Total No. of Questions : 7]

SEAT No. :

PE652

[Total No. of Pages : 2

[6585]-2

First Year M.E. (Production/Manufacturing and Automation) (CAD/CAM)

RESEARCH METHODOLOGY

(2017 Credit Pattern) (Semester - I) (511102)

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

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Use of scientific calculator is allowed.***
3) ***Figures to the right indicate full marks.***

Q1) a) What do you mean by" Research"? Explain its significance in modern times. **[5]**

b) Describe the different types of research, clearly pointing out the difference between an "experimental" and a "survey". **[5]**

Q2) a) Explain various problem solving approaches in short. **[5]**

b) Write short note on Group Problem Solving Techniques. **[5]**

Q3) a) Explain the "meaning" and "significance" of a research design. **[5]**

b) Explain the meaning of the following in the context of 'Research design. **[5]**

i) Extraneous variables

ii) Confounded relationship

iii) Experimental and control groups

Q4) a) Discuss on Design of Experiment. Why it is required. **[6]**

b) Compare methods of research design with each other. **[4]**

P.T.O.

Q5) a) Brief on devices used in data collection. Explain any two devices. **[5]**

b) Brief on choice of data collection methods. **[5]**

Q6) a) What is layout of research report? How its study is significant? **[5]**

b) Write short note on Robust Design. **[5]**

Q7) a) What is graph theory? How its study is significant? **[5]**

b) Explain General Factorial Design. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE653

[Total No. of Pages : 2

[6585]-4
First Year M.E. (Production) (Manufacturing and Automation)
INDUSTRIAL AUTOMATION
(2017 Pattern) (Semester - I) (511104)

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

Instructions to the candidates:

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

Q1) a) Differentiate between gear, vane, and piston pumps. **[5]**

b) What are the most common problems encountered in hydraulic systems and how can they be prevented? **[5]**

Q2) a) What are the key factors to consider when selecting a hydraulic pump? **[5]**

b) What is the difference between return-line and pressure-line filters? **[5]**

Q3) a) Define pneumatics. What are its advantages and limitations compared to hydraulics? **[4]**

b) How would you troubleshoot a non-responsive pneumatic actuator? **[6]**

Q4) a) What is a sequential circuit in pneumatics, and how is it used to control the sequence of operations in an automated system? **[5]**

b) Describe the main components of a pneumatic system and their functions. **[5]**

Q5) a) Explain any two pressure measurement sensors. **[6]**

b) With neat sketch and example explain closed loop and open loop control system. **[4]**

P.T.O.

Q6) a) Write a simple ladder logic diagram for a start/stop motor control. **[6]**

b) Explain P, PI and PID Controllers. **[4]**

Q7) a) What are the advantages of vision-guided AGVs over wire-guided systems? **[6]**

b) With neat sketch explain any two configurations of industrial robots. **[4]**

Q8) a) What is the role of AI in smart factories and industry 4.0? **[5]**

b) List common challenges in implementing ANNs in real-time industrial environments. **[5]**

* * *

Total No. of Questions : 8]

SEAT No. :

PE654

[Total No. of Pages : 2

[6585]-5

First Year M.E. Production (CAD/CAM)
(Manufacturing and Automation)
COMPUTER INTEGRATED MANUFACTURING
(2017 Credit Pattern) (Semester -II) (511305)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4 and Q5 or Q6.***
2) ***Q7 and Q8 are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat self - explanatory sketches wherever necessary.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) What are the benefits of GT to the manufacturing industry? **[5]**

OR

Q2) Which approaches are considered in order to optimize overall efficiency and effectiveness of FMS? **[5]**

Q3) What is a relational database ? Describe the architecture of database management system. **[5]**

OR

Q4) What are the different levels of Integration against evolution of CIM? Explain . **[5]**

Q5) What are the components of PLM software ? Explain. **[7]**

OR

Q6) Which are the typical sensors that are normally used in robot? Explain. **[7]**

P.T.O.

Q7) a) What are the components of small local area network in CIM setup? Explain. **[8]**

b) What are the communication interfaces used in computer-to-computer communication? Explain in brief. What are the commonly used interface cards? **[7]**

Q8) Write short notes on any three

a) AGV

b) Data associated with FMC

c) ESPRIT- CIM OSA model

d) GKS implementation in a CAD workstation **[18]**

● ● ●

Total No. of Questions : 8]

SEAT No. : ____

PE655

[Total No. of Pages : 2

[6585]-6

First Year M.E. (Production) (CAD/CAM) (Manufacturing and Automation)

ARTIFICIAL INTELLIGENCE & ROBOTICS

(2017 Credit Pattern) (Semester - II) (511306)

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

Instructions to the candidates:

1) ***Solve Any 5 Questions.***
2) ***Neat Diagram must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***
5) ***Figures to the right indicates full marks.***

Q1) a) Define a robot and explain the basic concept of robotics. **[5]**

b) What is the SCARA configuration, and where is it commonly used. **[5]**

Q2) a) What are the key properties of a transformation matrix? **[5]**

b) What is Jacobin of the manipulator? **[5]**

Q3) a) Explain the concept of a homogeneous transformation matrix and its significance in robotics. **[5]**

b) List the safety measures to be taken while working with industrial robots. **[5]**

Q4) a) Explain the concept of forward kinematics with an example. **[5]**

b) Explain the concept of a unit vector and its application in robotics. **[5]**

Q5) a) Briefly explain the software architecture of a robot control system. **[6]**

b) Explain the structure and key features of VAL language commands. **[4]**

P.T.O.

Q6) a) Explain the role of accelerometers in robotic systems. **[6]**

b) What are the key components of a machine vision system? **[4]**

Q7) a) Explain the role of coordinate transformations in robotic manipulators. **[6]**

b) Explain the concept of singularity in robotic manipulators and its implications. **[4]**

Q8) a) How can potentiometer be used to sense position in robot? Explain. **[6]**

b) Write short note on artificial neural networking. **[4]**



Total No. of Questions : 8]

SEAT No. : ____

PE656

[Total No. of Pages : 2

[6585]-7

First Year M.E. (Production) (Manufacturing and Automation)
ADDITIVE MANUFACTURING
(2017 Pattern) (Semester - II) (511109)

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

Instructions to the candidates:

1) ***Solve Any 5 Questions.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***
5) ***Figures to the right indicates full marks.***

Q1) a) How does Additive Manufacturing differ from traditional manufacturing methods? **[5]**

b) What is Additive Manufacturing Process Chain? Explain in Detail. **[5]**

Q2) a) Additive Manufacturing is economically viable alternative to conventional manufacturing technologies for producing highly complex parts, justify the statement. **[6]**

b) What are the potential cost challenges in adopting Additive Manufacturing for large-scale production? **[4]**

Q3) a) What is the role of CT scanning in creating digital models for Additive Manufacturing? **[6]**

b) Describe the process of converting a CAD model into a format suitable for Additive Manufacturing. **[4]**

Q4) a) Describe the process of converting medical scan data (CT, MRI) into a 3D printable model using MIMICS. **[6]**

b) What role does MAGICS play in the quality control and optimization of Additive Manufacturing processes? **[4]**

P.T.O.

Q5) a) What are the key material properties that influence the performance of a 3D printed part? **[5]**

b) How is color achieved in Additive Manufacturing. and what materials are typically used for colored 3D printing? **[5]**

Q6) a) How does layer thickness influence the dimensional accuracy of a 3D printed part. **[5]**

b) Explain how environmental factors (e.g., temperature. humidity) impact the stability of materials used in Additive Manufacturing. **[5]**

Q7) a) With neat sketch explain the process of Fused Deposition Modelling (FDM). **[5]**

b) With neat sketch explain the process of Selective Laser Sintering (SLS).**[5]**

Q8) a) What is Computer-Aided Tissue Engineering (CATE), and how does it relate to Bio-Additive Manufacturing? **[5]**

b) Discuss a case study where Additive Manufacturing was used For the production of a customized implant or prosthesis. **[5]**



Total No. of Questions : 6]

SEAT No. :

PE657

[Total No. of Pages : 2

[6585]-8

S.Y.M.E. (Production) (Manufacturing & Automation) (CAD/CAM)
COMPUTATIONAL INTELLIGENCE IN TOOL DESIGN
(2017 Pattern) (Semester-III) (611101)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, and Q.5 & Q.6 are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) Elaborate application of AI for. **[10]**

a) Workpiece location and clamping stability analysis in fixture design.

b) Fixturing constraint analysis

OR

Q2) In progressive die design (Fig. 1): **[10]**

a) Draw strip layout showing stops and station on it and find out material utilization.

b) Find out cutting force with full shear and staggering.

Given: Blank thickness =1.2mm; Shear stress= 280N/mm^2

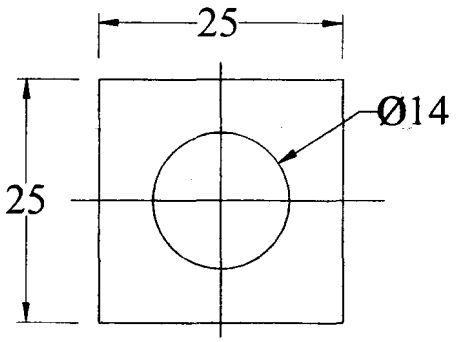


Fig. 1: Progressive Die Design

Q3) Write short note on (any two). **[10]**

a) Use of AI in process planning of forging impression.

b) AI for forging force analysis.

c) Computer aides forging die design

OR

P.T.O.

Q4) a) Explain analysis of cooling system in injection molding process. **[5]**

b) Computer aided injection mold design. **[5]**

Q5) a) Describe the die casting process for high melting point alloy with neat sketch. **[8]**

b) Explain use of AI techniques in cavity layout system and getting system in the die casting process. **[7]**

Q6) a) Describe the casting solidification in the sand casting process how AI assists in solidification analysis. **[7]**

b) Describe the element of the feeding system of the sand casting process with suitable example. **[8]**



Total No. of Questions : 6]

SEAT No. : ____

PE658

[Total No. of Pages : 2

[6585]-9

S.Y. M.E. (Production) (Manufacturing & Automation)

MECHATRONICS

(2017 Pattern) (Semester - III) (611102)

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

Instructions to the candidates:

1) ***Q. No. 5 and Q. No.6 are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) What is the role of a Wheatstone bridge circuit in weight measurement? Explain its application in a weighing scale with a diagram. **[10]**

OR

Q2) A strain gauge and bridge circuit are used to measure the tension force in a bar of steel that has a cross-sectional area of 20 cm^2. The strain gauge has a nominal resistance of 10Ω and a GF of 2. The bridge is supplied with 11 V. When the bar is unloaded, the bridge is balanced so the output is 0 V. Then force is applied to the bar, and the bridge voltage goes to 0.0006 V. Find the force on the bar. (Young's modulus 2×10^5 N/mm^2 for steel). **[10]**

Q3) a) Explain basic architecture of a microprocessor. **[4]**

b) Design a light sensor-based automated system to count objects on a conveyor belt. Explain the working principle and include a basic sketch.**[6]**

OR

Q4) Write the instructions to load two hexadecimal numbers 49D and 38C in the registers A and B respectively. Subtract the numbers, and store the result in memory location 697B. **[10]**

P.T.O.

Q5) a) Describe briefly textual programming languages used in Programming Logic Controllers. **[6]**

b) Construct a ladder logic diagram and outline narrative sequence for pneumatic cylinders sequencing in parallel. **[9]**

Q6) a) Differentiate microprocessor and microcontroller. **[5]**

b) Write short notes on the following(Any Two). **[10]**

i) status signals used in microprocessor

ii) composite controllers

iii) Intelligent Household Devices



Total No. of Questions : 6]

SEAT No. : ____

PE659

[Total No. of Pages : 2

[6585]-13
S.Y. M.E. (Production) (CAD/CAM)
COMPUTER AIDED PRODUCTION PLANNING
(2017 Pattern) (Semester - III) (511311)

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

Instructions to the candidates:

1) ***Q. No. 5 and Q. No.6 are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the various types of trends in production and how they impact decision-making in manufacturing. **[5]**

b) How is the computerized method of facility layout for design? **[5]**

OR

Q2) a) Given the following part-machine incidence matrix for 6 parts and 4 machines, apply the Rank Order Clustering algorithm to form part families. **[5]**

Part/Machine	M1	M2	M3	M4
P1	1	0	1	0
P2	1	1	0	1
P3	0	1	1	0
P4	1	0	0	1
P5	0	1	0	1
P6	1	1	1	0

b) Discuss design rationalization. **[5]**

Q3) a) Compare capacity planning. and manufacturing resources planning. **[5]**

b) Give comparison between MRP-I and MRP-II. **[5]**

OR

P.T.O.

Q4) a) A single machine is available to process 5 independent jobs. The processing times (in hours) and due dates (in hours from now) for each job are as follows: **[6]**

Job	Processing Time (hours)	Due Date (hours)
A	2	10
B	5	15
C	3	20
D	6	6
E	4	10

Using the Earliest Due Date (EDD) rule for sequencing, determine:

i) The sequence of jobs to minimize tardiness.

ii) The completion time and tardiness for each job in the sequence.

The total tardiness for all jobs.

b) Explain with neat block diagram of MRP and its component. **[4]**

Q5) a) What is the purpose of process quality simulators? **[8]**

b) Explain the generic model of ERP system. **[7]**

Q6) Write short notes on the following. **[15]**

a) Time standard.

b) Data collection techniques,

c) Process simulators

✪ ✪ ✪

Total No. of Questions : 6]

SEAT No. : ____

PE660

[Total No. of Pages : 1

[6585]-14

First Year M.E. (Printing Engineering & Graphic Communication)

PROBABILITY, STATISTICS AND REGRESSION ANALYSIS

(2017 Pattern) (Semester - I) (508101)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) Suppose 30% of the students wear glasses. If I take a random sample of 10 students find the probability that the number of students wearing glasses is almost 4 (note : Use binomial distribution) **[18]**

OR

Q2) Calculate mean, median, mode, standard deviation of the above given data. Plot a box plot of the same showing the above entities. **[18]**

7, 7, 9, 8, 10, 19, 20, 21, 20, 22, 21, 21, 17, 19, 20, 8, 7, 8, 9, 10

Q3) What is ANOVA and what is its significance in statistical testing? **[16]**

OR

Q4) What does Quality control mean? Explain the basis of control charts. Explain any one type of control chart. **[16]**

Q5) What do you mean by sampling. Explain Acceptance sampling. Define the OC curve. **[16]**

OR

Q6) Following are the problems observed in offset printing. State the cause of all the problems. **[16]**

a) Density increase
b) Dot gain
c) Poor contrast
d) Low color strength.

x x x

Total No. of Questions : 6]

SEAT No. : [ ]

PE661

[Total No. of Pages : 1

[6585]-16

First Year M.E. (Printing Engg. & Graphic Communication)

MODERN TRENDS IN PRINTING

(2017 Pattern) (Semester - I) (508103)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) Compare closed and open inking system. Explain the Function and Benefits of Closed Inking Systems. **[18]**

OR

Q2) Explain the purpose of different Rubber Hardness & its effect on Print Quality. **[18]**

Q3) a) Compare and explain the purpose of Pneumatics and Hydraulics systems used in different Printing Processes. **[8]**

b) Explain in brief the benefits of Electronic Line Shaft. **[8]**

OR

Q4) a) Explain Working principle of electronic line shaft. **[8]**

b) Compare common shaft vs electronic line shaft. **[8]**

Q5) Explain raw material Handling Systems in printing press. **[16]**

OR

Q6) Explain the purpose and benefits of proper waste disposal method. **[16]**

x x x

Total No. of Questions : 6]

SEAT No. :

PE662

[Total No. of Pages : 1

[6585]-18

First Year M.E. (Printing & Graphic communication)

COLOUR SCIENCE

(2017 Pattern) (Semester -II) (508107)

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6.***
2) ***Figures to right indicate full marks.***

Q1) Explain the following terms:

a) Purkinji mechanism

b) Luminous efficiency functions

[18]

OR

Q2) a) Color co-ordinates are required to transform from RGB to other types. which are those types Explain in detail? **[10]**

b) What are Mac-Adam ellipse? Explain its significance in color management. **[8]**

Q3) What is an ICC profile? Explain its significance and construction in details. **[16]**

OR

Q4) What are reference viewing conditions? Explain its application in color measurement. **[16]**

Q5) How does the optical color property of the material affect color reproduction? Explain in greater details. **[16]**

OR

Q6) Which attributes of material to be printed affect the color reproduction and color matching? **[16]**

● ● ●

Total No. of Questions : 6] **SEAT No. :**

PE663 **[Total No. of Pages : 1**

[6585]-19

First Year M.E. (Printing Technology & Graphic Communication)

WEB HANDLING ON PRESS

(2017 Pattern) (Semester - II) (508108)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Describe the working and importance of flying splicer in web handling. How does it differ from zero speed splicer? **[9]**

b) Explain the need for web surface treatment. Discuss plasma treatment as one of the techniques used. **[9]**

OR

Q2) Write short notes on: **[18]**

a) Web tension zones in flexo press.

b) Impact of ambient humidity on plastic film reels.

Q3) a) How does an accumulator roller system manage web tension? Explain its mechanism. **[8]**

b) Discuss the effect of speed variation on web tension during press run. **[8]**

OR

Q4) Describe the importance of nip control and draw control in maintaining web tension in printing and rewinding zones. **[16]**

Q5) Explain static and dynamic unbalance in rollers with causes. Describe how balancing is performed in a print shop. **[16]**

OR

Q6) a) Define wrap angle. How does wrap angle influence web tension and traction? **[8]**

b) What is roller misalignment? How does it impact the web path and print quality? **[8]**

☼ ☼ ☼

Total No. of Questions : 6]

SEAT No. :

PE664

[Total No. of Pages : 1

[6585]-20

First Year M.E. (Printing Engineering & Graphic Communication)

SUBSTRATE AND INK

(2017 Pattern) (Semester - II) (508109)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Figures to the right indicate full marks.***

Q1) Describe the Problems arising in printing processes due to the various defects in paper and plastic substrates. **[18]**

OR

Q2) Explain the raw materials used and technology of printing ink manufacturer for different types of ink. **[18]**

Q3) Calculate the quantity of ink required for 25000 copies of a 16 page booklet of A5 size each page with a print area of 200cm^2. There are 10 pages printed in black ink from halftone pictures and 6 pages in type matter in black. The booklet is printed by photo offset process on a coated art paper. **[16]**

OR

Q4) Calculate papers for endpapers in RA1 size for 2000 books in A5 size having 240 pages with 2% allowances. **[16]**

Q5) Explain Quality control for substrate and ink. **[16]**

OR

Q6) Explain Environmental laws for print industry. **[16]**

✪ ✪ ✪

Total No. of Questions : 6]

SEAT No. :

PE665

[Total No. of Pages : 1

[6585]-21

Second Year M.E. (Printing Engineering) (Graphic Communication)
PRINTED ELECTRONICS AND RFID
(2017 Pattern) (Semester-III) (608101)

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagram must be drawn whenever necessary.***

Q1) a) Explain the role of paper as a substrate in printed electronics. **[9]**

b) Compare traditional electronics manufacturing methods with printing methods used in printed electronics. **[9]**

OR

Q2) a) Describe the applications for conductive, semiconductive, and dielectric inks used in printed electronics. **[9]**

b) Discuss the role of polymer substrates in printed electronics. **[9]**

Q3) a) Describe the different frequency ranges used in RFID systems. **[8]**

b) Compare active and passive RFID tags. **[8]**

OR

Q4) a) Discuss why is RFID considered a potential replacement for UPC barcodes? **[8]**

b) Explain the concept of Electronic Article Surveillance (EAS) using RFID technology. **[8]**

Q5) a) Discuss the application of printed electronics in signage and displays. **[8]**

b) Discuss the role of printed electronics in healthcare management. **[8]**

OR

Q6) a) What are the advantages of using printed electronics for energy storage applications. **[8]**

b) Explain the role of printed batteries in portable and wearable devices. **[8]**



Total No. of Questions : 6]

SEAT No. : ____

PE666

[Total No. of Pages : 1

[6585]-22

S.Y. M.E. (Printing Engineering & Graphic Communication)

ADVANCES IN CONVERTING AND PACKAGING

(2017 Pattern) (Semester - III) (608102)

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

Instructions to the candidates:

1) ***Draw neat diagram wherever necessary.***
2) ***Figures to right indicate full marks.***

Q1) a) Explain the integration such as CIP 3 or CIP 4for any packaging press. **[9]**

b) Explain any 3 post press operations used in book binding. **[9]**

OR

Q2) a) Explain the following operations in packaging die-cutting, punching and holograms. **[9]**

b) Explain in detail its importance in packaging. **[9]**

Q3) a) Explain dry lamination with a neat diagram. State advantages and limitations with regards to wet lamination. **[8]**

b) What is corona treatment? How does poor surface treatment affect quality? **[8]**

OR

Q4) Explain any 2 designs corrugated box packaging. Explain Adhesives used in corrugated box making. **[16]**

Q5) Explain in detail the FFS techniques used for liquid packaging. **[16]**

OR

Q6) Why barrier properties are important in food packaging? Explain with any 3 examples. **[16]**

✪ ✪ ✪

Total No. of Questions : 5]

SEAT No. : ____

PE667

[Total No. of Pages : 2

[6585]-23

First Year M.E. (Information Technology)

MATHEMATICAL FOUNDATION OF INFORMATION TECHNOLOGY

(2017 Pattern) (Semester - I) (514401)

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

Instructions to the candidates:

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

Q1) Solve any two.

a) Explain Messy genetic algorithm with example. **[5]**

b) Find the probability that in tossing a fair coin four times there will appear **[5]**

i) 3 heads

ii) 2 tails and 1 head

iii) at least 1 head

iv) not more than 1 tail

c) A continuous random variable X has the probability density given by **[5]**

$$f(x)=\begin{cases}2e^{-2x} & x>0\\ 0 & x<=0\end{cases}$$

Find

i) E(X)

ii) $E(X^2)$

iii) $E(X^3)$

Q2) Solve any two.

a) Using your own intuition and definitions of the universe of discourse, plot fuzzy membership functions for "weight of people". **[5]**

b) The following mistakes per page were observed in a book, **[5]**

Number of mistakes per page	0	1	2	3	4
Number of times the mistakes occurred	211	90	19	5	0

Fit a Poisson distribution to fit data.

