the rate of independent deactivation for batch solids and constant mixed flow of fluid. [8]

OR

- Q8)** a) What are the various experimental methods for finding the rates of solid catalyzed reactions? [8]

- b) For the reaction $A \rightarrow 4R$ the following rate concentration data are available

CA mol/l	0.039	0.0575	0.075	0.092
$-r_A'$ mol A/h. kg cat	3.4	5.4	7.6	9.1

Directly from this data and without using the rate equation find the size of packed bed reactor for treating 1000 mol/h of pure A at 117°C to 35% conversion all at 3.2 atm. [10]

- Q9)** a) Explain Micheles-Menten kinetics in detail. [8]

- b) Explain the staged adiabatic packed bed reactors with intercooling and show how two stage reactors can be optimized. [8]

OR

- Q10)** a) Explain enzymatic fermentation reaction. [8]

- b) What are the steps involved in the design of a fluidized bed reactor? [8]



Total No. of Questions :10]

SEAT No. :

P4020

[Total No. of Pages : 1

[5561]-727

B.E. (Chemical)

ENVIRONMENTAL ENGINEERING

(2015 Course) (409344A) (Elective - I) (Semester - I)

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 side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) Discuss the effect of SO₂ on human, vegetation and on materials? [10]

OR

Q2) What are the levels of PM 10 pollution in India? [10]

Q3) Draw the neat diagram of Centrifugal Scrubber and explain its working [10]

OR

Q4) Explain the Operating principles of settling chamber with neat figure. [10]

Q5) Explain the types of water pollutants and how they are classified? [16]

OR

Q6) What is oxygen deficit with example? [16]

Q7) Explain the working of photo catalytic reactor with neat figure and example. [18]

OR

Q8) The BOD results given below are observed on a sample of wastewater

t days	0	1	2	4	6	8	10
BOD mg/lit	0	6.5	11	18	22	24	26

[18]

Q9) Explain micro screening Process in waste water treatment. [16]

OR

Q10) Explain Biological Nitrification process in detail. [16]



Total No. of Questions :10]

SEAT No. :

P4021

[5561]-728

[Total No. of Pages : 2

B.E. (Chemical)

MEMBRANE TECHNOLOGY

(2015 Pattern) (Semester - I) (End Semester) (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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Define membrane? Explain isotropic and anisotropic membranes. [6]

- b) Define following terms
- i) Permeability
 - ii) Separation factor

[4]

OR

Q2) a) Explain in details about characterization of membrane. [6]

- b) Give benefit and drawbacks of membrane processes over conventional separation processes. [4]

Q3) a) Explain in details with neat sketches interfacial polymerization membranes. [5]

- b) Explain in details application of inorganic and metallic membranes. [5]

OR

Q4) a) Explain in details about vibrating and rotating module. [6]

- b) Give short notes with equation on transport through micro porous and dense membrane? [4]

Q5) a) Explain in details methods of reducing fouling. [8]

- b) Explain in details boundary layer film model. [8]

OR

P.T.O.

- Q6)** a) What is concentration polarization? And give the methods to reducing concentration polarization. [8]
b) Explain in details about osmotic pressure model. [8]

- Q7)** a) Define desalination? And explain types of desalination with application RO membrane for sea water. [10]
b) Give the application of ultrafiltration membrane for clarification of fruit juice. [6]

OR

- Q8)** a) Describe in details application of microfiltration membrane for sterilization of wine and beer. [10]
b) Give in details application reverse osmosis membrane for waste water treatment. [6]

- Q9)** a) Describe in details with suitable sketches and reactions application of membrane for separation of hydrogen gas. [10]
b) Explain in details about membrane bioreactor and give one application. [8]

OR

- Q10)** a) Explain in details with neat sketches about membrane distillation. [8]
b) Describe in details application membrane carbon dioxide separation. [10]



Total No. of Questions :10]

SEAT No. :

P4022

[5561]-729

[Total No. of Pages : 2

**B.E. (Chemical Engineering)
CORROSION ENGINEERING**

(2015 Pattern) (Semester - I) (Elective - I) (409344C)

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*

Q1) What is Nernst equation for electrode potential? Under what conditions Nernst equation can be applied to corrosion reactions and calculation of corrosion rates? [10]