P.T.O.

c) In a random selection 64 of the 2400 intersections in a small city, the mean number of scooter accidents per year was 3.2 and sample standard deviation was 0.8. **[5]**

Make an estimation of the standard deviation of the population from the sample standard deviation.

Work out the standard error for this finite population.

Q3) Solve any two.

a) Differentiate between constrained optimization and unconstrained optimization. **[5]**

b) Var [X+Y] = Var [X] + Var[Y], if X and Y are independent random variables. **[5]**

c) Describe the concepts involved in real-coded genetic algorithm. **[5]**

Q4) Solve any two.

a) Explain with example Karmarkar's algorithm. **[5]**

b) Suppose on an average 1 house in 1000 in a certain district has a fire during a year. If there are 2000 houses in that district, what is the probability that exactly 5 houses will have a fire during a year? **[5]**

c) The theory predicts the proportion of beans, in the four groups A,B,C, and D should be 9:3:3:1. I an experiment among 1600 beans, the number in the four groups were 882, 313, 287 and 118. Does the experiment result support the theory? Apply chi square test. **[5]**

Q5) Solve any two.

a) State and prove Global Convergence Theorem. **[5]**

b) Prove that the value of any flow in a given transport network is less than or equal to the capacity of any cut in the network? **[5]**

c) Define classical relations and fuzzy relations. **[5]**



Total No. of Questions : 7]

SEAT No. :

PE668

[Total No. of Pages : 2

[6585]-24

First Year M.E. (Information Technology)

ADVANCE SOFTWARE ENGINEERING & PROJECT MANAGEMENT

(2017 Pattern) (Semester -I) (514402)

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

Instructions to the candidates:

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

Q1) a) Compare and contrast DFD and FSM as operational specification techniques. **[5]**

b) How does the Unified Modeling Language (UML) support system modeling? Explain with an example. **[5]**

Q2) a) How does Pattern-Based Design improve software maintainability? Provide an example. **[5]**

b) What are the different types of UML diagrams used in design modeling? Explain any two with examples. **[5]**

Q3) a) Discuss the importance of Lean Software Development (LSD) and its Principles. **[5]**

b) Explain the significance of Agile Modeling (AM) in the software development process. **[5]**

Q4) a) What are the key challenges in Software Project Maintenance?Explain Code Cloning and Refactoring. **[5]**

b) What are the various types of project contracts used in software project management? **[5]**

P.T.O.

Q5) a) Define Configuration Management and explain its importance in software engineering. **[5]**

b) Explain how Product and Process Attributes affect software quality. **[5]**

Q6) a) What are the major differences between Distributed Software Engineering and Traditional Software Engineering? **[5]**

b) Discuss the significance of Software Process Improvement and Maturity Models in software project management. **[5]**

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

a) Service -Oriented Software Engineering (SOSE)

b) CMMI-IPPD

c) AUP

● ● ●

Total No. of Questions : 8]

SEAT No. : [ ]

PE669

[Total No. of Pages : 2

[6585]-25

F.Y. M.E. (Information Technology)

APPLIED ALGORITHMS

(2017 Pattern) (Semester - I) (514403)

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

Instructions to the candidates:

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

Q1) a) Give a Greedy Algorithm for On-Line Euclidean Spanning Tree Problem. Analyze the same. **[4]**

b) Write and explain an algorithm to determine whether any pair of line segments intersects. **[6]**

Q2) a) Explain asymptotic notations: Big O, Omega, and Theta notations with suitable example. **[4]**

b) Write an algorithm for binary search. Write its complexity and remove the recurrence from the equation. **[6]**

Q3) a) Write down the steps of Miller-Rabin algorithm for primality test. Using it test the number 561 for primality. **[4]**

b) Explain the standard and slack forms of linear programming. **[6]**

Q4) a) Write and Explain the pointer doubling algorithm with suitable example. **[4]**

b) What is the need & significance of randomized algorithm? State the properties of randomized algorithm. Explain different classes of randomized algorithm. **[6]**

P.T.O.

Q5) a) Explain in detail the "Concept of Reducibility". **[4]**

b) What is randomized algorithm'? Explain types of randomized algorithms. **[6]**

Q5) a) Explain vertex cover problem using linear programming. **[4]**

b) What is B-Tree? What are its properties? Construct a B-tree with minimum degree t=3 by inserting elements 10, 20, 30, 40, 50, 60, 70, 80 and 90 in an initially empty B-Tree. **[6]**

Q7) a) Write and explain Johnson's algorithm for sparse graph. **[4]**

b) Explain Approximation algorithm with example of traveling-salesman problem. **[6]**

Q8) a) Write an algorithm to compute convex hull using divide and conquer approach. **[4]**

b) Write and Explain an algorithm to find a solution of 2D-Closest pair problem. Also analyze the same. **[6]**

x x x

Total No. of Questions : 6]

SEAT No. : [ ]

PE670

[Total No. of Pages : 1

[6585]-26
First Year M.E. (Information Technology)
RESEARCH METHODOLOGY
(2017 Pattern) (Semester - I) (514404)

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

Instructions to the candidates:

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

Q1) Explain Research Questions and Engineering Ethics. Distinguish between Research methods and Research methodology. **[10]**

Q2) a) Define the term 'Literature Review'. Enumerate the objectives and significance of literature review. **[5]**

b) What is hypothesis and Null hypothesis? How statistical analysis helps for testing of hypothesis? **[5]**

Q3) a) Discuss interview as a technique of data collection. **[5]**

b) Clearly explain the difference between collection of data through questionnaires and schedules. **[5]**

Q4) a) Mention the different types of reports, particularly pointing out the difference between technical report and descriptive report. **[5]**

b) Differentiate between qualitative and quantitative research. **[5]**

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

b) Explain the layout of research proposal in detail. **[5]**

Q6) Explain the following research outcomes and when to use respective method of publishing research with example of each. **[10]**

a) Conference paper publication
b) Copyright
c) Patent
d) Poster Presentation

❋ ❋ ❋

Total No. of Questions : 5]

SEAT No. :

PE671

[Total No. of Pages : 2

[6585]-27

First Year M.E. (Information Technology)
CYBER SECURITY AND FORENSICS
(2017 Pattern) (Semester-II) (514407)

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

Instructions to the candidates:

1) ***All questions are compulsory:***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams where necessary.***

Q1) Solve any Two: **[5]**

a) Define the term "Computer Forensics".

b) Define Security triad: Confidential, Integrity, Availability. **[5]**

c) Explain Identification and Authentication, Phishing and Spoofing. **[5]**

Q2) Solve any Two:

a) State the objectives of Computer Forensics. **[5]**

b) Explain Firewalls, VPNs, Intrusion Detection, and filters. **[5]**

c) Explain The Clark -Wilson Model. **[5]**

Q3) Solve any Two :

a) Explain Key Establishment and Authentication, Key Establishment Protocols. **[5]**

b) What is Cyber stalking, Violent Crime and Digital Evidence. **[5]**

c) Explain Domain Name System (DNS) and DNS cache poisoning. **[5]**

P.T.O.

Q4) Solve any Two:

a) Explain Forensic Analysis Fundamentals. **[5]**

b) Explain Windows Forensic Analysis -NTFS Overview. **[5]**

c) Explain Identification of Electronic Data, Forensic Preservation of Data. **[5]**

Q5) Solve any Two:

a) Explain BitLocker and Encrypting File System (EFS) **[5]**

b) Explain Data Gathering and Observation, Hypothesis Formation, Evaluating Hypotheses, Conclusions and Reporting. **[5]**

c) Explain Intrusion investigation- Introduction, Methodologies,Preparation, Case Management and Reporting. **[5]**

● ● ●

Total No. of Questions : 8]

SEAT No. :

PE672

[Total No. of Pages : 2

[6585]-28

First Year M.E. (Information Technology)

CLOUD AND DATA TECHNOLOGIES

(2017 Pattern) (Semester - II) (514408)

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

Instructions to the candidates:

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

Q1) a) Discuss following Multitenant Technology, Service Technology. **[6]**

b) Write a note on Multi-Device Broker. **[4]**

Q2) a) Explain Specialized Cloud Mechanisms : Automated Scaling Listener in Cloud Computing. **[6]**

b) Explain the functionality of Resource Management System. **[4]**

Q3) a) Explain Non-Disruptive Service Relocation Architecture. **[6]**

b) Explain key issues related Cloud Delivery Model Considerations. **[4]**

Q4) a) Discuss Algorithms k-means, Spam Filters, Naive Bayes. **[6]**

b) Explain concept of Zero Downtime Architecture. **[4]**

Q5) a) Write a brief note on **[6]**

i) Pregel and Hadoop

ii) Hubris

b) Explain the concept Data Leakage and Model. **[4]**

P.T.O.

Q6) a) Discuss various issues and challenges in Big data. **[4]**

b) Demonstrate with suitable examples : **[6]**

i) Data Science and Risk

ii) Data Engineering : Map Reduce

Q7) a) Write a short note on SLA Management System. **[5]**

b) Explain Specialized Cloud Architectures of cloud. **[5]**

Q8) a) Demonstrate relationships of Big Data and Cloud Computing. **[5]**

b) Discuss Models and Techniques for Cloud-Based Data Analysis. **[5]**



Total No. of Questions : 6]

SEAT No. : ____

PE673

[Total No. of Pages : 2

[6585]-29
First Year M.E. (Information Technology)
INFORMATION TECHNOLOGY ORIENTED OPERATIONS RESEARCH
(2017 Pattern) (Semester - II) (514409)

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

Instructions to the candidates:

1) ***Attempt any one of Q1 or Q2, rest all question compulsory.***
2) ***Assume Suitable Data, if necessary.***
3) ***Neat Diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Consider the following LP problem **[10]**

Maximize $Z = 2x_1 + 6x_2$

Subject to: $x_1 + 4x_2 \leq 15$

$x_1 + 2x_2 \leq 12$ and $x_1, x_2 \geq 0$

a) Convert this problem to a minimization problem.

b) Solve the problem of

by the graphical method.

OR

Q2) a) What is linear programming, and how does it help with decision-making? Provide an example of a business scenario where linear programming would be applicable. **[5]**

b) Discuss the advantages of applying a mathematical model to real-world problems in business or Industry. **[5]**

Q3) Attempt any two.

a) Consider the following profit and requirement table of a transportation problem, find an optimal solution. **[5]**

11	15	16	5	8	60
6	13	8	9	10	65
4	11	18	12	6	75
33	45	47	35	40	

P.T.O.

b) Consider the problem of assigning 5 jobs to 5 machines. The assignment costs are given below. Find an optimal way of assignment. **[5]**

19	18	-	16	14
-	21	13	15	15
16	13	15	17	-
17	-	20	16	18
20	12	12	-	19

c) Explain the steps to solve Assignment problem using Hungarian Method. **[5]**

Q4) Attempt any two.

a) Explain the steps involved in the decision-making process. **[5]**

b) What is the Maximin criterion? How is it used in decision making under uncertainty? **[5]**

c) Check if a saddle point exists in this game. If not, solve it using graphical method: **[5]**

	C1	C2
R1	2	4
R2	3	1

Q5) Attempt any two.

a) What are the stages and states for the dynamic programming formulation. **[5]**

b) What is meant by "Principle of Optimality" in the context of Dynamic Programming? **[5]**

c) Use Dynamic programming to solve :- **[5]**

Minimize $Z = y_1^2+y_2^2+y_3^2$

Subject to $y_1 + y_2 + y_3 = 30$

Where $y_1, y_2, y_3 \geq 0$

Q6) Attempt any two.

a) What are the key components of a time series? Briefly explain each. **[5]**

b) Describe the five phases of project management. Why is each phase important? **[5]**

c) The utility data for a network are given below. Determine the total float and identify the critical path. **[5]**

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

✪ ✪ ✪

Total No. of Questions : 5] **SEAT No. :**

PE674 **[Total No. of Pages : 2**

[6585]-30
S.Y.M.E. (Information Technology)
MOBILE AD-HOC NETWORKS
(2017 Pattern) (Semester - III) (5144013)

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

Instructions to the candidates:

1) ***Answer any two Sub-Questions from Q.1, Q.2, Q.3, Q.4, Q.5.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Answer any two of three Sub-Questions.

a) Define multicast routing in Ad Hoc networks. What distinguishes it from unicast and broadcast routing? **[5]**

b) Define the role of the transport layer in Ad Hoc wireless networks. What are its primary functions? **[5]**

c) Explain the classification of Ad Hoc routing protocols. How do proactive and reactive protocols differ in their operation? **[5]**

Q2) Answer any two of three Sub-Questions.

a) Explain the key issues and challenges in providing security in Ad Hoc wireless networks. Why is it more complex than in wired networks? **[5]**

b) Explain the main issues and challenges in providing QoS in Ad Hoc wireless networks. Why is QoS support more difficult than in traditional networks? **[5]**

c) Explain the major issues involved in designing a transport layer protocol for Ad Hoc wireless networks. How do these differ from wired networks. **[5]**

Q3) Answer any two of three Sub-Questions.

a) Define routing in Ad Hoc wireless networks. What are the primary functions of a routing protocol in such networks? **[5]**

b) Define network security in the context of Ad Hoc wireless networks. What are the fundamental requirements? **[5]**

c) Illustrate the operation of a tree-based multicast routing protocol in a mobile environment. Show how group membership changes are handled. **[5]**

P.T.O.

Q4) Answer any two of three Sub-Questions.

a) Illustrate with an example how TCP behaves in an Ad Hoc wireless network with frequent link failures. What are the consequences on performance? **[5]**

b) Illustrate with an example how MAC layer solutions support QoS in Ad Hoc wireless networks. What mechanisms are typically used? **[5]**

c) Explain the concept of radio propagation mechanisms. How do these mechanisms affect the signal strength and quality in Ad Hoc wireless networks? **[5]**

Q5) Answer any two of three Sub-Questions.

a) Using your understanding of IEEE 802.11a/b standards, explain how these protocols can be applied to support communication in a mobile Ad Hoc network? **[5]**

b) Illustrate the working of the Ad Hoc On-Demand Distance Vector (AODV) protocol using an example topology. Show how route discovery and maintenance are handled? **[5]**

c) Explain the key issues in designing multicast routing protocols for Ad Hoc wireless networks. Why are these issues more complex compared to wired networks? **[5]**



Total No. of Questions : 7]

SEAT No. : ____

PE675

[Total No. of Pages : 2

[6585]-31

S.Y. M.E. (Information Technology)

ADVANCED OPERATING SYSTEMS

(2017 Pattern) (Semester - III) (5144014)

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

Instructions to the candidates:

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

Q1) a) What are the fundamental differences between centralized operating systems and distributed operating systems in terms of structure and management? **[5]**

b) Discuss how context switching works in distributed operating systems and the role of system calls and interrupts. **[5]**

Q2) a) Explain the importance of process addressing in distributed systems. How does message-passing solve issues related to process communication? **[5]**

b) Describe the key elements of a Remote Procedure Call (RPC) model and its implementation challenges. **[5]**

Q3) a) Explain the concept of consistency models in DSM. How do these models ensure the correct behavior of distributed memory systems? **[5]**

b) Discuss the challenges of memory access in DSM systems and how granularity affects performance. **[5]**

Q4) a) What are the different techniques for achieving mutual exclusion in distributed systems? Compare the advantages and disadvantages of centralized and distributed approaches. **[5]**

b) Discuss the concept of deadlock detection and handling in distributed systems. **[5]**

P.T.O.

Q5) a) Explain how file replication and consistency contribute to fault tolerance in a distributed file system. **[5]**

b) What are the key design principles for ensuring high availability in Distributed File Systems? **[5]**

Q6) a) How do mobile operating systems optimize I/O performance for mobile devices? Discuss the role of device drivers and I/O scheduling. **[5]**

b) Explain the importance of security in mobile operating systems. How does Android OS handle security features like app sandboxing and permission models? **[5]**

Q7) Write short notes on the following (Any two) **[10]**

a) Distributed Computing Models.

b) Kernel Design in Mobile OS.

c) Election algorithms in distributed systems.



Total No. of Questions : 7]

SEAT No. :

PE676

[Total No. of Pages : 2

[6585]-32

First Year M.E. (Instrumentation & Control -Process Instrumentation)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2017 Pattern) (Semester-I) (506101)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***

Q1) a) Define linear combination of vector with suitable examples. **[4]**

b) Show that the set of vectors u = (1,3,5), v = (2,–1,–2), w = (3,2,3) are linearly dependent and find relation between them. **[4]**

c) Determine basis and dimension of vectors (3,8,–3,–5) , (1,–2,5,–3), (2,3,l,–4) in a vector space V = R^4. **[2]**

Q2) a) Find orthogonal projection $\overline{u}$ on W and orthogonal component of $\overline{u}$ to W. Find the norm of each vector and distance between vectors $\overline{u}$ = (1,1,2) and $\overline{v} = (1,4,-1)$. **[5]**

b) Show that the set $B = (\overline{u}_1, \overline{u}_2, \overline{u}_3)$ where $\overline{u}_1 = (0,1,0)$ $\overline{u}_2 = (1,0,1)$ $\overline{u}_3 = (1,0,-1)$ is an orthogonal basis of R^3. **[5]**

Q3) a) Obtain Newton Raphson formula to find **[5]**

i) square root

ii) r^{th} root of given numbers.

b) Solve by Gauss-Seidal iteration method. **[5]**

$$27x_1 + 6x_2 - x_3 = 85,$$
$$6x_1 + 15x_2 + 2x_3 = 72,$$
$$x_1 + x_2 + 54x_3 = 110.$$

P.T.O.

Q4) a) If on an average one ship in every ten is wrecked, find the probability that out of five ship expected to arrive, 4 at least will arrive safely. **[5]**

b) The probability that a bomb dropped from a plane will strike the target is $\frac{1}{5}$. If six bombs are dropped, find the probability that exactly two will strike the target. **[5]**

Q5) a) A continuous random variable X has a probability density function given by $f(x) = 2e^{-2x},\ x \geq 0.$ and $f(x) = 0,\ x < 0.$ Find: **[5]**

i) Find moment generating function

ii) The first four moment about origin.

b) The first four central moments of a distribution are 0, 2.5, 0.7 and 18.75. Comment on the skewness and kurtosis of the distribution. **[5]**

Q6) a) A joint PDF of two continuous random variable X and Y is **[6]**

$f(x,y) = cxy, 0 < x < 4,\ 1 < y < 5.$ And $f(x, y) = 0$, otherwise.

i) Find the value of constant C

ii) Find p$[1 < x < 2,\ 2 < y < 3]$

iii) Find p$[x \geq 3,\ y \leq 2]$.

b) Explain the terms axioms of probability. **[4]**

Q7) a) Find singular value decomposition of the matrix. **[5]**

$$A = \begin{bmatrix} 2 & -1 \\ 2 & 2 \end{bmatrix}$$

b) Assume that the mean height of soldiers to be 68.22 inches with variance 10.8 inches. How many soldiers in a regiment of 10,000 would you expect to be over 6 feet tall? Area at (z = 1.15) = 0.3749. **[5]**



Total No. of Questions : 7]

SEAT No. :

PE677

[Total No. of Pages : 2

[6585]-33

First Year M.E. (Process Instrumentation) (Instrumentation & Control)

TRANSDUCER DESIGN

(2017 Pattern) (Semester - I) (506102)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figure to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Write short note on Chemical field-effect transistor sensor. **[5]**

b) Select appropriate transducer for vibration measurement and justify the selection with example. **[5]**

Q2) a) Explain dynamic characteristics of instruments. **[5]**

b) Write a short notes on MEMS. **[5]**

Q3) a) Explain chemical sensor in detail with neat sketch and state its applications. **[5]**

b) Select the suitable transducer for non-contact type transducer for pressure measurement and elaborate it's working with neat sketch in details. **[5]**

Q4) a) Suggest suitable scheme to measure torque of a rotating shaft using stain gauge. **[5]**

b) Specify the different level measurement approach's in the industry, suggest suitable transducer used for liquid level measurement. **[5]**

P.T.O.

Q5) a) Suggest suitable application to detect metal using inductive sensor. **[5]**

b) Classify and state selection criteria of transducers and illustrate performance characteristics of transducer. **[5]**

Q6) a) State the importance of signal conditioning, and explain signal level and bias changes. **[5]**

b) Explain the role of ADC and DAC in interfacing of sensor with suitable example. **[5]**

Q7) a) Explain the concept of loading, divider circuits, and bridge circuits in brief. **[5]**

b) Discuss the SMART sensor used to detect leakage of gas in plant and explain with neat sketch. **[5]**



Total No. of Questions : 6]

SEAT No. :

PE678

[Total No. of Pages : 1

[6585]-34

First Year M.E. Instrumentation & Control (Process Instrumentation)

INDUSTRIAL AUTOMATION

(2017 Pattern) (Semester - I) (506103)

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

Instructions to the candidates:

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

Q1) Comment on interfacing of PLC to SCADA. **[10]**

Q2) Elaborate the operation of timers and counters with suitable examples. **[10]**

Q3) Devise ladder programs for systems that will carry out the following tasks:**[10]**

a) Give an output after a photocell sensor has given 10 pulse input signals as a result of detecting 10 objects passing in front of it.

b) Give an output when the number of people in a store reaches 100, there continually being people entering and leaving the store.

Q4) Describe the operation of an on/off controller and explain how it might be used to control the temperature in a domestic central heating system. **[10]**

Q5) Draw a famous automation hierarchy for an industrial application. Analyze the function of each level of automation hierarchy. **[10]**

Q6) Develop daisy chain topology to connect three field devices using Field Bus.**[10]**

x x x

Total No. of Questions : 6]

SEAT No. :

PE679

[Total No. of Pages : 1

[6585]-35

First Year M.E. (Instrumentation & Control)/(Process Instrumentation)

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - I) (506104)

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

Instructions to the candidates:

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

Q1) How would you define research, its significancy, components of good research study? **[10]**

Q2) What are various approaches to study the research problem & formulation of objectives? **[10]**

Q3) What criteria should be fulfilled while developing hypothesis and differentiate between various types of hypotheses? **[10]**

Q4) What are different data collection options available to the researcher? Compare and contrast them and brief on the ethical issues in collecting data.**[10]**

Q5) How do you determine sample? Explain different types of probability and non-probability sampling. **[10]**

Q6) What are various stages of report writing and explain criteria for good research report. **[10]**

❋ ❋ ❋

Total No. of Questions : 6]

SEAT No. : ____

PE680

[Total No. of Pages : 1

[6585]-36

First Year M.E. (Instrumentation & Control) (Process Instrumentation)

PROCESS DYNAMICS AND CONTROL

(2017 Pattern) (Semester - II) (506107)

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

Instructions to the candidates:

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

Q1) Elaborate self-tuning regulator with suitable example. **[10]**

Q2) Comment on effect of zeros and time delay on system performance. **[10]**

Q3) Develop fundamental model of stirred tank heater using first principle. **[10]**

Q4) Develop feed-forward control strategy to improve the performance of heat exchanger. **[10]**

Q5) Develop Inferential control strategy for composition control in distillation column. **[10]**

Q6) Design IMC based PID controller for FOPDT system as given below: **[10]**

$$\frac{e^{-3s}}{(3.5s+1)}$$

✪ ✪ ✪

Total No. of Questions : 5]

SEAT No. :

PE681

[Total No. of Pages : 2

[6585]-37

First Year M.E. (Instrumentation and Control) (Process Instrumentation)

EMBEDDED SYSTEM DESIGN

(2017 Pattern) (Semester - II) (506108)

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

Instructions to the candidates:

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

Q1) Attempt any two of the following.

a) Explain with suitable block diagram Analog Comparator of AVR μC. **[5]**

b) Write short note on interrupt handling of AVR microcontroller. **[5]**

c) Analyze with suitable interfacing diagram of DAC0808 with AVR μC. **[5]**

Q2) Attempt any two of the following.

a) Draw a neat block diagram and Describe ARM memory architecture. **[5]**

b) Describe ARM core architecture. **[5]**

c) Elaborate with neat sketch, 3-stage pipelining of ARM-7. **[5]**

Q3) Attempt any two of the following.

a) What are the Goals for the Universal Serial Bus? **[5]**

b) Explain with suitable diagram RS-485 Link. **[5]**

c) Compare between SPI vs. I^2C. **[5]**

Q4) Attempt any one of the following.

a) Design AVR based DAS for home automation system. GSM and Bluetooth technology should be used for communication. Draw and explain the system with suitable block diagram and circuit diagram. Consider suitable parameters. **[10]**

b) Design and develop AC motor speed control scheme using 8051 microcontroller which will display actual speed of the motor, set point can be enter for speed through keyboard, Input supply failure indication. **[10]**

P.T.O.

Q5) Attempt any one of the following.

a) Develop complete embedded system for temperature monitoring and control using LPC2148 μC. Provide the facility to communicate the information through SMS. For this system,

i) Identify different parameters for home automation system **[2]**

ii) Enlist selected sensors **[2]**

iii) Develop block diagram **[2]**

iv) Elaborate the operation of the system with respect to block diagram **[2]**

v) Develop the algorithm for the system **[2]**

b) Design and develop Automatic Traffic Light Control System over GSM module using Adriano or LPC2148. For this system,

i) Identify different parameters for home automation system **[2]**

ii) Enlist selected sensors **[2]**

iii) Develop block diagram **[2]**

iv) Elaborate the operation of the system with respect to block diagram **[2]**

v) Develop the algorithm for the system **[2]**



Total No. of Questions : 5]

SEAT No. : ____

PE682

[Total No. of Pages : 2

[6585]-38

First Year M.E. (Instrumentation & Control) (Process Instrumentation)

CONTROL SYSTEM

(2017 Pattern) (Semester - II) (506109)

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

Instructions to the candidates:

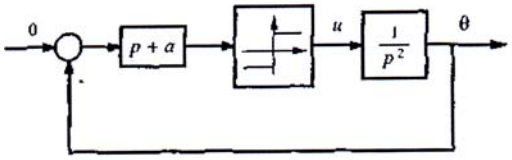
1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figure to the right candidates indicate full marks.***
4) ***Use of electronic pocket calculator.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any two Questions

a) Determine the type and stability or the critical point at (0,0) of system below. **[5]**

$$\dot{x} = \begin{bmatrix} 2 & 7 \\ -5 & -10 \end{bmatrix} x$$

b) The system shown in Figure, represents a satellite control system with rate feedback provided by a gyroscope. Draw the phase portrait of the system, and determine the system's stability. **[5]**



c) Explain phase plain portraits of linear system. **[5]**

Q2) Attempt any two Questions

a) Determine the saddle point with reference to phase portrait. Also determine the type and stability of each critical point. **[5]**

$x' = x - y$

$y' = x^2 - y^2 - 2$

P.T.O.

b) Brief the describing function of saturation nonlinearities. **[5]**

c) Elaborate the construction of phase trajectories by delta method. **[5]**

Q3) Attempt any two Questions

a) Derive the describing function whose input-output characteristics are as shown in figure. 1 **[5]**

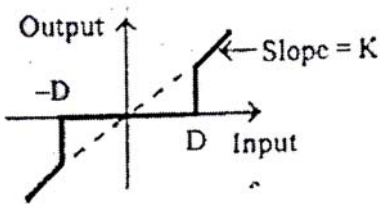


Figure .1

b) Consider the nonlinear system **[5]**

$$\dot{x}_1 = -x_1 - x_2^2$$

$$\dot{x}_2 = -x_2$$

Investigate the stability of the equilibrium points.

c) Consider a nonlinear system described by the equation **[5]**

$$\dot{x}_1 = -3x_1 + x_2$$

$$\dot{x}_2 = x_1 - x_2 - x_2^3$$

Using the Krasovskii method for constructing the Lyapunov function with P as identity matrix. Investigate the stability of the equilibrium state.

Q4) Attempt any two Questions

a) Elaborate the concept input state linearization. **[5]**

b) Discuss the Diffeomorphism and State Transformation in feedback linaearization. **[5]**

c) Write short note on zero dynamics. **[5]**

Q5) Attempt any one Question

a) Elaborate the sliding mode controller for simple pendulum system. **[10]**

b) Discuss one Application of sliding mode control in details. **[10]**



Total No. of Questions : 5]

SEAT No. :

PE683

[Total No. of Pages : 2

[6585]-39

S.Y.M.E. (Instrumentation and Control) (Process Instrumentation)
ADVANCED SIGNAL PROCESSING
(2017 Pattern) (Semester - III) (606101)

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

Instructions to the candidates:

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

Q1) Attempt any two questions.

a) Convert the following analog filter to a digital filter using impulse invariant technique: $H(s) = \frac{1}{(s+1)(s+2)}$ **[5]**

b) Determine a DT Butterworth filter for the following specifications using an impulse invariant method. **[5]**

$0.8 \le |H(e^{j\omega})| \le 1;\ 0 \le \omega \le 0.2\pi$

$|H(e^{j\omega})| \le 0.2;\ 0.6\pi \le \omega \le \pi$

Sampling frequency is 1 Hz.

c) What are different methods of FIR filter design? Discuss a windowing method of FIR filter design. **[5]**

Q2) Attempt any two questions.

a) Consider a sequence f = {2 5 8 5 9 7 4 –1 1}. Decompose the sequence using Haar Wavelet. **[5]**

b) Discuss the Heisenberg uncertainty principle. Illustrate the concept of STFT. **[5]**

c) Decompose the signal using Daubechies wavelet $x(n) = \{2\ 4\ 1\ 4\}$. **[5]**

P.T.O.

Q3) Attempt any two questions.

a) Discuss the concept of Time-frequency analysis. What are different transforms are used for time-frequency analysis? **[5]**

b) Discuss Haar Wavelet. List various properties of Haar Wavelet. **[5]**

c) A signal with a sampling frequency of 3072 kHz is to be decimated by a factor of 3 get the new sampling frequency of 48 kHz. The signal band of interest extends from 0 to 20 kHz. The pass band deviation is 0.01dB and stop-band attenuation is 80dB. Design a three stage filter. **[5]**

Q4) Attempt any two Questions.

a) Autocorrelation values $\gamma_{yy}(0) = 3$ $\gamma_{yy}(1) = 1$, and $\gamma_{yy}(2) = 0$ are given for a process of a single sinusoid with additive white noise. Find the frequency, its power and variance of white noise. **[5]**

b) Discuss various non parametric methods of power spectrum estimation. **[5]**

c) Discuss the AR Model for power spectrum estimation. Write the necessary steps of power spectrum estimation. **[5]**

Q5) Attempt any two Questions.

a) Elaborate the Linear Prediction Filter with neat diagram. **[5]**

b) Illustrate the concept of Power Spectral Density and Energy Spectral Density. **[5]**

c) Discuss the Levinson-Durbin algorithm in brief. **[5]**



Total No. of Questions : 7]

SEAT No. : [ ]

PE684

[Total No. of Pages : 2

[6585]-40

S.Y. M.E. (Instrumentation & Control) (Process Instrumentation)

BUILDING AUTOMATION

(2017 Pattern) (Semester - III) (606102)

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

Instructions to the candidates:

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

Q1) a) Draw the basic block diagram of building life safety system, explain each block in details. **[6]**

b) Write a short notes on "Fire Signature". **[4]**

Q2) a) Explain how template are generated in biometrics system with neat sketch. **[6]**

b) Write a short notes on Intrusion detection system. **[4]**

Q3) a) Explain VAV Air conditioning system with neat sketch. **[6]**

b) Write a short notes on Chillers. **[4]**

Q4) a) Explain any one application of vapour compression cycle with neat sketch. **[6]**

b) Write a short notes on Zoned Air-Conditioning Systems. **[4]**

P.T.O.

Q5) a) List and Explain benefits of DDC. **[6]**

b) Write a Short notes on Network Standards. **[4]**

Q6) a) Explain Integrated building management system in data centre with neat sketch. **[6]**

b) Write a short notes on Energy Savings concept & methods in BMS. **[4]**

Q7) a) What is the difference between project life cycle & project management life cycle. **[6]**

b) Write a short notes on Commissioning. **[4]**

x x x

Total No. of Questions : 8]

SEAT No. :

PE685

[Total No. of Pages : 3

[6585]-41

First Year M.E. (Mechanical)/(Automotive Engg.)/(Design Engineering)/ (Computer Aided Design, Manufacture & Engineering)

ADVANCED MATHEMATICS

(Design/CAD-CAM/Auto-Mobile)

(2017 Credit Pattern) (Semester - I) (507201)

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

Instructions to the candidates:

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

Q1) a) Find the orthonormal basis for the subspace of $\mathbb{R}^4$ spanned by the vectors (1,1,1,1), (3,3,–1,–1), (0,0,2,0) by applying Gram-Schmidt's method. **[5]**

b) If $w = \phi + i\psi$ represents the complex potential for an electric field and $\phi = x^3 - 3xy^2 + 2x + e^x \cos y$, determine the function ψ. **[5]**

Q2) a) Evaluate $\int_c \frac{e^{2z}}{(z+1)^4} dz$ where c is the circle $|z| = 2$. **[5]**

b) Find the mechanical system which is governed by the differential equation with the given initial condition using Laplace transform **[5]**

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = e^{-t}, \quad y(0) = 0, y'(0) = 1$$

Q3) a) Find the Laplace transform of $f(t) = e^{3t} \sin at + u(t-2) \sin(a(t-2))$. **[5]**

b) Solve the following differential equation by series method **[5]**

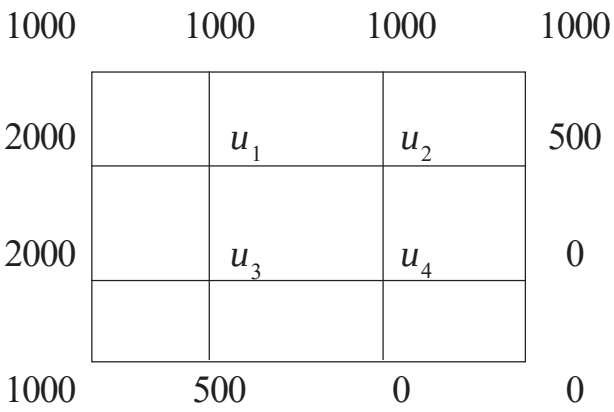
$$y'' - 2xy' + y = 0 .$$

P.T.O.

Q4) a) Calculate by power method the largest eigen value and the corresponding eigen vector of the matrix **[5]**

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix} \text{ with } X_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}.$$

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh with boundary values as given below. **[5]**



Q5) a) Solve the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with the conditions $u(0, t) = u(1, t) = 0$ and $u(x, 0) = \sin(\pi x)$ with step size $h = 0.1$ using Schmidt Bender's method. **[5]**

b) Using Galerkin's method, solve the boundary value problem $y'' + 2y = e^x$ with conditions $y(0) = 0 = y(1)$. **[5]**

Q6) a) Find the function y for which functional $\int_0^1 \left((y')^2 + y^2 - 2ye^x\right) dy$ with conditions $y(0) = y(1) = 0$. **[5]**

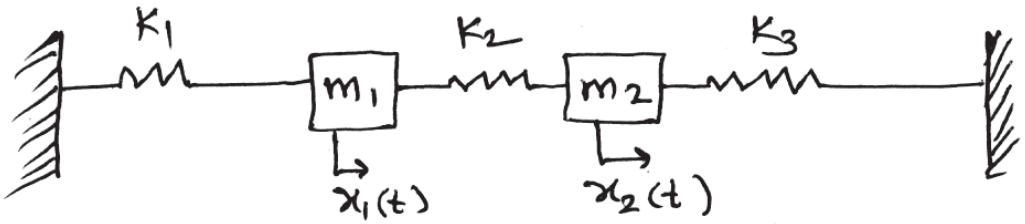
b) Solve the following overdetermined system of linear equations using least square method. **[5]**

$2x + y = 5$, $3x + 2y = 8$, $5x + 3y = 12$

Q7) a) Show that the map $w = \dfrac{2z+3}{z-4}$ transform the circle $x^2 + y^2 - 4x = 0$ into the straight line $4u + 3 = 0$. **[5]**

b) Find the Fourier transform of $f(x) = \begin{cases} x & ; \ |x| \le a \\ 0 & ; \ |x| > a \end{cases}$. **[5]**

Q8) a) For the following mass spring system $m_1 = 9$, $m_2 = 1$, $k_1 = 24$, $k_2 = 3$, $k_3 = 3$ assumming there is no friction. Find the natural frequencies **[5]**



b) Solve the differential equation $16 \dfrac{\partial^2 u}{\partial x^2} = \dfrac{\partial^2 u}{\partial t^2}$ by taking h = 1, upto $t = \dfrac{5}{4}$

Given that **[5]**

i) $u(0, t) = u(5, t) = 0$

ii) $u(x, 0) = x^2 (5 - x)$

iii) $u_t(x, 0) = 0$

ⓘⓘⓘⓘ

Total No. of Questions : 7]

SEAT No. : ____

PE686

[Total No. of Pages : 2

[6585]-43

First Year M.E. (Mechanical-Automotive Engineering)

AUTOMOTIVE SAFETY AND REGULATIONS

(2017 Pattern) (Semester - I) (502303)

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

Instructions to the candidates:

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

Q1) a) Discuss various causes of accidents. Explain the measures to be taken to avoid accidents on road. **[5]**

b) Describe role of active and passive safety components in automobile. Justify your answer with example. **[5]**

Q2) a) Explain the various test requirements for protection of pedestrians in the events of collision with a motor vehicle. **[5]**

b) Explain with suitable sketch reference points used in pedestrian tests carried out in laboratory. **[5]**

i) Impact and Target point

ii) Lower bumper reference line

Q3) a) Describe role of crumple zone in vehicle structure and explain objectives of it. **[5]**

b) Describe crash test procedure for rear crash with suitable sketch and explain requirement of it. **[5]**

Q4) a) What are ergonomic requirement of automobile driver cabin space design? Explain with suitable sketch. **[5]**

b) Describe as per AIS-15 Seat belt anchorages and specifications used in automobile vehicles. **[5]**

P.T.O.

Q5) a) Describe various types of test dummies used in crash testing. **[5]**

b) Draw construction and define beam pattern of modern head lamp unit. **[5]**

Q6) a) What are requirements of car seat? Explain construction and working of automobile seat. **[5]**

b) Draw follow traffic and road sign and Explain specification of board as per CMVR **[5]**

i) Slippery Road

ii) No Entry

iii) No Parking

iv) One way

v) Wild animals

Q7) Write Short note on the following. (Any Two) **[10]**

a) Whiplash injury

b) AIS 100

c) Bumper construction and design

d) Use of LED in automobiles

Total No. of Questions : 8]

SEAT No. :

PE687

[Total No. of Pages : 2

[6585]-44

First Year M.E. (Mechanical Engineering) (All Mechanical Branches)

RESEARCH METHODOLOGY

(2017 Credit Pattern) (Semester - I) (502104)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule is electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the techniques of defining a research problem. **[4]**

b) Explain significance of research. **[5]**

OR

Q2) a) Discuss research design in case of descriptive and diagnostic research studies. **[4]**

b) Explain research process with neat block Diagram. **[5]**

Q3) a) Explain multi Scale modeling with neat sketch. **[4]**

b) What is Hypothesis? Explain characteristics of Hypothesis. **[5]**

OR

Q4) a) Explain Meaning of following in the context of Research Design **[4]**

i) Extraneous variables

ii) Control variables

iii) Confounded Relationship

iv) Research Hypothesis

b) Write a note on setting up a computer model to predict the performance of an experiment system. **[5]**

P.T.O.

Q5) a) Explain dissemination of research findings and different steps and precautions while writing research report. **[8]**

b) Explain regression analysis, curve fitting and developing correlation. **[8]**

OR

Q6) a) Describe the outline and structure of research report. **[8]**

b) Explain the role of DSP in data collection in noisy environment. **[8]**

Q7) a) Explain the term plagiarism. How can we avoid plagiarism in paper writing and thesis writing? **[8]**

b) How a suitable journal is selected for publishing research work? **[8]**

OR

Q8) a) What is Uncertainty analysis? How uncertainty in the measurement is estimated? **[8]**

b) Explain format of a research proposal clearly stating the sections to be included while writing a good research proposal. **[8]**

* * *

Total No. of Questions : 7]

SEAT No. : ____

PE688

[Total No. of Pages : 2

[6585]-47

First Year M.E. (Mechanical-Automotive Engineering)

AUTOMOTIVE CHASSIS DESIGN

(2017 Pattern) (Semester - II) (502309)

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

Instructions to the candidates:

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

Q1) a) What are the objectives of Suspension system? Explain role of spring and shock absorbers in it. **[5]**

b) Define the following terms. **[5]**

i) Pitching and rolling.

ii) Bouncing and Yawing.

iii) Sprung and Unsprang weight.

Q2) a) Sketch and explain the construction and working of Torsion bar. State example of use of it. **[5]**

b) Classify shock absorbers from various viewpoints. Explain working principle of hydraulic shock absorber. **[5]**

Q3) a) What are various requirements of a wheel? Why are they arranged in particular fashion? Explain. **[5]**

b) Classify the steering system. Describe with neat sketch construction and working of conventional steering system used in automobile. **[5]**

Q4) a) State the principle and derive equation for correct steering of a vehicle. **[5]**

b) Sketch the constructional details of heavy duty pneumatic tyre and explain the role of components in it. **[5]**

P.T.O.