OR

Q2) a) Write the discrepancies of EMF series and explain them in brief. [5]
b) With suitable illustrations, explain the throwing power of plating bath. [5]

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) Metal cladding
 ii) Fretting corrosion
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 Nerst equation for electrode potential and that to corrosion reactions also. [8]

Q9) a) With a neat diagram explain the concept of cavitation in detail. Explain the remedial measures of the same. Also explain how the cavitation can be useful in the treatment of waste water. [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 passivity and anodic protection? Explain it with neat diagram. [8]



Total No. of Questions :10]

SEAT No. :

P4023

[Total No. of Pages : 2

[5561]-730

B.E. Chemical

PETROLEUM REFINING

(2015 Pattern) (Semester - I) (End Sem) (Elective-I) (409344D)

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 the right indicates full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume Suitable data, if necessary.

Q1) a) Define & explain the following terms [6]

- i) Fire Point
- ii) Octane Number
- iii) Smoke point

b) Discuss the composition & exploration of petroleum? [4]

OR

Q2) a) Discuss the electric desalting process with typical diagram? [6]

b) What are the key issues and challenges for refineries in India? [4]

Q3) Describe heating through exchangers and pipe still heaters [10]

OR

Q4) a) Explain operation, working of catalytic cracking process with typical diagram? [5]

b) Write recent development of FCC along with neat schematic diagram? [5]

P.T.O.

- Q5)** a) Describe dewaxing operation with schematic diagram [8]
b) Explain Solvent extraction with neat schematic diagram? [8]

OR

- Q6)** a) Describe the bitumen manufacturing process with typical diagram? [8]
b) Explain in detail about various properties of lube oil? [8]

- Q7)** a) Why desulphurization is necessary in the refinery? Discuss Hydro-desulphurization process with typical schematic diagram along with reaction and operating parameters [12]
b) What is the blending operation and explain the line blending operation? [5]

OR

- Q8)** a) Describe the process of Hydro treating with typical schematic diagram [9]
b) Write in details about Environmental aspects used in the refineries [8]

- Q9)** a) Write in details about storage aspects used 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 housekeeping strategies used for petroleum and petroleum products [8]



Total No. of Questions : 10]

SEAT No. :

P4024

[Total No. of Pages : 2

[5561]-731
B.E. (Chemical)
CHEMICAL PROCESS SYNTHESIS
(2015 Course) (Semester - I) (Elective - II)(409345A)

Time : 3 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 the concept of Onion Model. [5]

b) Write in brief different approaches in process development. [5]

OR

Q2) a) Explain various types of reaction systems in choice of reactors. [10]

Q3) a) Explain the effect of following parameters on choice of reactor. [10]

- a) Temperature
- b) Catalyst

OR

Q4) Write down the different reaction paths for the choice of reactors. [10]

Q5) a) Discuss various types of dryers. [8]

b) Explain azeotropic distillation with suitable example. [8]

OR

P.T.O.

Q6) Write notes on following for separation of mixtures: [16]

- a) Evaporation
- b) Absorption

Q7) Explain with sketches the concept of heat integration by thermal coupling.

[16]

OR

Q8) a) Discuss of integration of heat pump. [8]

- b) Explain the composite curves. Write down a simple heat recovery problem with one hot stream and one cold stream. [8]

Q9) a) Explain the concept of Pinch technology. [9]

- b) Explain the problem Table Algorithm in Pinch technology. [9]

OR

Q10) a) Explain the intensification of hazardous materials. [8]

- b) Write in brief on: [10]

- i) Overall safety and health considerations in Chemical plant.
- ii) Fire hazards in Chemical industry.



INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP
(2015 Pattern) (Semester - I) (Elective-II) (409345B)

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 right indicate full marks.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Assume suitable data, if necessary.