Q5) a) Explain the working of a Vacuum brake by means of a diagram. How it is different from an air brake? Explain. **[5]**

b) Draw a layout of a pneumatic brake system, name the parts and explain working of it. **[5]**

Q6) a) Compare between the following **[5]**

i) Drum Brake and Disc brake

ii) Brake system of motorcycle and Car

b) Draw a chassis layout used for rigid six wheeler vehicle. Explain the components of it. **[5]**

Q7) Write Short note on the following (Any two) **[10]**

a) Power steering.

b) Scammell articulated trailers.

c) Tyre tread design.

d) Brake lining materials.

x x x

Total No. of Questions : 5]

SEAT No. :

PE689

[Total No. of Pages : 2

[6585]-48

S.Y.M.E. (Mechanical) (Automotive Engineering)

VEHICLE DYNAMICS

(2017 Pattern) (Semester-III) (602313)

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

Instructions to the candidates:

1) ***Attempt all questions.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal niarks.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt any Two.

a) Describe the construction details of Radial tire and Bias ply tire. **[5]**

b) Explain variation of tractive effort with longitudinal slip. **[5]**

c) Draw the tire axis system as recommended by the SAE and explain various angles and forces associated with the tire. **[5]**

Q2) Attempt any Two.

a) Derive the equation for maximum tractive effort that the tire ground can support in terms of coefficient of road resistance. **[5]**

b) Discuss the effect of wheel lock up during braking on the directional stability and control of a road vehicle. **[5]**

c) Write short notes power requirement of a full size passenger car as a function of speed. **[5]**

Q3) Attempt any Two.

a) Explain steering force and moments in suspension kinematics. **[5]**

b) A passenger car weighs 20 kN and has a wheelbase of 2.8 m. The center of gravity is 1.27 m behind the front axle. If a pair of radial-ply tires, each of which has a cornering stiffness of 46 kN/rad are installed in the front, and a pair of bias-ply tires, each of which has a cornering stiffness of 33 kN/rad are installed in the rear. The average steering gear ratio is 22. Determine whether the vehicle is understeer or oversteer. **[5]**

c) Describe anti-dive and squat geometry. **[5]**

P.T.O.

Q4) Attempt any Two.

a) Explain various tests that can be used to evaluate handling characteristics of vehicles. **[5]**

b) Explain the steady-state handling characteristics of a two-axle vehicle. **[5]**

c) Sketch and explain the handling behavior of car with and without vehicle stability control system. **[5]**

Q5) Attempt any Two.

a) Write short note on the model of ISO road profile. **[5]**

b) Explain the concept of active and semi active suspension with neat sketch. **[5]**

c) Explain the effect of wheelbase in road and suspension modelling. **[5]**



Total No. of Questions : 7]

SEAT No. : ____

PE690

[Total No. of Pages : 1

[6585]-51

First Year M.E. (Mechanical CADME)

COMPUTER AIDED DESIGN

(2017 Pattern) (Semester - I) (502403)

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

Instructions to the candidates:

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

Q1) a) Explain in brief CAD/CAM system evaluation Criteria. **[5]**

b) Explain Bezier curves and state its applications. **[5]**

Q2) a) Explain the parametric representation of surface revolution and Tabulated surface. **[5]**

b) Explain the Geometric constraints and Datum Plane. **[5]**

Q3) a) Explain the parametric representation of Blending surface. **[5]**

b) Explain the role of orthogonal and perspective transformations in CAD. **[5]**

Q4) a) Explain 3D modelling aids and tools. **[5]**

b) Explain the parent child relationship with suitable example. **[5]**

Q5) a) Explain the parametric and variational modelling. **[5]**

b) Explain the Role Artificial Intelligence in CAD. **[5]**

Q6) a) Explain the STEP Architecture and implementation issues. **[5]**

b) Write short notes on ACIS and DXF. **[5]**

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

a) Parametric design

b) Functional areas of CAD

x x x

Total No. of Questions : 7]

SEAT No. :

PE691

[Total No. of Pages : 1

[6585]-52

First Year M.E. (Mechanical) (CADM & E)

COMPUTER INTEGRATED MANUFACTURING

(2017 Pattern) (Semester-II) (502407)

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

Instructions to the candidates:

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

Q1) Explain the role of CAD/CAM in CIM? **[10]**

Q2) Explain collaborative manufacturing technology, its characteristics. **[10]**

Q3) Write short note on MRP-I and Explain the principle of PDM & PLM. **[10]**

Q4) Explain web based forging and casting process system? Advantages in forging and casting industry. **[10]**

Q5) Discuss the requirement of Data Base Management in CIM. **[10]**

Q6) What is a DNC system, and how it works? Highlight some advantages and disadvantages? **[10]**

Q7) Explain the principle of lean manufacturing and its characteristics also explain four functions of lean production. **[10]**



Total No. of Questions : 7]

SEAT No. :

PE692

[Total No. of Pages : 1

[6585]-53

First Year M.E. (Mechanical) (CADM & E)

INDUSTRIAL PRODUCT DESIGN & PRODUCT LIFECYCLE MANAGEMENT

(2017 Pattern) (Semester - II) (502408)

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

Instructions to the candidates:

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

Q1) Define Quality Function Deployment (QFD) and discuss its evolution. How is QFD strategically applied during product planning to align customer requirements with design specifications? **[10]**

Q2) Critically analyze modern approaches in product design. How does rapid prototyping contribute to innovation and efficiency within the design and development cycle? **[10]**

Q3) Discuss the benchmarking process in engineering. Evaluate how benchmarking helps in formulating accurate and competitive engineering specifications.**[10]**

Q4) Examine the influence of Design For Manufacturability (DFM) principles on controlling development costs and enhancing product quality. What strategic benefits do organizations gain through DFM? **[10]**

Q5) Compare different Product Data Management (PDM) systems. Highlight their primary features and functional advantages in managing product-related information across the development lifecycle. **[10]**

Q6) Define Product Lifecycle Management (PLM). Analyze the core architectural frameworks of PLM systems and explain how they contribute to technological innovation and enterprise integration. **[10]**

Q7) Explain the concept of product workflow. Assess its importance in improving operational efficiency, ensuring quality control and streamlining production processes. **[10]**

☼ ☼ ☼

Total No. of Questions : 7]

SEAT No. :

PE693

[Total No. of Pages : 2

[6585]-54

First Year M.E. (Mechanical) (Computer Aided Design Manufacture & Engineering)

AUTOMATED MANUFACTURING SYSTEM MODELLING

(2017 Pattern) (Semester - II) (502409)

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

Instructions to the candidates:

1) ***Answer Any five questions.***
2) ***Draw a neat diagram wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary***

Q1) a) Differentiate between fixed and programmable automation with suitable examples. **[5]**

b) Explain the basic elements of an automated system with a block diagram.**[5]**

Q2) a) What is Flexible Manufacturing System (FMS)? Discuss its advantages and limitations. **[5]**

b) Explain Group Technology (GT) and its significance in cellular manufacturing. **[5]**

Q3) a) Explain the working of a pneumatic Schmitt trigger with a neat diagram.**[5]**

b) Design a pneumatic circuit for an automatic die-casting machine using basic logic devices. **[5]**

Q4) a) How is Artificial Intelligence (AT) applied in manufacturing automation?**[5]**

b) Briefly explain Fuzzy Logic and its role in decision-making in automated systems. **[5]**

P.T.O.

Q5) a) Compare contact and non-contact inspection methods with examples. **[5]**

b) Discuss the role of IoT in modern manufacturing systems. **[5]**

Q6) a) Explain Discrete-Time Markov Chain with an example. **[5]**

b) What are Stochastic Petri Nets? How are they different from Classical Petri Nets? **[5]**

Q7) A manufacturing plant wants to implement an automated inspection system. Suggest a suitable inspection strategy (contact/non-contact) and justify your choice with reasons. **[10]**

x x x

Total No. of Questions : 7]

SEAT No. :

PE694

[Total No. of Pages : 1

[6585]-55

Second Year M.E. (Mechanical) (CADM & E)

SIMULATION MODELING

(2017 Pattern) (Semester-III) (602413)

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

Instructions to the candidates:

1) ***Answer the five questions from following.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Explain the following terms. **[10]**

a) Explain the simulation procedure of continuous system.

b) Explain the Triangular Distribution.

Q2) Explain the following terms. **[10]**

a) System & System environment.

b) Components of a system.

c) Stochastic nature of output data.

Q3) List the areas of application related to simulation modeling. And list the limitations of simulation. **[10]**

Q4) Explain different performance measures in manufacturing system modeling. **[10]**

Q5) Discuss in detail Weibull distribution and Empirical continuous distribution. **[10]**

Q6) What is necessity of verification & validation of model? **[10]**

Q7) Define Modeling of System Randomness. Explain various Sources of Randomness and their effect on Machine Downtime. **[10]**



Total No. of Questions : 7]

SEAT No. : ____

PE695

[Total No. of Pages : 2

[6585]-56
S.Y. M.E. (Mechanical) (CADM & E)
OPTIMIZATION TECHNIQUES
(2017 Pattern) (Semester - III) (602414)

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

Instructions to the candidates:

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

Q1) Solve by Simplex method **[10]**

Minimize $f = -3x_1 - 2x_2$

Subject to $x_1 - x_2 \leq 1$

$3x_1 - 2x_2 \leq 6$

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

Q2) How optimization problem can be formed & Discuss classification of optimization problem? **[10]**

Q3) Explain different Optimality criteria for single objective, Multi objective & constrained optimization problem. **[10]**

Q4) How to solve secant method & Write an algorithm for interval halving method? **[10]**

P.T.O.

Q5) Minimize $F(X_1, X_2) = [X_1^2 + X_2 - 11]^2 + [X_1 + X_2^2 - 7]^2$ **[10]**

Subjected to $g_1(x) = 26 - (X_1 - 5)^2 - X_2^2 \geq 0$,

$g_2(x) = 20 - 4X_1 - X_2 \geq 0$,

$X_1, X_2 \leq 0$

Range $(0 <= X_1, X_2 <= 5)$

using complex search Method.

Q6) Explain the concept of Particle Swarm Optimization. **[10]**

Q7) Discuss feasible direction method & generalized reduced gradient Method. **[10]**

Total No. of Questions : 7] **SEAT No. :**

PE696 **[Total No. of Pages : 2**

[6585]-57

First Year M.E. (Mechanical) (Design Engineering)

MATERIAL SCIENCE AND MECHANICAL BEHAVIOR OF MATERIALS

(2017 Pattern) (Semester - I) (502202)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***A neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of a programmable calculator is not allowed.***
5) ***Assume suitable data wherever necessary.***

Q1) a) Explain the applications of smart materials by considering functional attributes. **[5]**

b) Explain the constituents of composite materials in detail. **[5]**

Q2) a) Explain Tresca's Criteria of Yielding and draw its Yield Locus. **[5]**

b) The state of stress at a point in a body is given by $\begin{bmatrix} 20 & -40 & 0 \\ -40 & -40 & 0 \\ 0 & 0 & 100 \end{bmatrix}$. **[5]**

Using Mohr's Circle determine the following:

i) Octahedral normal stress

ii) Octahedral shear stress

iii) Maximum shear stress

Q3) a) Describe the phenomenon of Bauschinger's effect in mild steel. **[5]**

b) A specimen of an alloy is made into a cylindrical bar of 12.827 mm diameter and 203.2 mm length. The bar is loaded in axial tension up to proportional limit when the load is 42.85 kN. At this load the length was measured as 12.808 mm. Determine the following: **[5]**

i) Proportional Limit

ii) Modulus of elasticity

iii) Poisson's Ratio

P.T.O.

Q4) a) A 13 mm-diameter tensile specimen has a 50 mm gage length. The load corresponding to the 0.2 percent offset is 6800 kg and the maximum load is 8400 kg. Fracture occurs at 7300 kg. The diameter after fracture is 8 mm and the gage length at fracture is 65 mm. Calculate the standard properties of the material from the tension test. **[5]**

b) Explain with neat sketch the Biaxial Tension (Hydraulic Bulge) Test. **[5]**

Q5) a) Two points on a true stress-strain curve for aluminum alloy are σ = 222 MPa at ε =0.05 and σ = 303MPa at ε = 0.15. Find the values of K and n using Power Law Approximation that best fit the data. Then using these values of K and n, predict the true stress at a strain of ε = 0.30. **[5]**

b) Explain isotropic and kinematic hardening models with neat sketch. **[5]**

Q6) a) Explain Elastic-plastic torsion of a solid circular shaft. **[5]**

b) Explain shake down theorem. **[5]**

Q7) What is viscoelasticity? Explain Maxwell Model, Voigt Model and Maxwell-Voigt Model for rheological properties of viscoelastic material with neat sketch. **[10]**

☼ ☼ ☼

Total No. of Questions : 7]

SEAT No. :

PE697

[Total No. of Pages : 3

[6585]-58

First Year M.E. (Mechanical) (Design Engineering)

ADVANCED STRESS ANALYSIS

(2017 Pattern) (Semester - I) (502203)

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

Instructions to the candidates:

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

Q1) a) Given the Airy stress function $\Phi = Ax^2y$ where A is constant, check whether it satisfies the biharmonic equation. If it satisfies then find the stress components σx, σy and τxy. **[6]**

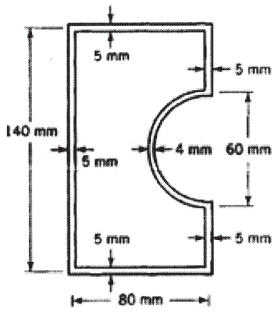
b) List the conditions under which the beam is subjected to unsymmetrical bending. **[4]**

Q2) a) Derive equilibrium equation in differential form for polar co-ordinates. **[5]**

b) The following strain were obtained on a rectangular strain rosette mounted on steel for which modulus of Elasticity = 200 GPa, Poisson ratio = 0.3, ε = 220 μm/m (0°), ε = –150 μm/m (45°) and ε = –280 μm/m (90º). Determine : **[5]**

i) the state of stress and strains at the location of the strain gauge
ii) the principal strains and principal stresses
iii) the maximum shear stress.

Q3) a) A torque T 3.0 kN m is applied to the torsion member whose cross section is shown in Figure. Determine the maximum shear stress in the member and the angle of twist per unit length. Take G = 30 GPa. **[5]**

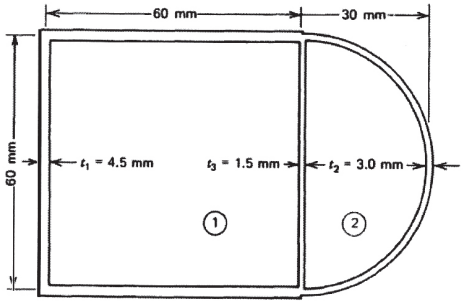


b) Explain dimensional analysis in experimental techniques. **[5]**

P.T.O.

Q4) a) Explain Plain Strain condition. **[3]**

b) A hollow thin wall torsion member has two compartments with cross-sectional dimensions as shown in figure below. The material is an aluminium allow for which G = 26 GPa. Determine the shear flow in all the cross sections if the maximum shear stress at locations away from stress concentrations is 30 MPa. **[7]**



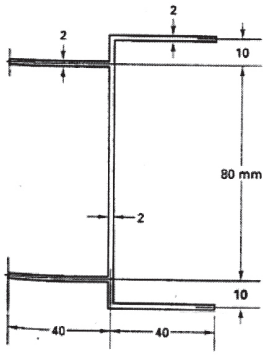
Q5) A steel ball of diameter 100 mm is pressed against the inside of a thick spherical steel race of inner radius 100 mm. If the load is exerted between steel ball and steel race is 110 kN, compute the maximum principal stress, maximum shear stress, and maximum octahedral shear stress. Take E = 200 GPa and v = 0.29 for steel ball and race. **[10]**

Q6) A thin-walled cross section of a beam is shown in Fig. The dimension is given based on the centerline of each member of the cross section. **[10]**

a) Determine the moment of inertia about x-axis passing through CG.

b) Calculate forces in the legs of the cross section due to shear flow.

c) And hence find the shear center for the beam cross section.



Q7) a) Explain the effect of a stressed model in circular polariscope in a light field arrangement. **[5]**

b) Explain Prandtl's membrane analogy, with a suitable example. **[5]**

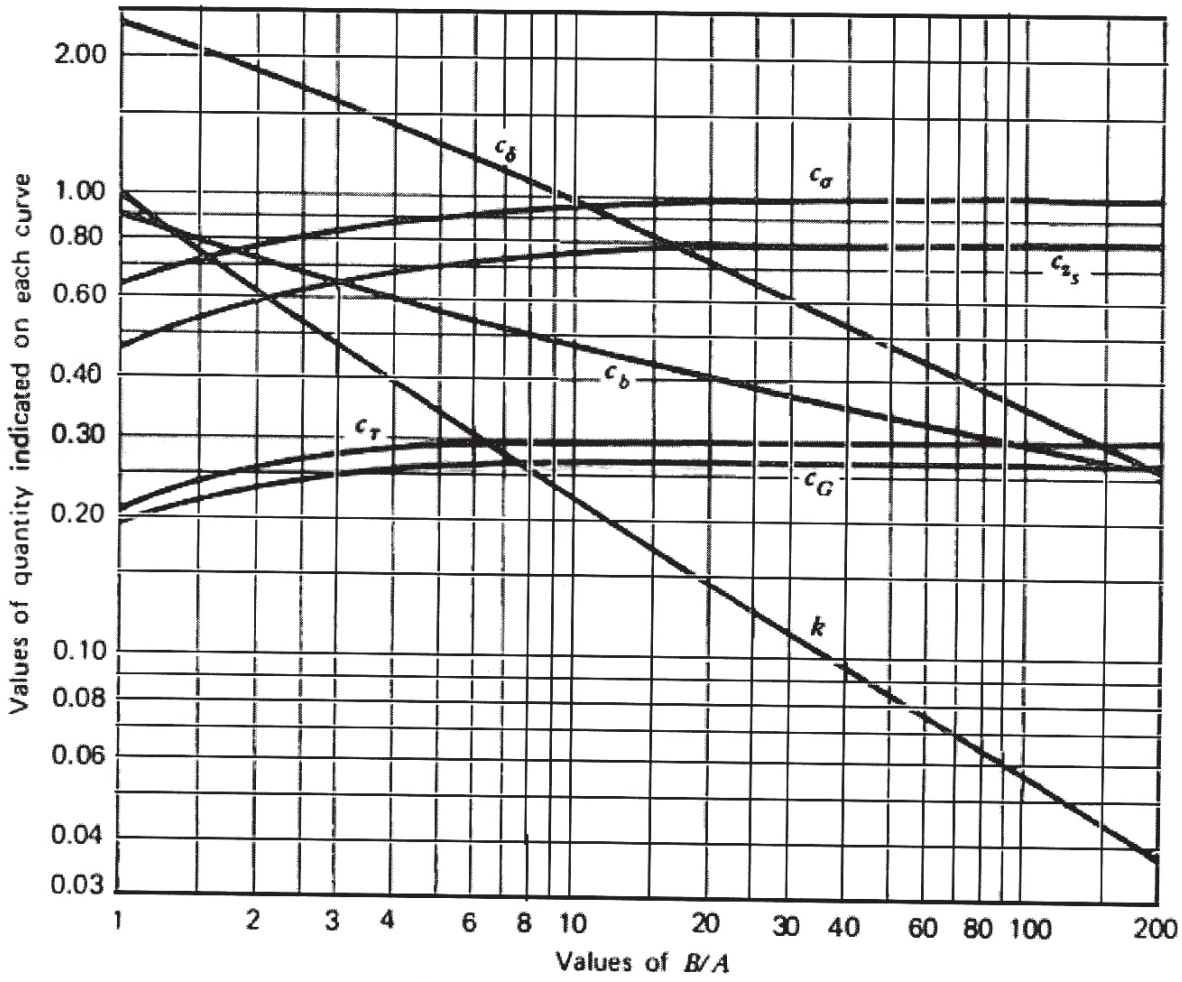


Figure Stress and deflection coefficients for two bodies in contact at a point.

Total No. of Questions :7]

SEAT No. : ____

PE698

[Total No. of Pages : 3

[6585]-59

First Year M.E. (Mechanical) (Design Engineering)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(2017 Pattern) (Semester-II) (502207)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***A neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of a programmable calculator is not allowed.***
5) ***Assume suitable data wherever necessary.***

Q1) a) Determine the degree of freedom of the mechanism shown in Figure 1. **[5]**

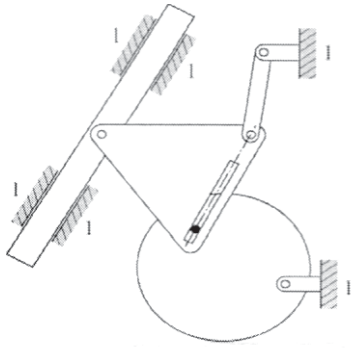


Figure 1

b) Discuss the relation between Transmission angle and mechanical advantage of a four bar mechanism. **[5]**

Q2) a) Explain velocity and acceleration analysis of complex mechanism by normal acceleration and auxiliary point method. **[5]**

b) Discuss the advantage of using Goodman's method acceleration analysis of a complex mechanism. **[5]**

Q3) a) Explain the significance of Ball's Point in Curvature Theory. List the four different ways to find it. **[5]**

b) Discuss Bobillier construction and its applications. **[5]**

P.T.O.