Q1) Differeniate between:

- | | |
|----------------------------------|------------|
| a) Entrepreneur and Intrapreneur | [5] |
| b) Entrepreneur and Manager | [5] |

OR

Q2) Write short note on:

- | | |
|---------------------|------------|
| a) Entrepreneurship | [5] |
| b) Manager | [5] |

Q3) Describe the role of Entrepreneur in Indian economy with typical examples? **[10]**

OR

Q4) Explain the role of National Institute of Entrepreneurship and Small Business Development (NIESBUD) and Small Industries Service Institute (SISI) in Entrepreneurship development. **[10]****Q5)** a) Write and explanatory note of team role theory by Belbin. **[8]**
 b) Discuss various management theories and managerial work. **[8]**

OR

Q6) a) Explain Business communication and communication process. **[8]**
 b) Explain the Hierarchy of needs given by Abraham Maslow. **[8]**

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) Describe various project management concepts. [8]

Q9) a) Write note on Channel of Distribution. [9]

b) Describe promotion and pricing. [8]

OR

Q10)a) Discuss the various strategies of product and brand management. [9]

b) Describe the role of marketing in society and the firm. [8]



PIPING DESIGN AND ENGINEERING
(2015 Pattern) (Semester - I) (Elective-II)

Time : 2½ Hours]**[Max. Marks : 70****Instructions to the candidates:**

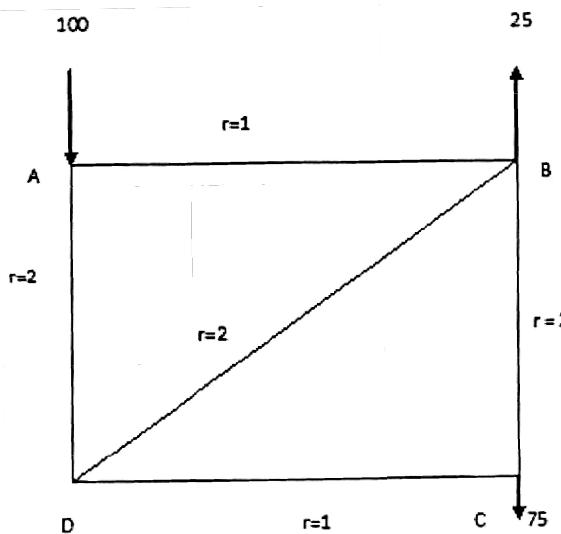
- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagram must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) For the network shown in figure. The head loss is given by $hf = rQ^{1.85}$. 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.

To start the calculations the following discharges are suggested

[10]

Line	AB	BD	AD
Discharge	56	03	44
Direction	A to B	B to D	A to D

**OR**

Q2) Explain selection of material for piping and desirable properties of piping materials. **[10]**

Q3) Explain [10]

- a) Gate Valve
- b) Globe Valve

OR

Q4) Newtonian and non-Newtonian fluid. [10]

Q5) a) Explain NPSHa and NPSHr. [8]

- b) Explain the homogeneous and Heterogeneous flow in slurry pipe lines. [8]

OR

Q6) a) Explain line sizing of pneumatic conveying of solids. [8]

- b) Explain line sizing of flare stacks. [8]

Q7) a) A steam pipe with 100 mm I.D. and 110 mm O.D. is covered with an insulating material having thermal conductivity $1.0 \text{ W}/(\text{m.K})$. The steam temperature is 473 K and the ambient temperature is 293 K. Taking the convective heat transfer coefficient between the insulation surface and air as $8.0 \text{ W}/(\text{m}^2.\text{K})$, find the critical radius of insulation. For this value (r_c), calculate the heat loss per meter of pipe and outer surface temperature. Neglect the resistance of the pipe wall. [8]

- b) Derive relation for critical radius of insulation of sphere having radius R. [8]

OR

Q8) a) Why thermal insulation is necessary? What are the important requirements of an insulating material. [8]

- b) Write a short Notes on
 - i) Critical thickness of insulation
 - ii) Hot and Cold insulation in piping[8]

Q9) a) Explain BOM and Piping isometrics. [9]

- b) Explain piping layouts considerations of
 - i) Pipe racks
 - ii) Pumps[9]

OR

Q10) a) Explain plot plan and equipment layout [9]

- b) Explain piping layouts considerations of
 - i) Heat Exchangers
 - ii) Storage Tank[9]



Total No. of Questions : 10]

SEAT No. :

P4027

[5561]-734

[Total No. of Pages : 2

B.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(Elective - II) (2015 Pattern) (409345D) (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) Assume suitable data, if necessary.

Q1) Explain Fenske's method in detail. [10]

OR

Q2) a) Explain the concept of K-values in multi component distillation. [5]
b) Explain Homogeneous azeotropic distillation in brief. [5]

Q3) Explain Thiele - Geddes method in detail. [10]

OR

Q4) a) Explain reactive distillation with industrial application. [5]
b) Give the industrial application of reversible chemical complexation. [5]

Q5) a) Explain the different types of the membranes with industrial applications. [8]
b) Explain the mechanism and application of the electrodialysis process. [8]

OR

Q6) a) Explain the mechanism of RO and MF with schematic diagram. [8]
b) Give the principle of pervaporation and explain in detail the mechanism of the process. [8]

P.T.O.

Q7) Explain the pressure swing and temperature swing adsorption in detail. [16]

OR

Q8) a) Explain the various types of chromatography. [8]

b) Explain the application of chromatography method. [8]

Q9) a) Give the classification and application of molecular sieves. [9]

b) Explain ultra centrifugation with industrial application. [9]

OR

Q10) Write short notes on the following: [18]

a) Zone refining

b) Zone electrophoresis



Total No. of Questions :10]

SEAT No. :

P4028

[5561]-735

[Total No. of Pages :3

B.E.(Chemical Engineering)

PROCESS MODELING AND SIMULATION

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

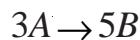
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Develop the complete batch-reactor model for a exothermic elementary reaction:



Derive the overall material balance, component balances and energy balance equations starting from the basic laws of conservations. The reactor is jacketed and the temperature is controlled by a coolant flow F_{co} through the jacket. If the reactor temperature is controlled by a proportional controller with gain K_c , explain the modification to be done in the final energy balance equation to accommodate the control law. [10]

OR

Q2) Define mathematical modelling and explain the types of models. Describe process simulation and mention its scope. [10]

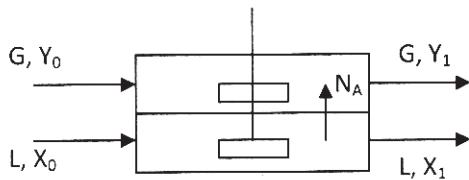
Q3) Derive the model equation for the laminar flow of a fluid through a packed bed column. [10]

OR

Q4) Develop the dynamic model of a double pipe heat exchanger operating on a continuous basis. Draw schematic of the heat exchanger and state the assumptions. [10]

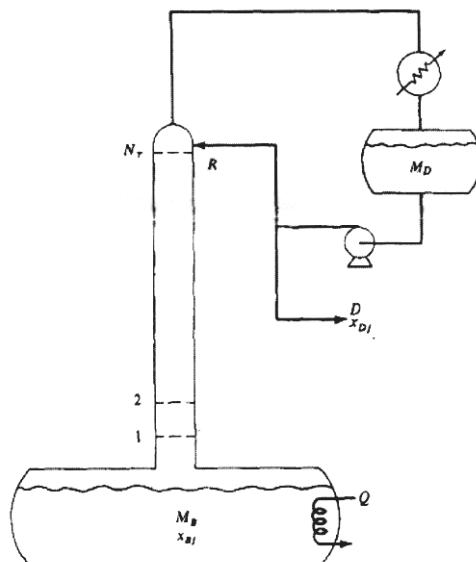
P.T.O.

- Q5)** A continuous mixer-settler extraction unit is operating as a perfectly mixed stage as shown in the figure. Develop the steady-state and unsteady-state model equations relating the process assuming a linear equilibrium relation. List all the assumptions. [16]

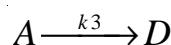
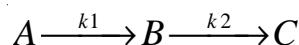


OR

- Q6)** Develop the model of a differential distillation for a binary system as shown in the figure. The system consists of a still pot containing a heater in which the liquid mixture is present. The column containing N_T trays is attached to the pot and separates the binary mixture in a stage-wise manner over time. Mainly derive the material and component balance relations for the still pot, the intermittent tray, the top tray, the reflux drum and the energy balance relation for the still pot. [16]



- Q7)** A batch reactor carries out the following series-parallel reactions: [16]



The reactions obey 1st-order kinetics and are endothermic. Thus the reactor is heated by passing steam in the reactor jacket at a volumetric flowrate of F_{so} . Develop the complete model of the process. Enlist all the assumptions.