Q4) a) A slider-crank mechanism is shown in Figure 2. The dimensions are OA=20mm, AB=25mm, AD=10mm and DC=10mm. Draw the inflection circle for the motion of the coupler and find the instantaneous radius of curvature of the path of the coupler point C. **[5]**

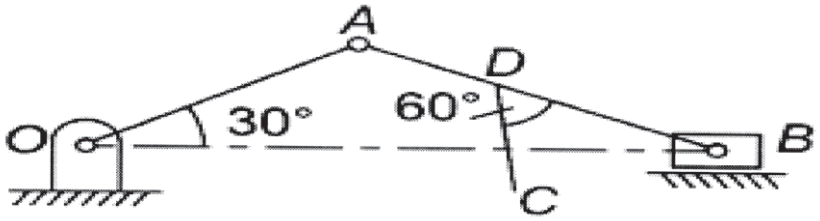


Figure 2

b) Figure 3 shows three positions of link AB of length 80 mm. It is to be moved through the successive positions A_1B_1, A_2B_2 and A_3B_3 with coordinates as shown. Position A_3B_3 is horizontal and point A_3 is 80mm vertically above point B_2. Graphically synthesize a four-bar mechanism with link AB as its coupler. Find out the coordinates of the ground pivots in the same reference frame. Also, find the lengths of input and output links. Draw the mechanism in its second position. **[5]**

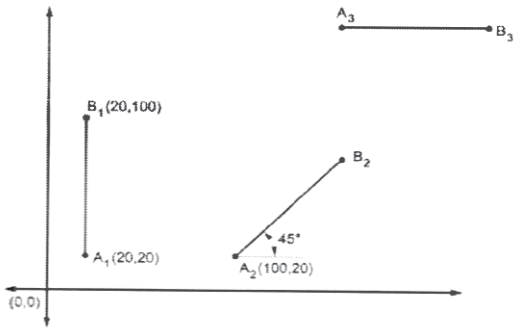


Figure 3

Q5) a) What is relative pole? Explain three position synthesis of four bar chain mechanism by relative pole method. **[5]**

b) Synthesize a four-bar mechanism by the method of inversion. Assume the following data: **[5]**

i) The length between fixed points is 10cm.

ii) The length of the Input Link is 3.4 cm.

iii) 2-positions of the input link from the initial position 30°and 60°

iv) 2-positions of the output link from the initial position 20° and 40°

Q6) a) Explain the following terms: (Any 2) **[5]**

i) Type synthesis

ii) Number synthesis

iii) Dimensional synthesis

b) Design a four-bar mechanism with input link 'a', coupler link 'b', and output link 'c'. Angles θ and ϕ for three successive positions are given in the table below: **[5]**

	1	2	3
θ	20°	35°	50°
ϕ	35°	45°	60°

Using Freudenstein's equation find out other link lengths b, c, and d. Assume link length a=1.

Q7) a) Derive displacement equations for Hooke's Joint using matrix method. **[5]**

b) Discuss Denavit-Hartenberg (D-H) parameters with their importance in analysis of spatial mechanisms. **[5]**



Total No. of Questions : 7] **SEAT No. :**

PE699 **[Total No. of Pages : 2**

[6585]-60

First Year M.E. (Mechanical-Design Engineering)

ADVANCED MECHANICAL VIBRATIONS

(2017 Pattern) (Semester - II) (502208)

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

Instructions to the candidates:

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

Q1) Calculate the natural frequencies and the mode shape for system shown in Figure 1 below **[10]**

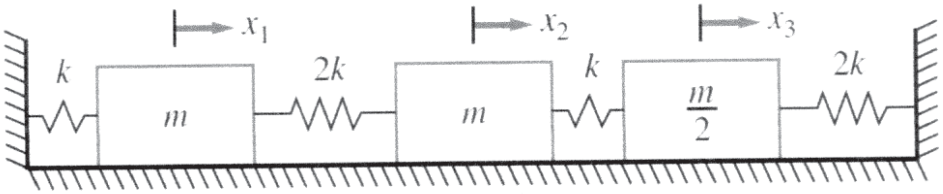


Fig. 1

Q2) For the torsional system shown in Figure 2 below, determine the natural frequencies using Holzer method and locate the relative positions of the nodes. Take $I_1 = I_3 = 0.45$ kg/m^2, $I_2 = I_4 = 0.11$ kg/m^2, $K_{t1} = K_{t3} = 0.113 \times 10^5$ N-m/rad and $K_{t2} = 0.226 \times 10^5$ N-m/rad. **[10]**

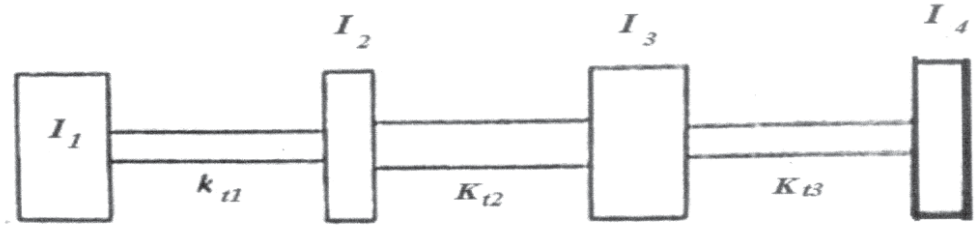


Fig. 2

Q3) What is the required tension in a transmission line of length 15m and linear density of 5 kg/m such that the transmission line's lowest natural frequency for transverse vibrations is 100 rad/s. Assume the line (string) is simply supported. **[10]**

P.T.O.

Q4) An apparatus of mass m is shipped in a container as shown in Figure 3 below. In the process of unloading, the container is dropped from a height h to a hard floor. Find the response **[10]**

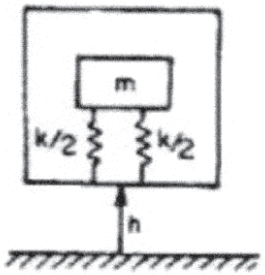


Fig.3

Q5) a) Explain time domain analysis and frequency domain analysis. **[6]**

b) Differentiate Vibration Isolation and Vibration Absorber. **[4]**

Q6) a) Discuss Auto correlation function and power spectral density. **[6]**

b) Explain Narrowband and Wideband random process. **[4]**

Q7) Write Short Notes on : **[10]**

a) Experimental modal analysis

b) Fault Diagnosis

c) Dynamic Vibration Absorber

d) Balancing of rotating machine

Total No. of Questions : 8]

SEAT No. : ____

PE700

[Total No. of Pages : 3

[6585]-61
First Year M.E. (Mechanical) (Design Engineering)
FINITE ELEMENT METHOD
(2017 Pattern) (Semester - II) (502209)

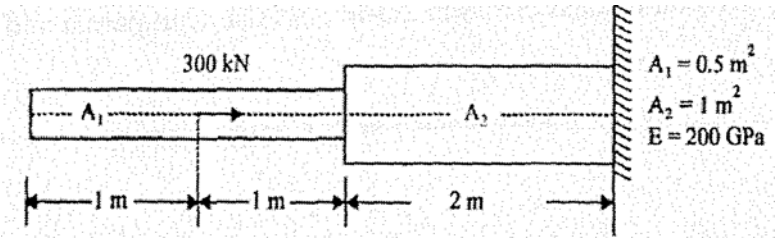
Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

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

Q1) a) Discuss Rayleigh Ritz method with Galerkin method? **[4]**

b) Determine the nodal displacements and element stresses by finite element formulation for the following figure. Use P=300 k N; A,= 0.5 m2; A2=1 m2; E=200 GPa **[6]**



Q2) a) A three stepped rod of E=2×100000 N/sq.mm, and 600mm of length with 600,400, and 200 sq.mm c/s area. Both the ends are fixed and at node 2 and 3 is subjected to axial tensile load of 10 KN and 5KN each. Model the rod with by FEM and solve for following : **[6]**

i) Global stiffness matrix

ii) Nodal displacements

iii) Reaction forces

b) Compare gauss elimination approach with penalty approach? List applications? **[4]**

P.T.O.

Q3) a) Six-noded triangle has following details. Calculate the displacements in x and y directions at point P? Assume zeta 1=0.4 and zita 2=0.6 **[6]**

Nodes	1	2	3	4	5	6
x-cordi.	0	10	5	5	7.5	2.5
y-cordi..	0	0	5	0	5	5
u- vector	0.1	0.15	0.5	0.2	0.3	–0.4
v-vector	0.2	–0.1	0.6	–0.2	–0.3	0.4

b) Discuss Steps to solve unknowns by following used in FEA **[4]**

i) Newton cotes Formula

ii) Sampson 1/3 rule

Q4) a) Write short notes on **[5]**

i) Uniqueness of mapping of isoparametric elements.

ii) Jacobean matrix

iii) Gaussian quadrature integration technique.

b) Explain FEA procedure used in solving 3-D Rectangular element problems to calculate unknown Deflections and elemental stresses? **[5]**

Q5) a) Compare Plate and Shell elements? Explain Mindlin's theory with applications? **[5]**

b) Explain steps in 2D FEA for Stiffness matrix in **[5]**

i) Triangular plate

ii) Rectangular plate element?

Q6) a) Explain modified Newton-Raphson method [MNRM] to handle material nonlinear problems? And list advantages of MNR Method? **[5]**

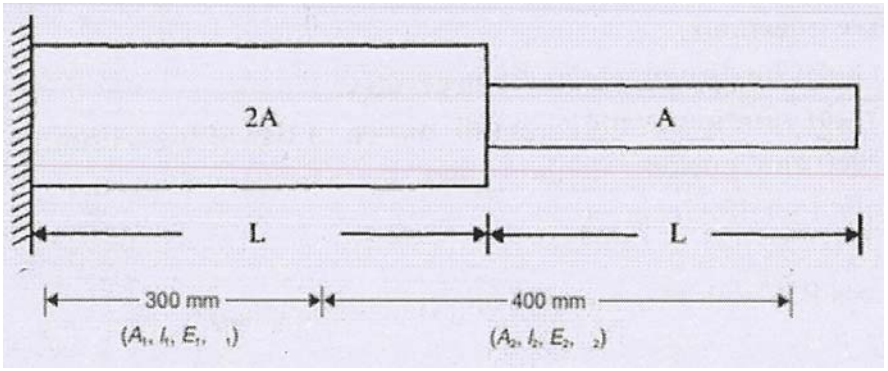
b) Write a short note on Gaussian Quadrature Numerical integration for 1- Dimensional **[5]**

i) One -Point Formula

ii) Two - Point Formula

Q7) a) Explain types of Vibration problems with examples? And also list out 1-numerical methods to solve eigen values? **[4]**

b) Find the natural frequencies of vibrations of stepped shaft fixed at one end and free at other end. The shaft has area 2A and A of equal Lengths L and diameter D=40 mm and d=20 mm as shown. **[6]**



Q8) a) Explain different types of symmetries that occurs in meshing? Discuss types of symmetric problems with example? **[5]**

b) List and discuss errors in 2D-FEA? Also Compare h and p Method? **[5]**



Total No. of Questions : 7] **SEAT No. :**

PE701 **[Total No. of Pages : 2**

[6585]-62
S.Y.M.E. (Mechanical) (Design Engineering)
OPTIMIZATION TECHNIQUES
(2017 Pattern) (Semester - III) (602213)

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

Instructions to the candidates:

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

Q1) a) What do you mean by optimization? State different applications of engineering optimization. **[5]**

b) Write a short note on Mathematical modeling of optimization problem. Explain with suitable example. **[5]**

Q2) Maximize the following function with simple simplex method. **[10]**

Maximize $Z = 60x_1 + 50x_2$

Subject to, $x_1 + 2x_2 \leq 40$

$3x_1 + 2x_2 \leq 60$

$x_1, x_2 \geq 0$

Q3) Explain in brief **[10]**

a) Teaching learning Based Optimization

b) Simulated Annealing

Q4) Minimize the function using the golden section method with n = 6 **[10]**

$f(x) = 0.65 - [0.75/(1+x^2)] - 0.65x \tan^{-1}(1/x)$ within the range [0, 3].

P.T.O.

Q5) Write a short note on **[10]**

a) Evolutionary structural optimization for displacement of stiffness.

b) Evolutionary structural optimization based on stress level.

Q6) Explain with suitable example Neural-Network-based optimization technique. **[10]**

Q7) a) What is topology optimization? Explain with suitable example. **[5]**

b) Write a short note on Bi-Directional evolutionary optimization. **[5]**



Total No. of Questions : 10]

SEAT No. :

PE702

[Total No. of Pages : 3

[6585]-63

S.Y. M.E. (Mechanical) (Design Engineering)

MECHANICAL MEASUREMENTS AND CONTROLS

(2017 Pattern) (Semester - III) (602214)

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

Instructions to the candidates:

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

Q1) a) Define: **[4]**

i) State space

ii) State variable

b) What are the temperature compensation methods used in strain gauge? Explain any one in detail. **[6]**

OR

Q2) a) With neat sketch explain construction and working of **[6]**

i) Pyrometer

ii) Piezo electric accelerometer

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

i) Drift

ii) Hysteresis

Q3) a) With neat sketch explain the significance of signal conditioning specific to amplification, filtering. **[6]**

b) Differentiate between Time Domain and Frequency Domain modeling approach. **[4]**

OR

P.T.O.

Q4) a) Explain Bit Width. What is the difference between 32-bit and 64-bit system? **[6]**

b) Write note on band pass filters. **[4]**

Q5)a) For system shown in figure Assume mass = 2 kg, stiffness = 4N/m and damping = 0.3Ns/m, also f(t) = force input in Nand y(t) is displacement output in m. **[6]**

For this system:

i) Deriver transfer function

ii) Identify the location of the poles and zeros.

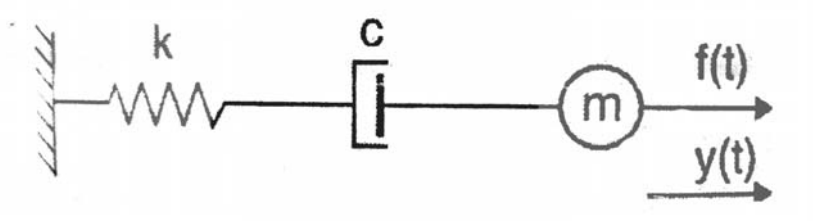


Fig. Q5 a.

b) Determine poles and zeros of system and comment on stability of system having transfer function = $\frac{6(S+3)}{S^2+2S+2}$. **[4]**

OR

Q6) a) Explain Phase margin and gain margin. **[6]**

b) Explain with neat sketch Marginal stability. **[4]**

Q7) a) Classify control system and explain the significance of transfer function. **[4]**

b) Find the transfer function of the following block diagram. **[6]**

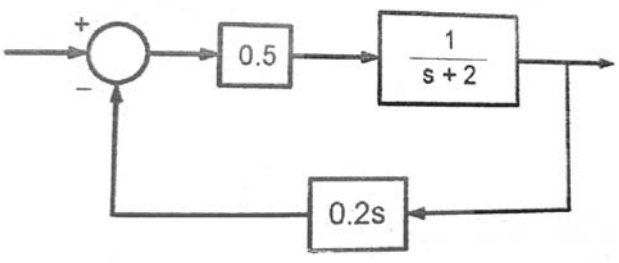


Fig.Q7 b.

OR

Q8) a) Sketch the PD Controller (parallel form) output with respect to time for shown graph of an error Verses time. Assume Kp = 10%/S. Kd = 0.5%/S and P0 = 20%. **[6]**

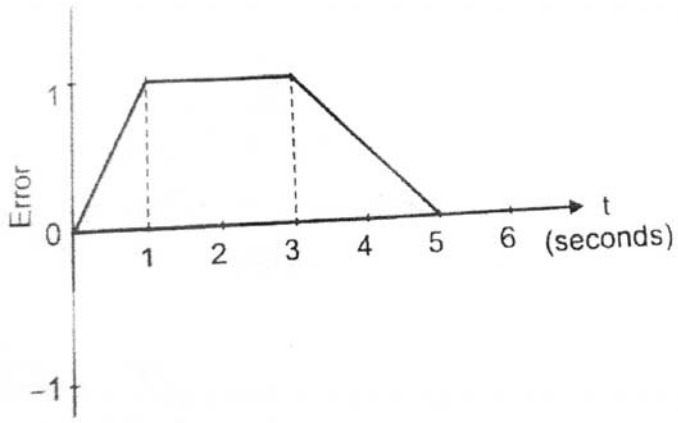


Fig.Q8 a (X-axis-Time, Y-axis-Error)

b) Write short note on PID controller. **[4]**

Q9) a) Explain the steps of sketch the Bode Plot. What are the advantages and limitations of Bode Plots? **[6]**

b) Differentiate between PI (Proportional + Integral) controller and PD (Proportional + Derivative) Controller. **[4]**

OR

Q10)a) Explain with example: **[4]**

i) Stable System

ii) Unstable System

b) Characteristic equation of the system is given by

$S^4 + 3S^3 + 3S^2 + 2S + K = 0$. Find value of K, if system is stable, using Routh Hurwitz criterion. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PE703

[Total No. of Pages : 3

[6585]-64

First Year M.E. (Mechanical) (Heat Power/Energy Engineering)
ADVANCED MATHEMATICS AND NUMERICAL METHODS
(2017 Credit Pattern) (Semester - I) (507101)

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

Instructions to the candidates:

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

Q1) a) Find the positive root of the equation $\cos x - x^2 - x = 0$ to four decimal places using Newton Raphson method. **[5]**

b) Find the least square fit of the form $y = a_0 + a_1 x^2$ to the following data **[5]**

x	–1	0	1	2
y	2	5	3	0

Q2) a) Solve by Jacobi's iteration method, **[5]**

$20x + y - 2z = 17$

$3x + 20y - z = -18$

$2x - 3y + 20z = 25$

upto third iteration

b) Using Newton's backward difference formula, construct an iterpolating polynomial of degree 3 for the data: **[5]**

$f(-0.75) = -0.0718125$,

$f(-0.5) = -0.02475$, $f(-0.25) = 0.3349375$,

$f(0) = 1.10100$. Hence find $f\left(-\frac{1}{3}\right)$.

P.T.O.

Q3) a) Find the dominent eigen value and corresponding eigen vector of the matrix $A=\begin{bmatrix}1 & -3 & 2\\ 4 & 4 & -1\\ 6 & 3 & 5\end{bmatrix}$ starting from $X_0=\begin{bmatrix}1\\1\\1\end{bmatrix}$ **[5]**

b) Using Romberg's method, compute $\int_0^{1.2}\frac{dx}{1+x}$ **[5]**

Q4) a) Compute the integral $\int_5^{12}\frac{1}{x}\,dx$ by applying Gauss's quadrature formula. **[5]**

b) Obtain the cubic spline for the data **[5]**

x	0	1	2	3
y	2	–6	–8	2

Q5) a) Using Given's method reduce the following matrix A to its tridiagonal form: **[5]**

$$A=\begin{bmatrix}2 & 1 & 3\\ 1 & 4 & 2\\ 3 & 2 & 3\end{bmatrix}$$

b) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx}=x^2+y^2$; given that $y(1) = 1.5$, taking $h = 0.1$ to find y at $x = 1.2$. **[5]**

Q6) a) Using Adams Bashforth predictor-corrector method find y at $x = 0.4$, given that **[5]**

$$\frac{dy}{dx}=x^2(1+y),\ y(1)=1,\ y(1.1)=1.233$$

$y\ (0.2) = 1.548$ $y\ (0.3) = 1.979$

b) Solve partial differential equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$, represented by mechanical system using Gauss-Seidal method to find u_1, u_2, u_3, u_4. given that, **[5]**

(use five iterations)

		1000	1000	
1000		u_1	u_2	1000
2000		u_3	u_4	500
2000				0
	1000	500	0	0

Q7) a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t \geq 0$ given that $u(x,0) = 20$, $u(0,t) = 0$, $u(5,t) = 100$. Compute u for the time-step with h=1 by Crank-Nicholson method. **[5]**

b) Solve the following equations by Gauss-Seidal method. **[5]**

$4x + 2y + z = 14$

$x + 5y - z = 10$

$x + y + 8z = 20$

Q8) a) Using Heun's method, find y(0.2). given $y' = y + e^x$, $y(0) = 0$, $h = 0.2$. **[5]**

b) Evaluate the pivotal values of $\frac{\partial^2 u}{\partial t^2} = 16\frac{\partial^2 u}{\partial x^2}$ taking $\Delta x = 1$ upto $t = 1.25$, $u(0,t) = 0$, $u(5, t) = 0$ $u_t(x,0) = 0$, $u(x,0) = x^2(5 - x)$ **[5]**

❋ ❋ ❋

Total No. of Questions : 7]

SEAT No. :

PE704

[Total No. of Pages : 2

[6585]-65

First Year M.E. (Mechanical-Energy Engineering)

ADVANCED THERMODYNAMICS

(2017 Pattern) (Semester - I) (502502)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary and mention the same clearly.***
5) ***Use of steam tables, Mollier chart and calculator is allowed.***

Q1) a) State and explain the law of corresponding states. **[4]**

b) Write the Van der Waals equation of state and state how it is differ from the equation of state for an ideal gas. **[6]**

Q2) a) Sketch the Mollier chart and explain why do the isobars diverge from one another on mollier diagram. **[5]**

b) Explain the term critical pressure, critical temperature and triple point of water. **[5]**

Q3) a) Derive First and Second Tds equation. **[4]**

b) Water is heated at a constant pressure of 0.7 MPa. The boiling point is 164.97°C. The initial temperature of water is 0ºC. The latent heat of evaporation is 2066.3 kJ/kg. Find the increase of entropy of water, if the final state is steam. **[6]**

Q4) a) Explain the following term **[4]**

i) Dead State

ii) Irreversibility

b) A well-insulated heat exchanger is to heat water (Cp = 4.18 kJ/kgºC) from 25ºC to 60ºC at a rate of 0.4 kg/s. The heating is to be accomplished by geothermal water (Cp = 4.31 kJ/kgºC) available at 140ºC at a mass flow rate of 0.3 kg/s. The inner tube is thin-walled and has a diameter of 0.6 cm. Determine **[6]**

i) the rate of heat transfer and

ii) the rate of exergy destruction in the heat exchanger.