OR

Q8) Develop the dynamic model of a trickle bed reactor of a desulfurization process wherein the rate of hydro-desulfurization is given by the Langmuir-Hinshelwood equation: [16]

$$-r_s = \frac{k P_{H_2} P_s}{(1 + k_T P_s + k_{H_2S} P_{H_2S})^2}$$

Where P_{H_2} = partial pressure of H_2

P_s = partial pressure of S (sulphur) and

P_{H_2S} = partial pressure of H_2S , while 'k' represents the respective rate constants.

Q9) A batch reactor, when modelled in a unsteady-state for a non-elementary reaction results in the following differential equation: [18]

$$\frac{dC_A}{dt} = -2C_A^3 + 12C_A^2 - 20C_A + 8.5$$

Where C_A is the concentration of the reactant in the reactor at time 't'. The initial concentration on the reactant $C_A(0)=1$ mol/L. Simulate the given reaction model using the Euler's numerical integration method , till time $t=0.5$ min to determine the reactant concentration. Consider a step size of $h=0.1$ and show all the five iterations. Explain the effect of step size on the simulation performance.

OR

Q10) Explain the following types of numerical methods used in the solution of different types of process models with examples: [18]

- a) Numerical integration methods to solve differential equations.
- b) Numerical methods to solve linear and nonlinear algebraic equations.



Total No. of Questions : 10]

SEAT No. :

P5149

[Total No. of Pages : 3

[5561]-736

B.E. (Chemical)

PROCESS ENGINEERING COSTING & PLANT DESIGN
(2015 Pattern) (Semester - II)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.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) Explain factors affecting on processes selection. [10]

OR

Q2) Explain types of insurances & taxes.

Q3) The Original value of a piece of equipment is Rs. 4500 completely installed and ready for use. Its salvage value is estimated to be Rs.300 at end of service life estimated to be 20 years. Determine the asset value of equipment at the end of 11 years using: [10]

- a) Straight line method
- b) Declining balance method
- c) Double declining balance (200%).

OR

Q4) Draw & Explain the tree diagrams showing the cash flow industrial operations.

Q5) a) Explain break even chart for production with its significances. [8]
b) Find the values of X,Y,Z that minimize the functions $X + 2Y_2 + Z_2$ subject to that $X+Y+Z=1$ making use of the Lagragian Multitier. [8]

OR

P.T.O.

- Q6)** a) Explain general procedure for determining optimum condition using analytical method.
- b) An organic chemical is being produced by a batch operation in which no product is obtained until the batch is finished. Each cycle consists of the operating time necessary to complete the reaction plus a total time of 1.4 h for discharging and charging. The operating time per cycle is equal to $1.5Pb^{0.25}h$, where Pb is the kilograms of product produced per batch. The operating costs during the operating period are \$20 per hour, and the costs during the discharge period are \$15 per hour. The annual fixed costs for the equipment vary with the size of the batch as follows:

$$C_F = 340Pb^{0.8} \text{ dollars per batch}$$

Inventory and storage charges may be neglected. If necessary, the plant can be operated 24 h per day for 300 days per year. The annual production is 1 million kg of product. At this capacity, raw- material and miscellaneous costs, other than those already mentioned, amount to \$260,000 per year.

Determine the cycle time for conditions of minimum total cost per year.

- Q7)** a) Write a note on optimum flow rate of cooling water in condenser. [8]
- b) Draw the composite curve for following systems. [8]

Stream	Stream type	Heat capacity flow	Source Temp.	Target Temp.
1	Hot	2.5	150	60
2	Hot	8	90	60
3	Cold	3	20	125
4	Cold	3	25	100

OR

- Q8)** a) Prepare the techno-economic feasibility report for XYZ fertilizer plant.
- b) Using the optimization, calculate the design cost of Heat exchanger in details.

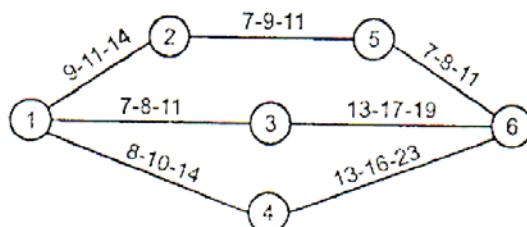
- Q9) a)** Draw a network diagram for the construction of bungalow with following activities. [9]

Activity	Event	Sub Event
A	1	2
B	1	3
C	3	4
D	2,4	5
E	4	6
F	5	7
G	7	8
H	6	9
I	5	10
J	8	11
K	10,11	12
L	9,12	13
M	13	14
N	14	15

- b) Differentiate between PERT and CPM. Illustrate the same with suitable examples. [9]

OR

- Q10)a)** Following network diagram shows the three estimates for various activities. Find the critical path considering:
- Optimistic time
 - Pessimistic time
 - Critical path using PERT. Also Earliest expected time.



- b) Explain the HAZOP study in details.



Total No. of Questions : 10]

SEAT No. :

P4768

[Total No. of Pages : 2

[5561]-737

B.E. (Chemical)

**Energy Conservation in Chemical Process Industries
(2015 Pattern) (End Semester)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer five questions.*
- 2) *Neat diagrams must be drawn wherever NECESSARY.*
- 3) *Use of logarithmic tables slide rule, ELECTRONIC POCKET CALCULATOR and steam tables is allowed.*
- 4) *Assume suitable data, if NECESSARY.*

Q1) Discuss the energy conservation act-2001 and its features. **[10]**

OR

Q2) Give the Classification of energy sources. **[10]**

Q3) State Energy Management & discuss the objectives of Energy Management. **[10]**

OR

Q4) Explain the role, responsibilities and duties of energy manager. **[10]**

Q5) What is co-generation? Explain the importance co-generation in sugar industries. **[16]**

OR

Q6) a) Write in details elements of energy management program. **[8]**
b) Enlist activities for promoting energy conservation in present status. **[8]**

P.T.O.

Q7) a) Give the checklist for energy conservation in motors and transformers. [8]

b) How and where the energy losses can be minimized in coolers. [8]

OR

Q8) Discuss the organization of energy conservation programs at plant level, division level and corporate level. [16]

Q9) Explain waste minimization and its classification, housekeeping, process change. Recycling, product modification, waste minimization steps, benefits of waste minimization in Sugar industry. [18]

OR

Q10) Explain waste minimization and its classification, housekeeping, process change. Recycling, product modification, waste minimization steps, benefits of waste minimization in Dairy industry. [18]

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Total No. of Questions : 10]

SEAT No. :

P5584

[Total No. of Pages : 2

[5561]-738

B.E. (Chemical Engineering)

CHEMICAL PROCESS SAFETY (Elective - III)

(2017 Pattern) (Semester - 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, 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) What is American Institute of Chemical Engineers Code of Professional Ethics for employed engineers? [5]

b) Explain methods to store toxic chemicals. [5]

OR

Q2) a) How Toxicants are eliminated from Biological Organisms? Explain in detail. [5]

b) With the help of sketch explain dose versus response curves. [5]

Q3) a) What are the government regulations pertaining to Industrial Hygiene? Explain in brief. [5]

b) How workers are evaluated forexposure to toxic vapors? [5]

OR

Q4) a) Explain briefly about boiling liquid expanding vapour explosion (BLEVE). [5]

b) Distinguish between fire and explosion. [5]

P.T.O.

Q5) a) With the help of Graph of concentration of flammable liquid vs. temperature, explain various flammability properties of fluids. [10]

b) Explain relief systems, its risks and management. [7]

OR

Q6) a) List and explain miscellaneous design aspects for preventing Fires and Explosions. [10]

b) What is the difference between fire and explosion? Explain in detail. [7]

Q7) a) Explain various methods for Storage and handling of flammable and toxic chemicals. [10]

b) What are the objectives of hazard survey? How these surveys are conducted? [7]

OR

Q8) a) How interaction between different process units is assessed for accidents? Explain in detail. [10]

b) Describe the role of chemical engineers in preventing hazards. [7]

Q9) a) Explain event trees and fault trees in the context of process safety. [8]

b) How disasters happen? Outline the process to tackle disasters. [8]

OR

Q10) a) Explain emergency shutdown systems. [8]

b) Write short notes on [8]

i) Tackling disaster.

ii) Plan for emergency.