P.T.O.

Q5) a) Explain Inversion curve and Joule Thomson coefficient. **[5]**

b) With usual notations derive the following thermodynamics relation. **[5]**

$$Cp - Cv = \frac{TvB^2}{K}$$

Q6) a) What is adiabatic flame temperature? How to determine it? **[4]**

b) Explain the term Enthalpy of formation and Enthalpy of combustion. **[6]**

Q7) Write Notes on (any two) **[10]**

a) Nerst heat theorem

b) Fugacity and Activity

c) Gibbs phase rule



Total No. of Questions : 7]

SEAT No. :

PE705

[Total No. of Pages : 2

[6585]-72

First Year M.E. (Mechanical-Heat Power)

ADVANCED THERMODYNAMICS AND COMBUSTION TECHNOLOGY

(2017 Pattern) (Semester - I) (502102)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary and mention the same clearly.***
5) ***Use of steam tables, Mollier chart and calculator is allowed.***

Q1) a) Define compressibility factor and explain the term reduced pressure and reduced temperature. **[5]**

b) State and explain Gibbs phase rule. **[5]**

Q2) a) Explain P-T diagram for a pure substance. **[4]**

b) Water is heated at a constant pressure of 0.7MPa. The boiling point is 164.97ºC. The initial temperature of water is 0ºC. The latent heat of evaporation is 2066.3 kJ/kg. Find the increase of entropy of water, if the final state is steam. **[6]**

Q3) a) Explain the following term

i) Dead State

ii) Irreversibility **[4]**

b) A 50-cm-long, 800-W electric resistance heating element whose diameter is 0.5 cm is immersed in 40 kg of water initially at 20ºC. Assuming the water container is well insulated, determine how long it will take for this heater to raise the water temperature to 80ºC. Also, determine the minimum work input required and exergy destruction for this process, in kJ. Take T_0 = 20ºC. **[6]**

Q4) a) With usual notations derive the following thermodynamics relation **[5]**

$$ds = Cp\frac{dT}{T} - \beta v dp$$

P.T.O.

b) With usual notations derive the following thermodynamics relation. **[5]**

$$Cp - Cv = \frac{TvB^2}{K}$$

Q5) a) Derive Clausius-Claperyon equation. **[6]**

b) State and explain Amagat's law. **[4]**

Q6) a) What is adiabatic flame temperature? How to determine it? **[4]**

b) Liquid propane (C_3H_8) enters a combustion chamber at 25°C at a rate of 1.2 kg/min where it is mixed and burned with 150 percent excess air that enters the combustion chamber at 12°C. If the combustion is complete and the exit temperature of the combustion gases is 1200 K, determine **[6]**

i) the mass flow rate of air and

ii) the rate of heat transfer from the combustion chamber.

Substance	$\bar{h}^{o}_{f}$ kJ/kmol	$\bar{h}_{285k}$ kJ/kmol	$\bar{h}_{298k}$ kJ/kmol	$\bar{h}_{1200k}$ kJ/kmol
$C_3H_8(e)$	–118910	-	-	-
O_2	0	8296.5	8682	38447
N_2	0	8286.5	8669	36777
$H_2O(g)$	-241820	-	9904	44380
CO_2	-393520	-	9364	53848

Q7) Write Notes on (any two) **[10]**

a) Thermodynamics of Aging and Death

b) Fugacity and Activity

c) Thermodynamics of Biological cells

☼ ☼ ☼

Total No. of Questions : 7]

SEAT No. :

PE706

[Total No. of Pages : 2

[6585]-73

First Year M.E. (Mechanical-Heat Power)

ADVANCED FLUID MECHANICS

(2017 Pattern) (Semester - I) (502103)

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

Instructions to the candidates:

1) ***Attempt Any Five Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right 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 Langragian and Eulerian descriptions. **[5]**

b) A steady, incompressible, two-dimensional velocity field is given by the following components in the *xy*-plane: **[5]**

$$u = 1.1 + 2.8x + 0.65y$$

$$v = 0.98 - 2.1x - 2.8y$$

Calculate the acceleration field (find expressions for acceleration components a_x and a_y), and calculate the acceleration at the point $(x, y) = ((-)2, 3)$.

Q2) Derive generalized expression of Navier-stokes equations. **[10]**

Q3) a) Consider steady, incompressible, parallel, laminar flow of a film of oil falling slowly down an infinite vertical wall. The oil film thickness is h, and gravity acts in the negative z-direction (downward). There is no applied (forced) pressure driving the flow the oil falls by gravity alone. Derive the expression for velocity and pressure fields in the oil film and sketch the normalized velocity profile. You may neglect changes in the hydrostatic pressure of the surrounding air. **[6]**

b) Discuss Kelivin's circulation theorem with application. **[4]**

P.T.O.

Q4) a) What do you mean by flow separation? Discuss the causes of it? What are the impacts of flow separation on the drag coefficient? **[5]**

b) Elaborate the concept of Vortex Lines, Doublet. **[5]**

Q5) a) Discuss the implication of an inflection point in a boundary layer profile. Specifically, does the existence of an inflection point infer a favorable or adverse pressure gradient? Explain. **[5]**

b) Derive Momentum integral equation for boundary layer. **[5]**

Q6) a) Elaborate the significance of Turbulence modeling. Write equations for k - ε (epsilon) model. **[5]**

b) Discuss Taylor's theory of turbulence dispersion. **[5]**

Q7) a) A gas initially at a supersonic velocity enters an adiabatic converging duct. Discuss how this affects (i) the velocity, (ii) the temperature, (iii) the pressure, and (iv) the density of the fluid. **[5]**

b) Air enters a nozzle at 0.2 MPa, 350 K, and a velocity of 150 m/s. Assuming isentropic flow, determine the pressure and temperature of air at a location where the air velocity equals the speed of sound. What is the ratio of the area at this location to the entrance area? **[5]**

Table 1

One-dimensional isentropic compressible flow functions for an ideal gas with $k = 1.4$

Ma	Ma*	A/A^*	P/P_0	ρ/ρ_0	T/T_0
0	0	∞	1.0000	1.0000	1.0000
0.1	0.1094	5.8218	0.9930	0.9950	0.9980
0.2	0.2182	2.9635	0.9725	0.9803	0.9921
0.3	0.3257	2.0351	0.9395	0.9564	0.9823
0.4	0.4313	1.5901	0.8956	0.9243	0.9690
0.5	0.5345	1.3398	0.8430	0.8852	0.9524
0.6	0.6348	1.1882	0.7840	0.8405	0.9328
0.7	0.7318	1.0944	0.7209	0.7916	0.9107
0.8	0.8251	1.0382	0.6560	0.7400	0.8865
0.9	0.9146	1.0089	0.5913	0.6870	0.8606
1.0	1.0000	1.0000	0.5283	0.6339	0.8333
1.2	1.1583	1.0304	0.4124	0.5311	0.7764
1.4	1.2999	1.1149	0.3142	0.4374	0.7184
1.6	1.4254	1.2502	0.2353	0.3557	0.6614

Total No. of Questions : 7]

SEAT No. : ____

PE707

[Total No. of Pages : 3

[6585]-74
First Year M.E. (Mechanical - Heat Power)
ADVANCED HEAT TRANSFER
(2017 Pattern) (Semester - II) (502107)

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

Instructions to the candidates:

1) ***Attempt Any Five Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right 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) Derive Three Dimensional Heat Conduction Equation in Cartesian Coordinates with Unsteady State and Heat Generation for Anisotropic material and deduce it to **[10]**

a) 1-D Fourier Equation in y coordinate

b) 2-D Laplace Equation in x and z coordinate

c) 1-D Poisson's Equation in z coordinate

Write Three Dimensional Heat Conduction Equation in spherical Coordinates.

Q2) a) What is lumped system analysis? What are the assumptions made in the lumped system analysis and when is it applicable? Write expression for the same. **[5]**

b) In a quenching process, a copper plate of 3 mm thick is heated upto 350°C and then suddenly, it is dropped into a water bath at 25°C. Calculate the time required for the plate to reach the temperature of 50°C. The heat transfer coefficient on the surface of the plate is 28 $W/m^2.K$. The plate dimensions may be taken as length 40 cm and width 30 cm. Also calculate the time required for infinite long plate to cool to 50°C. **[5]**

Other parameters remain same.

Take the properties of copper as

$C = 380$ J/kg.K, $\rho = 8800$ kg/m^3,

$k = 385$ W/m.K.

P.T.O.

Q3) a) Write note on **[5]**

i) Reynolds analogy

ii) Chilton-Colburn analogy

b) A bare thermocouple is used to measure the temperature of a gas flowing through a hot duct. The heat transfer coefficient between a gas and thermocouple is proportional to $u^{0.8}$, where u is the gas velocity and heat transfer rate by radiation from the walls to the thermocouple is proportional to temperature difference. When the gas is flowing at 5 m/s, the thermocouple reads 323 K and when it is flowing at 10 m/s, it reads 313 K. Calculate the appropriate wall temperature at a gas temperature of 298 K. What temperature will the thermocouple indicate when the gas velocity is 20 m/s? **[5]**

Q4) a) Explain following in brief related with internal forced convection. **[5]**

i) Entrance region

ii) Constant surface heat flux

b) Hot air at 470°C flows over a flat plate 40 cm × 20 cm and 3 mm thick at a velocity of 2 m/s along the 40 cm side. The initial plate temperature is 30°C. The specific heat of the plate is 450 J/kg.K and density of the plate material is 8000 kg/m^3. Calculate the initial temperature rise of the plate in °C/min, if the plate receives heat due to convection and radiation from both sides. Assume emissivity of the plate is 0.85. **[5]**

Take

$Nu = 0.664\ Re_L^{1/2} Pr^{1/3}$

The properties of air at 250ºC

$\rho = 0.674$ kg/m^3, $C_p = 1035$ J/kg.K,

$\nu = 41.79 \times 10^{-6}$ m^2/s, $k_f = 0.0427$ W/m.K.

Pr = 0.68

Q5) Engine oil at 60°C flows at 0.5 kg/s in a duct with constant surface temperature of 20°C. Assuming fully developed flow, calculate (i) heat flux at entry (ii) pressure drop per metre length for 3 cm diameter tube and for a 3×1 rectangular duct of equal wall area. **[10]**

The properties of engine oil, at 40ºC

$\rho = 876$ kg/m^3, $k_f = 0.144$ W/m.K,

$\nu = 0.24 \times 10^{-3}$ m^2/s, $C_p = 1.96$ kJ/kg.K.

Take Nu = 3.66, f = 64/ Re for tube

Nu = 3.96 and $f = \dfrac{68.36}{\mathrm{Re}_{D_h}}$

for rectangular duct

Q6) a) The steam at 165°C condenses in the shell side of a heat exchanger over the tubes through which water flows. Water enters the 4-cm-diameter, 14-m-long tubes at 20°C at a rate of 0.8 kg/s. Determine the exit temperature of water and the rate of condensation of steam. Take fluid properties at 85°C and latent heat of steam as 2066.5 kJ/kg **[5]**

Use following correlations

Nu = 4.6	for laminar flow, Constant heat flux
Nu = 3.66	for laminar flow, Constant wall temperature
Nu = 0.023 $\mathrm{Re}_d^{(0.8)}$ $\mathrm{Pr}^{(0.4)}$	for turbulent flow, Constant heat flux or wall temp

b) Explain with neat sketch different regimes of pool boiling. **[5]**

Q7) a) What do you mean by shape factor? Discuss all theorems related to the same. **[5]**

b) A window glass 0.3 cm thick has a monochromatic transmissivity of 0.9 in the range of 0.3 μm to 2.5 μm and nearly zero elsewhere. Estimate the total transmissivity of the window for (a) near black solar radiation at 5800 K, and (b) black room radiation at 300 K. **[5]**

✪ ✪ ✪

Total No. of Questions : 7] **SEAT No. :**

PE708 **[Total No. of Pages : 2**

[6585]-75

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

AIR CONDITIONING TECHNOLOGY

(2017 Pattern) (Semester - II) (502108)

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

Instructions to the candidates:

1) ***Answer any 5 questions out of 7.***
2) ***Draw neat labeled diagrams whenever necessary.***
3) ***Assume suitable data if necessary.***
4) ***Use of thermodynamics charts and psychometic table is permitted.***

Q1) a) Explain with neat sketch ADP. **[5]**

b) Derive an expression for enthalpy of moisture. **[5]**

Q2) a) What are the factors that affect IAQ in the Building. **[4]**

b) The air supplied to a room of a building in winter is to be at / 7ºC and have a relative humidity of 60%. If the barometric pressure is 1.0325 bar, find: **[6]**

i) The specific humidity, and

ii) The dew point under these conditions.

Q3) Room air at 20ºC DBT and 50% RH is mixed with outdoor air at 40ºC DBT and 30% RH in the ratio of 4:1. The mixture is passed through a cooling coil whose temperature is maintained constant at 10ºC whose by-pass factor is 0.2. Determine the following: **[10]**

a) Condition of air before entering the coil,

b) Condition of air leaving the coil, and

c) Refrigeration load on the cooling coil when 250m^3/min if air is supplied to the room.

P.T.O.

Q4) In an air-conditioning plant, an air handling unit supplies a total of 4000m^3/min of dry air which comprises by mass 20 percent of fresh air at 39ºC DBT and 26ºC WBT and 80 percent recirculated air at 24ºC DBT and 50% RH. The air leaves the cooling coil at 12ºC saturated. **[10]**
Calculate the following

a) Total cooling load; and

b) Room heat gain.

Q5) A 12 cm long duct passes air at the rate of 1.2m^3/s. If the friction factor is 0.0048, calculate the pressure drop in the following cases: **[10]**

a) When the duct is circular of diameter 280mm;

b) When the duct is 280 mm square section.

Q6) a) Obtain an expression for pressure loss due to sudden enlargement in a duct passage. **[5]**

b) Write short note on "All water system". **[5]**

Q7) a) Write a short note on: Basic selection method for Fan in air conditioning system. **[5]**

b) Explain the procedure to draw a GSHF line on a psychrometric chart. **[5]**

✡ ✡ ✡

Total No. of Questions : 7]

SEAT No. :

PE709

[Total No. of Pages : 2

[6585]-76

First Year M.E. (Mechanical-Heat Power)

MEASUREMENTS AND CONTROLS

(2017 Pattern) (Semester - II) (502109)

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

Instructions to the candidates:

1) ***Attempt Any Five Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right 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) Elaborate principle of Analogue and digital instruments. **[5]**

b) Differentiate between deflection and null type of instruments with suitable examples. **[5]**

Q2) a) Discuss the sources of Systematic Errors in measurement. **[5]**

b) Explain the Properties of Regression and correlation coefficient. **[5]**

Q3) a) Discuss working principle of radiation pyrometer with diagram. **[5]**

b) Determine Karl Pearson's Correlation Coefficient **[5]**

X	20	16	12	08	04
Y	22	14	04	12	08

Q4) a) Explain the construction and working of Rotameter. **[5]**

b) Discuss technique measurement of heat transfer coefficient. **[5]**

P.T.O.

Q5) a) How Vacuum gauge works? **[5]**

b) Explain construction and working of any one Acceleration measurement method. **[5]**

Q6) a) Explain any one instrument used for Liquid Level measurement. **[5]**

b) Write note on pneumatic and hydraulic controllers. **[5]**

Q7) Explain in brief **[10]**

a) Hot wire anemometer.

b) Reduction of Systematic Errors.

x x x

Total No. of Questions : 7] **SEAT No. :**

PE710 **[Total No. of Pages : 2**

[6585]-77

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

COMPUTATIONAL FLUID DYNAMICS

(2017 Pattern) (Semester - III) (602113)

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

Instructions to the candidates:

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

Q1) a) Explain the Transport equation in differential form and explain the significance of each term. **[5]**

b) Classify partial differential equations into elliptic, parabolic and hyperbolic types. Provide one physical example for each and explain the nature of their boundary conditions. **[5]**

Q2) a) Write the finite difference formulation for 2D steady-state heat conduction over a square plate with Dirichlet boundary conditions. Show the discretized equation at an internal node. **[6]**

b) Explain the significance of Substantial and Local Derivative in fluid mechanics. **[4]**

Q3) a) Difference between central difference and upwind difference in FVM. When is each scheme preferred? **[4]**

b) Discuss the different types of errors encountered in numerical methods and explain how stability analysis helps in controlling error growth during computations. **[6]**

Q4) a) Write two dimensional heat convection-diffusion equation and discretize it with finite volume method. **[6]**

b) Describe the concept of a generalized curvilinear coordinate system. Why is it used in CFD, and how does it help in handling complex geometries. **[4]**

P.T.O.

Q5) a) Solve a sample 1D unsteady heat conduction problem for a single time step using the implicit finite volume method. State your assumptions clearly. **[4]**

b) Write the discretized finite volume form for 1D advection equation using an upwind scheme. Under what conditions is the upwind scheme preferred? **[6]**

Q6) a) Write the governing equations of incompressible Navier-Stokes flow. Briefly describe the physical significance of each term. **[5]**

b) What are the common boundary conditions applied in solving Navier-Stokes equations? Explain how these affect the accuracy and stability of the solution. **[5]**

Q7) a) Derive the Reynolds-Averaged Navier-Stokes (RANS) equations from the instantaneous Navier-Stokes equations. Explain the significance of Reynolds stresses. **[6]**

b) Explain the eddy viscosity concept in turbulence modeling. How does it help in approximating the Reynolds stress tensor? **[4]**



Total No. of Questions : 7]

SEAT No. : ____

PE711

[Total No. of Pages : 2

[6585]-78

S.Y. M.E. (Mechanical-Heat Power)

DESIGN OF HEAT TRANSFER EQUIPMENTS

(2017 Pattern) (Semester - III) (602114)

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

Instructions to the candidates:

1) ***Attempt Any Five Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right 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 are allowed.***

Q1) a) A heat exchanger is required to cool 55,000 kg/h of alcohol from 66°C to 40°C using 40,000 kg/h of water entering at 5°C. **[5]**

Calculate

i) exit temperature of water,

ii) heat transfer rate,

iii) surface area required for parallel flow type of heat exchanger.

Take overall heat transfer coefficient

U = 580 W/m^2.K, Cp (alcohol) = 3760 J/kg.K, Cp (water) = 4180 J/kg.K

b) Draw Temperature profile in case of following **[5]**

i) Evaporator

ii) Condenser

iii) Counter flow

iv) 1-2 Split flow (TEMA G) exchanger

P.T.O.

Q2) a) Discuss a F-LMTD method for design of cross flow heat exchanger. **[5]**

b) Explain the Kern method. **[5]**

Q3) a) What is need of Pressure Drop analysis? **[5]**

b) Explain the process for evaluation of Tubular Heat Exchanger Pressure Drop. **[5]**

Q4) a) Discuss use of Reynolds Analogy in determination of Heat Transfer Characteristics. **[5]**

b) Write a note on Steady-State Kays and London Technique. **[5]**

Q5) a) Elaborate the various materials used for the construction of cooling towers. **[5]**

b) Explain forced draft cooling tower with diagram. **[5]**

Q6) a) Explain following points related with Furnace **[5]**

i) Components

ii) Applications

b) What the parameters to be considered to design steam traps. **[5]**

Q7) Write note on **[10]**

a) Heat pipe

b) Passive Heat transfer augmentation techniques for heat exchanger.

x x x

Total No. of Questions : 8]

SEAT No. :

PE712

[Total No. of Pages : 2

[6585]-79

First Year M.E. (Mechanical(Mechatronics))

SYSTEM MODELLING, IDENTIFICATION AND SIMULATION

(2017 Pattern) (Semester - I) (502801)

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

Instructions to the candidates:

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

Q1) a) Derive the equation of motion for a mechanical or electrical system using Newton's or Kirchhoff's law. **[5]**

b) Obtain state-space model from a transfer function of a thermal or hydraulic system. **[5]**

Q2) a) Show how a nonlinear system can be linearized using Taylor series expansion and Jacobian matrix. **[5]**

b) Explain the role of eigenvalues and eigenvectors in modeling a multi-DOF system. **[5]**

Q3) a) Define bond graph. Draw and explain bond graph for a spring-mass-damper mechanical system. **[5]**

b) Create a bond graph for a simple DC motor system and describe the energy flow paths. **[5]**

Q4) a) Describe how least squares method is applied for first or second order system identification. **[5]**

b) Use input-output data to identify a discrete-time ARX model using least squares method. **[5]**

P.T.O.

Q5) a) Describe how experimental frequency response is obtained using sine wave input. **[5]**

b) Explain time-domain response identification using unit step test data. **[5]**

Q6) a) Explain the working of a linear Kalman filter for estimating the system state from noisy measurements. **[5]**

b) Compare Extended Kalman Filter and Unscented Kalman Filter with suitable applications. **[5]**

Q7) a) Describe supervised learning in neural networks with a simple two-layer example. **[5]**

b) Explain fuzzy logic rules and how outputs are obtained using membership functions and defuzzification. **[5]**

Q8) a) Write differences between transfer function and state-space model with suitable examples. **[5]**

b) Show how bond graph helps to model a coupled electro-mechanical system like a motor with load. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE713

[Total No. of Pages : 2

[6585]-80
First Year M.E. (Mechanical-Mechatronics)
CONTROL SYSTEMS - I
(2017 Pattern) (Semester - I) (502802)

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

Instructions to the candidates:

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

Q1) a) What is the difference between transfer function and state space model? Explain with suitable example. **[5]**

b) Solve a state equation using the state transition matrix method. Illustrate your steps clearly. **[5]**

Q2) a) Explain poles and zeros of a system. Show how they affect the system's frequency and time response. **[5]**

b) Explain Routh-Hurwitz criterion with an example. State the condition for stability using Routh array. **[5]**

Q3) a) State and prove necessary and sufficient conditions for controllability using Kalman's test. **[5]**

b) How do you test observability from the state model? Explain using a numerical example. **[5]**

Q4) a) Explain the effect of high condition number in a system matrix. Why is it important in practical applications? **[5]**

b) Describe Lyapunov stability criterion. Derive Lyapunov's function and its condition for system stability. **[5]**

Q5) a) Explain how pole placement is carried out for a system using transformation into control canonical form. **[5]**

b) Use Ackermann's formula to design a state feedback controller for a third-order system. Show all steps. **[5]**

P.T.O.