Total No. of Questions : 10]

SEAT No. :

P5150

[Total No. of Pages : 2

[5561]-739

**B.E. (Chemical Engineering)
FOOD TECHNOLOGY
(2015 Pattern)(End Sem)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Write 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 right indicate full marks.
- 3) Draw suitable diagrams wherever necessary.
- 4) Use of scientific calculators is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Draw and explain the unit operations necessary in food engineering. [5]
b) Write the short notes on following. [5]
i) Canning & sterilization
ii) Food Additives

OR

- Q2)** Write the advantages and disadvantages of extrusion cooking and [10]
hydrostatic pressure cooking methods.

- Q3)** a) Draw a milk powder processing flow diagram with stepwise procedure.[5]
b) Enlist the deteriorative factors affecting the food quality on storage and
suggest the remedies to control over them. [5]

OR

- Q4)** a) Draw and explain the ice cream production with preservation. [5]
b) Enlist the different ways to categorize the cheese and explain any one in
details. [5]

P.T.O.

Q5) Write the note on following [18]

- a) Hot air dehydration
- b) Laws of size reduction for food grains processing
- c) Freeze drying and freeze concentration

OR

Q6) a) How evaporation is useful in food processing? Illustrate with suitable examples. [9]

- b) Explain the roasting and hot oil frying theory in detail. [9]

Q7) a) Write a note on bar code and other markings printed on food packets. Also explain combined packaging system. [8]

- b) What are the functions of packaging materials? What are various factors important from marketing point of view for food products that can be achieved through proper packaging? [8]

OR

Q8) a) Describe 'Active packaging'. Enlist and explain the various factors included into it. [8]

- b) Write a short note on following packaging materials-
 - i) Textiles and wood packing
 - ii) Metal packing
 - iii) Aluminum packing[8]

Q9) a) Write a note on 'Codex Almentarius' for food quality assurance. [8]

- b) Justify- "The concepts of rheology are useful in food quality assurance." [8]

OR

Q10) a) Write a detailed note on assessment of food materials such as fruits, vegetables, cereals, dairy products, meat, egg and processed food products. [8]

- b) Write a note on US Food and drug administration. [8]



Total No. of Questions : 10]

SEAT No. :

P5151

[Total No. of Pages : 2

[5561]-740

B.E. (Chemical) (End Semester)
ADVANCED MATERIALS
(2015 Pattern) (Elective - III)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) Explain the advanced metallic material system in detail. [10]

OR

Q2) Explain the process of austempered ductile iron with applications in detail.[10]

Q3) a) Give the different types of ceramic materials [5]

b) Explain 'Nomex' [5]

OR

Q4) Explain the advanced ceramic processing techniques in detail. [10]

Q5) a) Give the properties of composite materials. [8]

b) Explain the fabrication techniques of polymer composites. [8]

OR

Q6) a) Explain the mechanical behaviour of composite material. [8]

b) Give various types of the composite materials and explain it in detail. [8]

Q7) a) Give the classification of metal composite material. [8]

b) Explain the crack propagation in metal composite materials. [8]

P.T.O.

OR

- Q8)** a) Give the application of metal matrix composite materials. [8]
b) Explain the reinforcement in the metal composites. [8]

- Q9)** a) Explain the fabrication method of carbon composite materials. [9]
b) Explain the application of non material in chemical engineering. [9]

OR

- Q10)** a) Explain the abtative polymer applications in detail. [9]
b) Give the properties of carbon composite materials. [9]



Total No. of Questions : 10]

SEAT No. :

P6172

[Total No. of Pages : 2

[5561]-742

**B.E. (Chemical Engineering)
NANOTECHNOLOGY (Elective - IV)
(2015 Pattern)**

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) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1)** a) Explain the different types of carbon based nanomaterials along with their physical properties and applications. [5]
- b) Explain any two synthesis methods of carbon nanostructures. [5]

OR

- Q2)** a) Write a short note on fullerenes and metallofullerenes. [5]
- b) Explain the steps involved in Chemical vapor deposition for nanomaterial synthesis. [5]

- Q3)** a) Explain molecular beam epitaxy for synthesis of nanoparticles. [5]
- b) Explain pulsed laser deposition with its schematic layout. List its advantages. [5]

OR

- Q4)** a) Explain principle and operation of Transmission electron microscope. [5]
- b) Explain the principle of working of x-ray diffraction method. [5]

- Q5)** a) Explain de Broglie's hypothesis with suitable expressions'. [7]
- b) What are quantum dots, quantum well and wire? Explain in detail along with their properties and applications. [10]

P.T.O.

OR

- Q6)** a) Write short note on Extrinsic semiconductors and intrinsic semiconductors. [10]
b) Write down the short note on Quantum Cryptography. [7]

- Q7)** a) Enlist and Explain colloidal properties of nanoparticles. [10]
b) What are the factors affecting contact angle and wetting? [7]

OR

- Q8)** a) Discuss the various nanostructured materials for Photocatalysis along with their properties? [7]
b) Discuss in detail about Self-assembly and Catalysis. [10]

- Q9)** a) Discuss Nano-biotechnology and explain how nanostructure mediated drug delivery helps for treatment of various diseases? [8]
b) Explain health and environmental Impacts of nanotechnology? [8]

OR

- Q10)** Write short notes on : [16]

- a) Polymer nanocomposites and fillers
- b) Photocatalytic Reactors
- c) Nanoclay and its applications
- d) Nanohydrogels



Total No. of Questions : 8]

SEAT No. :

P5585

[Total No. of Pages : 2

[5561]-743

B.E. (Chemical)

**FUEL CELL TECHNOLOGY
(2015 Pattern) (Elective - IV)**

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) With diagram, explain the combination of an electrode and its solution. [8]
- b) Describe the functioning of battery that requires an outside electrical source to drive the non-spontaneous redox reaction. [6]
- c) Write a short note on Molten carbonate fuel cell (MCFC). [6]

OR

- Q2)** a) Note the construction and working of Galvanic Cells. [8]
- b) Why Platinum is used in an Electrolytic cell? [6]
- c) Write a short note on Alkaline Fuel Cell (AFC) [6]

- Q3)** With labeled diagram, explain the mechanism of allowing positively charged ions and blocking electrons. [16]

OR

- Q4)** a) Note the advantages of Fuel Cell over energy storage devices. [8]
- b) Explain why Fuel Cells are more energy efficient than mechanical energy conversion devices. [8]

P.T.O.

Q5) With diagram, justify the statement : **[16]**

Solid oxide fuel cells (SOFCs) offer a clean, low-pollution technology to electrochemically generate electricity at high efficiencies.

OR

Q6) With diagram, justify the statement : **[16]**

Solid oxide fuel cells (SOFCs) work at higher temperature and at about 60 percent efficiencies.

Q7) Fuel Cell System is supported by ancillary systems. Enlist and explain any three. **[18]**

OR

Q8) Analyze the characteristic feature of fuel Cell over single processor system and write in details on the salient features of being a multiple system. **[18]**



Total No. of Questions : 10]

SEAT No. :

P5152

[Total No. of Pages : 2

[5561]-744

B.E. (Chemical)

PETROCHEMICAL ENGINEERING

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

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Explain Petrochemical products with examples and write down the note on Petrochemical industries in India. [10]

OR

Q2) Discuss in detail the main basic building blocks of petrochemical industry explain with suitable examples. [10]

Q3) Draw and Explain the flow diagram for Manufacturing of naphthenes and list out the different derivatives of naphthenes. [10]

OR

Q4) Explain the various downstream processes for separation and purification used in Petrochemical industry. [10]

Q5) a) Enumerate the synthetic chemical intermediates and products from olefins and describe the production of ethylene by naphtha cracking process. [8]
b) Write note on different hydrocarbon used as feedstock used in petrochemical plants. [8]

P.T.O.

OR

- Q6)** a) Draw and explain production of acetic acid as second generation petrochemical and write down its application in petrochemical industries. [10]
b) Write a note on Fluid Catalytic Cracking units. [6]

Q7) Describe in detail bulk, emulsion and suspension types of polymerization. [18]

OR

- Q8)** a) With neat sketches explain in detail about production of Nylons-6 along with its Engineering applications. [9]
b) Write down the difference between Addition and Condensation Polymerization reaction. [9]

Q9) Describe in detail the various limits published by MPCB for discharge of waste water from Petrochemical industries. [16]

OR

Q10) Write a note on following: [16]

- a) Safety consideration in petrochemical plants.
b) Major petrochemical plants in India.