Q6) a) Describe the steps for designing a state observer. Draw both open-loop and closed-loop observer diagrams. **[5]**

b) Describe the design of observer using pole placement and explain the concept of observer/controller duality. **[5]**

Q7) a) Why is a reduced order observer needed? Explain the design process for a second order system. **[5]**

b) Draw and explain the block diagram of a system with compensator. Write governing equations for the same. **[5]**

Q8) a) What is a regulated system? Derive the governing equations and show how regulation is achieved using FSF. **[5]**

b) Design a command tracking system using integral control and observer. Justify your design steps. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE714

[Total No. of Pages : 2

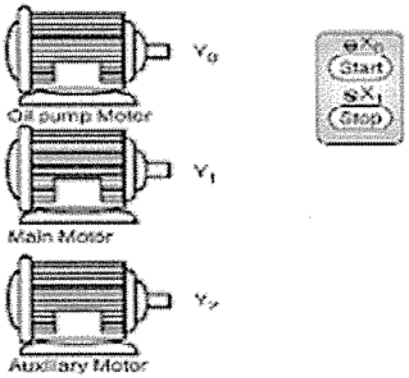
[6585]-82
First Year M.E. (Mechanical - Mechatronics)
PLC PROGRAMMING
(2017 Pattern) (Semester - II) (502807)

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

Instructions to the candidates:

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

Q1) Draw ladder diagram for given condition: Starting the oil pump motor immediately when START is pressed. The main motor will be started after a 10 sec. delay and then the auxiliary motor after a 5 sec. delay. In addition stopping all motors immediately when STOP is pressed. **[10]**



Q2) a) Discuss important I/O specifications like voltage levels, current ratings, and response time that are considered during PLC selection. **[4]**

b) Write a short note on memory types (RAM, ROM, EEPROM) used in PLCs and their role in program and data storage. **[6]**

Q3) a) What are Word Level Logic Instructions in PLCs? How are they different from bit-level instructions? Explain briefly. **[4]**

b) Describe the Program Scan Cycle of a PLC, explaining the functions of Input Scan, Program Scan, Output Scan, and Housekeeping. **[6]**

P.T.O.

Q4) a) What are Transducers? How do they convert physical parameters like pressure or temperature for use with PLC inputs? **[4]**

b) Explain the importance of Sensors in PLC automation. Mention examples like proximity sensors and photoelectric sensors. **[6]**

Q5) a) What is a Retentive Timer? How does it retain its accumulated value during power failures or stop conditions? **[6]**

b) Define Cascading Timers. How can multiple timers be connected to achieve longer time delays in PLC programming? **[4]**

Q6) Given two push to ON buttons (PB1, PB2), Red and green lamps, develop a ladder diagram to meet the following objectives. **[10]**

a) When PB1 is pushed, RED lamp should be ON and it will continue to be ON till PB2 is pushed.

b) When PB2 is pushed GREEN lamp should be ON and it will continue to be ON till PB1 is pushed.

c) If PB1 and PB2 both are pushed simultaneously both light should be OFF.

Q7) a) Discuss the significance of designing Safety Circuitry in PLC-controlled industrial machines. Give examples. **[5]**

b) What is a Selectable Timed Interrupt? How does it improve the real-time response of a PLC system? **[5]**

Q8) a) What are Mechanical Sequencers? How are they replaced by Programmable Sequencers in modern PLC systems? **[6]**

b) Explain Sequencer Instructions and write a simple ladder program for operating a 4-step sequential motor control. **[4]**



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

PE715 **[Total No. of Pages : 2**

[6585]-83

First Year M.E. (Mechanical-Mechatronics)

CONTROL SYSTEMS -II

(2017 Pattern) (Semester - II) (502808)

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

Instructions to the candidates:

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

Q1) a) Discuss about Kappa-Tau (KT) tuning method in control system **[6]**

b) Explain complementary sensitivity function in control system. **[4]**

Q2) a) What are the advantages of using a PID controller compared to a simple proportional Controller? **[6]**

b) Explain the definition, purpose and advantages of ITAE Criterion. **[4]**

Q3) a) Explain loop shaping in control system. **[6]**

b) Discuss the advantage & limitation of Internal Model Controller. **[4]**

Q4) a) Discuss about robust stability criterion in control system. **[6]**

b) Explain the concept of controller tuning **[4]**

Q5) a) Describe the role of gain and bandwidth in frequency response analysis **[6]**

b) What are the limitations of PID controller? **[4]**

P.T.O.

Q6) a) Explain the Nyquist plot and its use in stability analysis. **[6]**

b) What are the common issues or errors that can occur during PID tuning? **[4]**

Q7) a) Explain the concept of stability in control systems. **[6]**

b) Explain the Ziegler-Nichols tuning method. **[4]**

Q8) a) Explain the Bode plot and its use in frequency response analysis **[6]**

b) How do you determine the optical PID parameters for a given process? **[4]**



Total No. of Questions : 8]

SEAT No. : ____

PE716

[Total No. of Pages : 2

[6585]-84

First Year M.E. (Mechanical - Mechatronics)

INDUSTRIAL DRIVES & ACTUATORS

(2017 Pattern) (Semester - II) (502809)

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

Instructions to the candidates:

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

Q1) a) Draw torque speed characteristics of 3 phase induction motor. **[4]**

b) Explain different methods of starting of DC Motors. **[6]**

Q2) a) Explain working principle of Flow control valve. **[6]**

b) Discuss the working principle of synchronous motor. **[4]**

Q3) a) Explain the types of direction control valve. **[6]**

b) List the applications of pressure reducing valve. **[4]**

Q4) a) Discuss the working principle of vane pump with neat diagram. **[4]**

b) A pressure relief valve has a pressure setting of 200 bar. Determine the power Loss across the valve if all the pump flow of 120 l/min flows back to the reservoir Through this valve. **[6]**

Q5) a) Explain the working principle of semi-rotary actuator with neat sketch. **[4]**

b) Explain the different type of cylinder mountings. **[6]**

P.T.O.

Q6) a) Discuss the working of a regenerative circuit. **[4]**

b) Explain the construction and working of following. **[6]**

i) Meter in Circuit

ii) Meter out Circuit

Q7) a) Explain the circuit for hydraulic press. **[4]**

b) Explain in detail about Slip power recovery scheme. **[6]**

Q8) a) Explain working principle of gear pump with diagram. **[4]**

b) A cylinder has a bore of 125 mm diameter and a rod of 70 mm diameter. It drives a Load of 2000 kg vertically up and down at a maximum velocity of 3 m/s. The load is slowed down to rest in the cushion length of 50 mm. If the relief valve is set at 140 Bar, determine the average pressure in the cushions while extending and retracting. **[6]**

x x x

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

PE717 **[Total No. of Pages : 1**

[6585]-85

S.Y.M.E. (Mechanical) (Mechatronics)

MICROCONTROLLER APPLICATIONS IN EMBEDDED SYSTEMS

(2017 Pattern) (Semester - III) (602813)

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

Instructions to the candidates:

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

Q1) a) Draw & explain block diagram of PIC 18F microcontroller. **[6]**

b) Discuss flags in STATUS register of PIC 18F microcontroller in detail. **[4]**

Q2) a) With neat diagram explain Support devices of PIC 18F microcontroller. **[6]**

b) Explain the instructions for data transfer. **[4]**

Q3) a) With neat circuit diagram of LCD interfacing to PIC microcontroller. **[5]**

b) Explain stack & instructions releted to stack of PIC 18F microcontroller. **[5]**

Q4) a) What is Interrupt? Explain different types of interrupts. **[5]**

b) Draw block diagram Timer of PIC 18F microcontroller. Explain use of timers. **[5]**

Q5) a) With block diagram explain any one type of A/D converter. **[5]**

b) What is function of capture. Compare & PWM module? **[5]**

Q6) a) Explain data transfer in Inter-Integrated Circuit protocol. **[5]**

b) Explain data transfer in Serial Peripheral Interface protocol. **[5]**

Q7) a) Enlist features of embedded systems. Explain any two features of embedded system. **[6]**

b) Explain basic concepts in Serial communications. **[4]**

Q8) a) Explain hardware Aspect of the time & temperature monitoring system (TTMS). **[5]**

b) Explain software Aspect of the time & Temperature Monitoring system (TTMS). **[5]**

☼ ☼ ☼

Total No. of Questions : 8]

SEAT No. : ____

PE718

[Total No. of Pages : 2

[6585]-86

S.Y. M.E. (Mechanical - Mechatronics)

FLEXIBLE MANUFACTURING SYSTEMS

(2017 Pattern) (Semester - III) (602814)

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

Instructions to the candidates:

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

Q1) What is CAPP? Explain the any one type of CAPP with neat sketches. **[10]**

Q2) a) What are the three problem areas that must be considered in the analysis and Design of an automated production line? **[6]**

b) What are the four factor that favour the use of manual assembly line? **[4]**

Q3) a) Write a short note on Group Technology. **[6]**

b) Describe the various workstations of FMS. **[4]**

Q4) a) Describe, with neat sketch, ASRS system used in FMS. **[6]**

b) Explain the working of NC machine tool with the help of the diagram. **[4]**

Q5) a) List out and Explain about basic components of an NC system and CNC system. **[6]**

b) Explain in brief about DNC. **[4]**

P.T.O.

Q6) a) What is machine vision system and how it works? **[4]**

b) Mobile charger supplier drawn randomly constant sample size of 500 chargers every day for quality control test. Defects in each charger are recorded during Testing & tabulated as follows. **[6]**

Lot No.	Sample Size	Number of defects in sample[c]
1	500	12
2	500	14
3	500	16
4	500	18
5	500	16
6	500	14
7	500	12
8	500	12
9	500	32
10	500	16
11	500	18
12	500	16
13	500	14
14	500	12
15	500	16
16	500	18
17	500	12
18	500	19
19	500	18
20	500	21

Draw the appropriate control chart and comment on the state of control.

Q7) a) What are the components on which success of Concurrent Engineering depend? **[6]**

b) Write Short note on-Concept of six sigma. **[4]**

Q8) a) Explain how DFM helps in reducing the manufacturing cost of a product? **[6]**

b) Differentiate MRP-I and MRP-II. **[4]**



Total No. of Questions :8]

SEAT No. :

PE719

[Total No. of Pages : 2

[6585]-87

First Year M.E. (E & TC) (Communication Networks)

MODELLING AND SIMULATION OF COMMUNICATION NETWORKS

(2017 Pattern) (Semester-I) (504501)

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

Instructions to the candidates:

1) ***Answer any FIVE questions.***
2) ***Draw neat diagram whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) a) What are the steps in the methodology of simulation? **[4]**

b) Explain the graphical technique for post processing. **[4]**

c) What is direct component and quadrature component of a signal? **[2]**

Q2) a) Explain the principle of multicarrier modulation OFDM in detail with neat diagram. **[4]**

b) What are PN sequence generators? What are the properties of PN sequence generators? Why do we need them in simulating communication systems? **[4]**

c) Explain how simulation helps in performance studies of the communication systems. **[2]**

Q3) a) Giving the example state the estimation model for band pass signal. **[4]**

b) What are correlated Gaussian numbers? Why do we need them? Explain any one technique to generate correlated Gaussian numbers in detail. **[4]**

c) Elaborate various methodologies used in mapping a problem into a simulation model. **[2]**

Q4) a) Explain Non-Poissonian modeling of network traffic with Example **[4]**

b) What are the characteristics of queuing theory in network modeling? **[4]**

c) Describe the situations when one will choose the following estimation routines based on the data generated by simulation process. **[2]**

i) Histogram

ii) PSD

P.T.O.

Q5) a) How do estimate the error probability in a digital transmission system? **[4]**

b) Write an algorithm for simple Monte Carlo simulation for BER estimation of BPSK modulation. Assuming AWGN channel, Data symbols at source output are independent and equally probable and No pulse shaping is performed at transmitter. **[4]**

c) Explain importance of sampling Methods. **[2]**

Q6) a) What is tapped delay line model for LTV system? How various tap gains are generated? **[4]**

b) Find out the power spectral density relation in a Random process model **[4]**

c) Why is semi analytic simulation technique used? **[2]**

Q7) a) What are categories of a communication channel? Explain multipath fading in wireless communication channel. **[4]**

b) Discuss the factors to be considered for Simulation of Non-linearities. **[4]**

c) Describe performance estimation of a wireless system in Monte Carlo simulation **[2]**

Q8) a) Write an algorithm to demonstrate two state Markov model for discrete channel with memory. **[4]**

b) What are different techniques used to reduce run-time of the Monte Carlo method? Hence explain importance of sampling. **[4]**

c) Discuss pdf estimators. **[2]**



Total No. of Questions : 8]

SEAT No. :

PE720

[Total No. of Pages : 2

[6585]-88

M.E. - I (E&TC) (Communication Networks)

HIGH SPEED COMMUNICATION NETWORKS

(2017 Pattern) (Semester-I) (504502)

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

Instructions to the candidates:

1) ***Attempt any five questions out of eight.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Explain link layer addressing in High-Speed Networks. **[5]**

b) Give two applications of wireless LANs and explain why wireless LANs would be appropriate for these applications. **[5]**

Q2) a) Discuss TCP-Window Management System. **[5]**

b) Describe various characteristics of queuing system. **[5]**

Q3) a) What is Traffic and Congestion control in ATM. **[5]**

b) Why is video filtering is needed? Explain working principle of video filtering? **[5]**

Q4) a) Explain Fair queuing (FQ) Algorithm. **[5]**

b) Explain H.264/AVC coder. **[5]**

Q5) a) Explain any two Dynamic Protocols. **[5]**

b) Describe with diagram any one video filtering method. **[5]**

P.T.O.

Q6) a) How does Cell Delay Variation relate to performance of Congestion control in ATM networks? **[5]**

b) What is the need of Wireless LANs? Explain with an example. **[5]**

Q7) a) Explain architecture of 802.11. **[5]**

b) Discuss two ATM protocols. **[5]**

Q8) a) How is Congestion control achieved in Frame Relay? **[5]**

b) Discuss and compare various mechanisms of congestion control. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE721

[Total No. of Pages : 2

[6585]-89

First Year M.E. (E & TC) (Communication Networks)
NETWORK SECURITY
(2017 Pattern) (Semester - I) (504503)

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

Instructions to the candidates:

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

Q1) a) What are different message authentication requirements? **[5]**

b) Explain Network Security models? **[5]**

Q2) a) Explain AES algorithm in detail. **[5]**

b) What are secure Hash functions? Explain HMAC. **[5]**

Q3) a) Explain cyber security law and standards. **[5]**

b) Explain different security technologies. **[5]**

Q4) a) Explain secure software design. **[5]**

b) Explain security architecture. **[5]**

Q5) a) S/MIME and PGP are sister protocols. Discuss the quality they share. **[5]**

b) What are the web security requirements? Discuss. **[5]**

P.T.O.

Q6) a) What is the difference between SSL and TSL certificates. **[5]**

b) Explain encapsulating security payload with protocol required. **[5]**

Q7) a) What are the different types of email security? **[5]**

b) How cyber security affects the online transaction? **[5]**

Q8) a) What are the advantages of cyber security? Discuss. **[5]**

b) What is the primary security risk associated with VoIP? And how it is addressed? **[5]**



Total No. of Questions : 7]

SEAT No. :

PE722

[Total No. of Pages : 2

[6585]-90

First Year M.E. (E & TC) (Communication Network)
(E &TC All Branches and Electronics Branch) (2020)
RESEARCH METHODOLOGY
(2017 Credit Pattern) (Semester - I) (504504)

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

Instructions to the candidates:

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

Q1) a) What is the process involved in problem identification? Explain the steps involved in problem identification. **[5]**

b) Distinguish between research methods and research methodology. **[5]**

Q2) a) Explain the characteristics of static and dynamic instrumentation? What is the role of instrument in research? **[5]**

b) Explain the various steps involved in research. What are the characteristics of good research? **[5]**

Q3) a) Explain the meaning of ANOVA and explain eight steps of ONEWAY ANOVA. **[5]**

b) With reference to Simple Linear Regression analysis. Explain the terms: **[5]**

i) Least Squares Estimation and

ii) Coefficients of determination

Q4) a) Write a short note on correlation. **[5]**

b) How will you differentiate between descriptive statistics and inferential statistics?

Describe important statistical measures used to summaries survey/ research data. **[5]**

P.T.O.

Q5) a) Explain mathematical models as a conceptual model as a system. Explain the modeling elements and their interrelationship. **[5]**

b) What do you mean by asymptotic analysis? Explain with suitable example. **[5]**

Q6) a) Describe in brief, the outline and structure layout of a research report, covering all relevant points. **[5]**

b) Describe the different measurement scale used in process system. **[5]**

Q7) a) Explain the dissemination of research findings and address on different steps and precautions while writing research report. **[5]**

b) Explain the ethics and plagiarism check of the research article. What are the various tools available? **[5]**



Total No. of Questions : 8]

SEAT No. :

PE723

[Total No. of Pages : 2

[6585]-91

First Year M.E. (E & TC) (Communication Networks)

TRAFFIC ANALYSIS AND QOS

(2017 Pattern) (Semester - II) (504507)

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

Instructions to the candidates:

1) ***Answer Q.No.1 or 2, Q.No.3 or 4, Q.No. 5 or 6, Q.No. 7 or 8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Use of cell phone is prohibited in the examination hall.***
5) ***Use of electronic pocket calculator is allowed.***

Q1) a) What are different four aspects of SNMP communication Model? Explain Administrative model in Detail. **[6]**

b) Explain briefly the difference between the database of a network management system and its MIB. How do you implement each in a network management system? **[6]**

OR

Q2) a) What are different message PDUs used in SNMP operation. Explain the encapsulation in detail. Write a note on Trap PDU with a suitable diagram showing different fields. **[6]**

b) Explain SNMP architecture in detail with all models. **[6]**

Q3) a) Explain the conceptual Model of Telecommunication Management Network. **[7]**

b) Describe in detail Optical network & MAN feeder network. **[6]**

OR

Q4) a) Discuss the TMN service Management architecture in detail. **[7]**

b) Write a short note on Multi Protocol Label switching. **[6]**

P.T.O.

Q5) a) What is the need for high speed LAN? Explain in brief. **[7]**

b) What is the need for QoS? Explain in brief. **[6]**

OR

Q6) a) Define Integrated service. Explain it in detail in context of QoS. **[7]**

b) Explain in detail different types of Ethernet. **[6]**

Q7) a) Write a short note on MPLS traffic Engineering. **[6]**

b) Describe congestion control in Data Networks and Internet. **[6]**

OR

Q8) a) What is the difference between flow control and error control? **[6]**

b) Describe Traffic Control and Congestion Control in ATM Networks. **[6]**

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. : [ ]

PE724

[Total No. of Pages : 2

[6585]-92
First Year M.E. (E & TC) (Communication Network)
BROADBAND WIRELESS TECHNOLOGIES
(2017 Credit Pattern) (Semester - II) (504508)

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

Instructions to the candidates:

1) ***Attempt any five questions out of following eight questions.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Describe the concept of beam forming in broadband wireless networks. How does it enhance signal strength and minimize interference? **[5]**

b) Describe the significance of OFDM (Orthogonal Frequency Division Multiplexing) in broadband wireless communication systems. **[5]**

Q2) a) How do the underlying network architectures of WiMAX and LTE influence their performance, latency, and suitability for different use cases? **[5]**

b) Explain the significance of MIMO (Multiple Input Multiple Output) technology in boosting the efficiency of broadband wireless systems.**[5]**

Q3) a) Discuss space-time coding techniques used in MIMO systems to achieve diversity and coding gains. **[5]**

b) Differentiate between Orthogonal FDMA and Interleaved FDMA in the realm of wireless communication. **[5]**

Q4) a) How does QoS-enabled Dynamic Bandwidth Allocation (DBA) in Ethernet Passive Optical Networks (EPONs) optimize network efficiency and accommodate varying traffic demands? **[5]**

b) How does QoS-enabled Dynamic Bandwidth Allocation (DBA) in Ethernet Passive Optical Networks (EPONs) enhance network performance and support diverse traffic requirement? **[5]**

P.T.O.

Q5) a) Outline the different types of routing protocols and provide an explanation of the MANET routing protocol. **[5]**

b) What is EPON-Hybrid WOBAN, and how does it compare to conventional EPON and WOBAN architectures? **[5]**

Q6) a) Analyze and compare various Medium Access Control (MAC) protocols utilized in wireless communication networks. **[5]**

b) Clarify the distinction between wired and wireless broadband access technologies. **[5]**

Q7) a) How does Point-to-Point FTx support advanced services such as high-definition video streaming, virtual reality, and cloud computing? **[5]**

b) How does the scalability of Point-to-Point FTx networks compare to other fiber-based architectures in meeting growing bandwidth demands? **[5]**

Q8) a) How does Point-to-Point FTx enable advanced application such as HD video streaming, virtual reality, and cloud services? **[5]**

b) How do broadband access networks enable high-speed internet connectivity for residential and business users? **[5]**

❋ ❋ ❋

Total No. of Questions : 8]

SEAT No. :

PE725

[Total No. of Pages : 2

[6585]-93

First Year M.E. (E&TC) (Communication Network)

SDR AND COGNITIVE RADIO

(2017 Pattern) (Semester-II) (504509)

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

Instructions to the candidates:

1) ***Answer Q. No. 1 or 2, Q. No.3 or 4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams to be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Discuss the benefits of Cognitive Radio. **[7]**

b) Give any two major applications of Cognitive Radio technology. **[6]**

OR

Q2) a) Discuss the requirements and system architecture of SDR. **[7]**

b) Compare CR and Software Defined Radio technology. **[6]**

Q3) a) What is end-to-end communication in Cognitive Radio? **[6]**

b) Write the two spectrum sensing methods used in CR. **[6]**

OR

Q4) a) Draw the layered architecture of Cognitive Radio and explain it. **[6]**

b) Discuss various worldwide frequency plans available in Wireless communication. **[6]**

P.T.O.

Q5) a) Why Real Time Operating Systems is used in CR? **[6]**

b) Explain the Common Object Request Broker Architecture. **[6]**

OR

Q6) a) Write notes on functional and networking overview of SCA. **[6]**

b) Differentiate between SCA and JTRS. **[6]**

Q7) a) What is the role of adaptive techniques in antennas? **[7]**

b) What is a Smart Antenna? Explain the 3G Smart Antenna Requirements. **[6]**

OR

Q8) a) What is Chameleon Reconfigurable Communications Processor (RCP)? Explain? **[7]**

b) Write short notes on phased array antennas. **[6]**



Total No. of Questions : 8]

SEAT No. :

PE726

[Total No. of Pages : 1

[6585]-94

Second Year M.E. (E & TC) (Communication Network)

4G LTE : CELLULAR SYSTEMS

(2017 Pattern) (Semester - III) (604501)

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

Instructions to the candidates:

1) ***Answer Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or Q.6, Q. No. 7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of a calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Describe in detail LTE advanced E-UTRAN architecture. **[7]**

b) Explain the characteristic features of LTE and LTE Advanced. **[6]**

OR

Q2) a) Explain the High-level protocol architecture of LTE. **[7]**

b) Explain in brief the Mobility Management Entity (MME), Serving Gateway (S-GW), Packet Data Network Gateway (PDN-GW) **[6]**

Q3) a) Detail the RF requirements for LTE. **[6]**

b) Explain the carrier aggregation in the LTE. **[6]**

OR

Q4) a) Describe in detail the trans-receiver design in spectrm sharing. **[6]**

b) Illustrate the methodology involved in resource management. **[6]**

Q5) a) What is the software defined networks? Explain in brief. **[6]**

b) What is the need for Enhanced MIMO? Explain in brief. **[6]**

OR

Q6) a) Explain downlink and uplink MIMO. **[6]**

b) Explain the key features of OFDMA. **[6]**

Q7) a) Write in detail on mixed architectures of CoMP. **[7]**

b) Discuss the backhaul design for in-band relaying. **[6]**

OR

Q8) a) Write short note on Wi-Max standards evoluation. Give advantages of Wi-Max. **[7]**

b) Discuss the relay basic schemes in CoMP. **[6]**

ꕥ ꕥ ꕥ

Total No. of Questions : 8]

SEAT No. : [ ]

PE727

[Total No. of Pages : 2

[6585]-95

S.Y. M.E. (E & TC) (Communication Network)

MODERN COMMUNICATION RECEIVER DESIGN & TECHNOLOGY

(2017 Pattern) (Semester - III) (604502)

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

Instructions to the candidates:

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

Q1) With the help of suitable block diagram explain the Double Conversion receiver. **[10]**

Q2) Explain Drift-Canceling Loops and the Barlow-Wadley Receiver with suitable diagram. **[10]**

Q3) Explain the design of Automatically Switched Half-Octave Filter Banks for HF transceiver. **[10]**

Q4) Define the following terms in brief w.r.t. dynamic range. **[10]**

a) Linear composite dynamic range (LCDR).

b) Spurious-free second-order dynamic range (IP2SFDR).

Q5) a) Give the Classification of frequency synthesizer forms. **[5]**

b) Explain the Gilbert Cell Mixers with suitable diagram. **[5]**

P.T.O.

Q6) a) Explain the brute force, direct, coherent mixer synthesizer with suitable diagram. **[5]**

b) Explain the following parameters w.r.t. Mixers. **[5]**

i) Compression Point (-1 dB)

ii) Desensitization Level and Isolation

Q7) a) Write the applications of Logarithmic Intermediate Frequency. **[5]**

b) What is the significance of Automatic Gain Control (AGC) in Receivers? **[5]**

Q8) Enlist different Noise Blanker & state the importance of Noise Blanker in IF receiver. **[10]**

x x x

Total No. of Questions : 8]

SEAT No. :

PE728

[Total No. of Pages : 2

[6585]-100
F.Y.M.E. (E & TC) (IoT & Sensor System) (2020)
CLOUD ARCHITECTURE & PROTOCOLS
(2017 Pattern) (Semester - II) (504609)

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

Instructions to the candidates:

1) ***Attempt any 5 questions out of 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain cloud computing. How it is different from edge computing? **[5]**

b) Highlight essential characteristics of cloud computing with detailed applications. **[5]**

Q2) a) Differentiate between cloud servers and dedicated servers. **[5]**

b) summarize the challenges and opportunities for growth of cloud computing. **[5]**

Q3) a) Compare cloud computing and Grid computing. **[5]**

b) Give a brief insight into cloud security and challenges. **[5]**

Q4) a) Describe architectural considerations for collecting data in cloud- based systems. **[5]**

b) Explain regulatory issues faced in cloud computing. **[5]**

Q5) a) Write short note on : **[5]**

i) IaaS

ii) SaaS

iii) Paas

b) Draw and explain cloud architecture with all layers and protocols. **[5]**

P.T.O.

Q6) a) Give a detailed analysis of challenges and risks in cloud adoption. **[5]**

b) Compare and contrast cloud deployment models. **[5]**

Q7) a) Explain cloudSim Architecture in detail. **[5]**

b) Write short note on green cloud computing. **[5]**

Q8) a) What is virtualization in cloud computing? How cloning is done? **[5]**

b) Write short note on VMware virtualization and workstation. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE729

[Total No. of Pages : 1

[6585]-102

S.Y.M.E. (Electronics and Telecommunication-IoT and Sensor System)

MICRO SYSTEM FABRICATION

(2017 Pattern) (2020) (Semester - III) (604601)

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

Instructions to the candidates:

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

Q1) a) Explain the five differences between IC and MEMS. **[5]**

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

i) Chemical Cleaning

ii) Thermal Oxidation

Q2) a) What is DRIE? Why is it needed? **[5]**

b) Explain the two main technologies for high rate DRIE. **[5]**

Q3) a) What is MEMS sensor? Explain any one particular MEMS sensor. **[5]**

b) What is pressure sensor? Explain any one particular pressure sensor. **[5]**

Q4) a) What is comb-drives actuator? What does it look like? **[5]**

b) What do you understand by crystal defects? Mention four defects. **[5]**

Q5) a) Why deposition is used in fabrication? Explain their types. **[5]**

b) What is aging? Draw the bath-tub curve related to reliability. **[5]**

Q6) a) What is memory? Describe the different types of memory. **[5]**

b) Write the five applications of MEMS. **[5]**

Q7) a) What is the Etching? Why is it needed? **[5]**

b) What is intrinsic? List the intrinsic characteristics of MEMS. **[5]**

Q8) a) List the five general methods of IC and MEMS fabrication. **[5]**

b) What is semiconductor? How has MEMS been used in automotive systems? **[5]**

ꕥ ꕥ ꕥ

Total No. of Questions : 8]

SEAT No. : ____

PE730

[Total No. of Pages : 2

[6585]-103

S.Y. M.E. (E & TC - IoT and Sensor System) (2020)
IOT APPLICATIONS & WEB DEVELOPMENT
(2017 Pattern) (Semester - III) (604602)

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

Instructions to the candidates:

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

Q1) a) What are the key features of JAVA script as a programming language? **[5]**

b) What is mark-up language and why it is used? **[5]**

Q2) a) What is GUI (Graphical user interface)? **[5]**

b) Describe Event driven programming. **[5]**

Q3) a) Explain differences between SQL & SQLite. **[5]**

b) How can you interface SQLite with IoT application? **[5]**

Q4) a) Explain IoT fundamental and components. **[5]**

b) How do IoT devices contribute to real time energy consumption monitoring? **[5]**

P.T.O.

Q5) a) Explain data lake services scenarios in IoT. **[5]**

b) How can IoT enhance operational efficiency in manufacturing industries? **[5]**

Q6) a) Describe the IoT enable smart grid and solar energy harvesting. **[5]**

b) What role does the Hadoop ecosystem play in big data analysis? **[5]**

Q7) a) How can you use SQLite in mobile or web development? **[5]**

b) What are the challenges in implementing RT monitoring systems smart cities? **[5]**

Q8) a) What are the fundamental principles of designing a simple UI Layout? **[5]**

b) Explain the Android development environments. **[5]**

x x x

Total No. of Questions : 8]

SEAT No. :

PE731

[Total No. of Pages : 2

[6585]-105

First Year M.E. (E&TC) (Microwave)

RF AND MICROWAVE CIRCUITS

(2017 Pattern) (Semester-I) (504302)

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

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, wherever necessary.***

Q1) The input impedance of a short circuited lossy transmission line of length 1.5m ($< \lambda/2$) and a characteristic impedance of 100Ω is 40-j280Ω. **[10]**

a) Find α and β of the line.

b) Determine the input impedance if the short circuit is replaced by a load resistance ZL = 50 + j50Ω

c) Find the input impedance of the short circuited line for a line length of 0.15 λ.

Q2) a) Define the following terms w.r.t microwave components: **[5]**

i) Sensitivity

ii) Dynamic range

b) Consider a load resistance R_L = 100Ω to be matched to a 50Ω line with a quarter- wave transformer. Find the characteristic impedance of the matching section and plot the magnitude of the reflection coefficient versus normalized frequency, f/fo, where fo is the frequency at which the line is $\lambda/4$ long. **[5]**

Q3) a) Write a short note on Inter-Symbol Interference (ISI). **[5]**

b) Explain with help of proper diagram, working of two hole directional coupler and derive its scattering matrix. **[5]**

P.T.O.

Q4) a) Explain with help of suitable diagram construction and working of Varactor. **[5]**

b) Explain with help of suitable diagram construction and working of schottky diode. **[5]**

Q5) a) An RF power BJT generates a total power. P_w of 15W at case temperature of 25ºC. The maximum junction temperature is 150ºC and the maximum ambient operating temperature is specified to be Ta = 60ºC. What is the maximum dissipated power if the thermal resistance between case to sink and sink to air is 2ºK/W and 10ºK/W, respectively? **[5]**

b) Explain in detail the construction, working of n-channel MOSFET along with its electronic applications. **[5]**

Q6) Write a note on RF filters. **[10]**

Q7) Design a BJT Colpitts oscillator for 200 MHz in common emitter configuration having bias point of V_{ce} = 3V, I_c = 3mA. Following circuit parameters are given at room temperature of 25ºC. C_{BC} = 0.1fF, r_B = 2 KΩ, r_{CE} = 10KΩ, C_{BE} = 10fF. If the inductance should not exceed L_3 = L = 5nH, Find the values for capacitances in the feedback loop. **[10]**

Q8) Describe in detail the construction, working of Gunn diode along with its two valley theory. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE732

[Total No. of Pages : 2

[6585]-112

First Year M.E. (E & TC) (Signal Processing)
MATHEMATICS FOR SIGNAL PROCESSING
(2017 Pattern) (Semester - I) (504401)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data if necessary.***
3) ***Use of non-programmable calculator is allowed.***

Q1) a) A binary symmetric channel has a conditional probability of error p = 10–5 and the messages m0 and m1 are generated at the source with equal probability. Determine : **[6]**

i) The probability of receiving a response of r0

ii) The probability of receiving a response of r1

iii) The probability that m0 was sent and given that r0 is received

iv) The probability that m1 was sent and given that r0 is received

b) A coin is tossed up four times in succession, Determine the probability of obtaining three heads. **[6]**

OR

Q2) a) Consider the random process v(t) = cos (m+0), where 0 is a random variable with PDF, f (0) =; for 50s-0 elsewhere 2π. **[6]**

Show that the first and second moment are independent of time.

b) Explain the properties of PSD and ESD. **[6]**

Q3) a) Find k, l, m to make A a Hermitian Matrix $A = \begin{bmatrix} -1 & k & -i \\ 3-5i & 0 & m \\ L & 2+4i & 2 \end{bmatrix}$. **[7]**

b) Determine the autocorrelation function and ESD of $x(t) = eu\ (1)$. **[6]**

OR

P.T.O.

Q4) a) Let v(t) is a Gaussian Ergodic Random Process. Its mean value is zero and variance is 4 volts. V(t) is measured by a de meter, a true rms meter and a meter which first squares v(t) and then reads it as de component. Summarize that time averages of an Ergodic process and then evaluate the outcome of each meter. **[7]**

b) Verify given matrix is Orthogonal : **[6]**

$$A = 1/3\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$$

Q5) a) Calculate the PSD and power of a sinusoid given by $x(t) = A\cos(0t + \varnothing)$. **[6]**

b) Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} -4 & 4 \\ -1.6 & -1.2 \end{bmatrix}$. **[6]**

OR

Q6) a) Over a noisy channel 10000 digits are transmitted having a probability of error per digit of 5×10. What is the probability of getting only two digits in error? Also find mean and variance. **[6]**

b) Consider the vectors ([3, 0, 4], [–1, 0, 7], [2, 9, 11]} Check that the vectors are linearly independent and use the Gram-Schmidt process to find orthogonal vectors. **[6]**

Q7) a) Calculate the PSD and Power of a sinusoid given by $x(t) = A\cos(0t + \varnothing)$. **[7]**

b) Find the inverse matrix of the 3×3 matrix using Caley Hamilton theorem

$$A = \begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}.$$ **[6]**

OR

Q8) a) Find the moment about a line through the origin having direction $2i + 2j + k$. due to a 30kg force acting at a point (–4, 2, 5) in the direction of $12i – 4j – 3k$. **[7]**

b) Prove that : **[6]**

$\sin(A + B) = \sin A \cos B + \cos A \sin B$

$\cos(A + B) = \cos A \cos B + \sin A \sin B$

Total No. of Questions : 8]

SEAT No. :

PE733

[Total No. of Pages : 2

[6585]-113

First Year M.E. (E&TC) (Signal Processing)

DIGITAL IMAGE & VIDEO PROCESSING

(2017 Pattern) (Semester-I) (504402)

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

Instructions to the candidates:

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

Q1) a) With respect to digital image explain the following. **[5]**

i) Connectivity between pixels

ii) Distance measures between pixels

b) Explain Pseudo, color image processing in detail. Write its application. **[5]**

Q2) a) Explain separability of unitary transforms & basis images. **[5]**

b) Explain the following along with application. **[5]**

i) Power law transformation

ii) Vnsharp Marking

Q3) a) Explain homo-morphic filtering approach for image enhancement. **[5]**

b) Explain JPEG baseline encoder in detail. **[5]**

Q4) a) What is Global thresholding? What is its drawback? How adaptive thresholding overcomes it? Write algorithm for adaptive thresholding. **[5]**

b) With the help of morphological operations on binary images explain how the following operations are performed? **[5]**

i) Boundary extraction

ii) Region / Hole filling

iii) Thickening

P.T.O.

Q5) a) Describe the basic concept of Fourier descriptor for representation of boundary. List its properties and advantages. **[5]**

b) With block diagram, explain JPEG compression model in detail. **[5]**

Q6) a) Explain Region merging & region splitting techniques. **[5]**

b) What is difference between image restoration and image enhancement? Explain the image degradation model in detail. **[5]**

Q7) a) State the difference between analog and digital video? Explain basic video codes with suitable block diagram. **[6]**

b) Explain different color models used in Video compression. **[4]**

Q8) a) Explain basics of color video? Hence explain color convesion into YC6Cr color space along with its advantages. **[6]**

b) What is Pseudo coloring and False coloring? Give its application. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE734

[Total No. of Pages : 2

[6585]-114

First Year M.E. (E & TC) (Signal Processing)
ADVANCED DIGITAL SIGNAL PROCESSING
(2017 Pattern) (Semester - I) (504403)

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

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) Evaluate 4-point DFT of x(n) = {0, 1, 2, 3} **[6]**

b) List any two properties of DFT. **[2]**

OR

Q2) a) Write steps for IIR filter design using bilinear transformation. **[6]**

b) Compare FIR and IIR filters. **[2]**

Q3) a) Explain LMS adaptive algorithm? **[6]**

b) State applications of Multirate digital signal processing. **[2]**

OR

Q4) a) Explain recursive least square algorithm. **[6]**

b) State the Weiner Hopf Equation. **[2]**

Q5) a) Define Mean, auto correlation, time average and Ensemble average for random signals. **[8]**

b) Explain the wide sense stationary process in detail. Are the wide sense stationary process and Ergodic Process reasonable assumptions for a video signal? **[9]**

OR

P.T.O.

Q6) a) Show that random process $X(t) = A\cos(w_c t + \theta)$, θ is random variable uniformly distributed in the range $[0; 2\pi]$ is a Wide Sense Stationary Process. **[9]**

b) Compare Time averages and Ensemble averages. **[8]**

Q7) a) Write a brief note on Booth's Multiplication algorithm. **[9]**

b) Explain parallel processing and pipelining in VLSI architecture. **[8]**

OR

Q8) a) Explain VLIW architecture in detail. **[9]**

b) Explain implementation of decimation and Interpolation algorithm in detail. **[8]**



Total No. of Questions : 8]

SEAT No. : ____

PE735

[Total No. of Pages : 2

[6585]-115

First Year M.E. (E & TC) (Signal Processing)

BIOMEDICAL SIGNAL PROCESSING

(2017 Pattern) (Semester - II) (504407)

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

Instructions to the candidates:

1) ***Attempt any Five Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume the suitable data, if necessary.***

Q1) a) Explain Heart Structure with diagram. **[5]**

b) Explain Einthoven's triangle for 12 Lead ECG configurations. **[5]**

Q2) a) Explain different Bio-transducers. **[5]**

b) Explain electrical activity of cell. **[5]**

Q3) a) Write note on different Medical Images. **[4]**

b) Write note on Aliasing effect in details. **[6]**

Q4) a) Explain any two properties of Radon Transform. **[4]**

b) With the sequence of events and waves explain cardiac cycle and draw PQRST waveform. **[6]**

Q5) a) Write a note on MRI and Functional MRI(FMRI). **[4]**

b) Write a note on Eigen Analysis Spectral Analysis. **[4]**

c) Define non stationary signal with example. **[2]**

P.T.O.

Q6) a) Explain Radon Transform, Inverse Radon Transform. **[4]**

b) Explain in detail electromechanical models of signal generation. **[4]**

c) List any two characteristics of Noise. **[2]**

Q7) a) Discuss the model based approach for spectral estimation. **[4]**

b) Define following : **[4]**

i) Edge

ii) Line

iii) Points

iv) Corners

c) Write a note on volumetric representation. **[2]**

Q8) a) Explain the use of autocovariance in analysis of heart rate variability. **[4]**

b) Explain Noise reduction by Ensemble Averaging. **[4]**

c) List parametric system modelling. **[2]**



Total No. of Questions : 8]

SEAT No. :

PE736

[Total No. of Pages : 2

[6585]-116
First Year M.E. (E & TC) (Signal Processing)
SPEECH PROCESSING
(2017 Pattern) (Semester - II) (504408)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Make suitable assumptions wherever necessary.***

Q1) a) Explain LTI model for speech production system? How limitations of LTI is overcome in LTV model. **[6]**

b) Explain pitch frequency measurement using AMDF. **[4]**

Q2) a) Explain human speech production system with help of neat and labelled diagram. **[5]**

b) Explain the technique to separate voiced and unvoiced region of speech signal using ZCR. **[5]**

Q3) a) Explain the method of finding LPC coefficients using autocorrelation method, with its advantages and disadavantages. **[6]**

b) Explain Levinson-Durbin recursive algorithm for the calculation of predication coefficients. **[4]**

Q4) a) Explain the concept of Spectrogram and explain narrow band and wide band spectrogram. **[5]**

b) What is MFCC? Explain the method to calculate MFCC using block diagram. **[5]**

P.T.O.

Q5) a) What is LSF? What is its significance? Explain the procedure of conversion of LSP to LPC. **[5]**

b) With the help of wavelet, how speech signal is analyzed? Explain it. **[5]**

Q6) a) Explain the homomorphic speech processing in detail. **[5]**

b) Explain the pitch detection using LPC parameters in detail. **[5]**

Q7) a) Explain forward and backward adaptive quantizer in detail. **[4]**

b) What is Speech enhancement? Explain the Spectral Subtraction method of speech Enhancement? **[6]**

Q8) a) What is APCM? Compare APCM with companded PCM. Explain how companded PCM will Improve the SNR of the signal. **[6]**

b) Explain Speaker identification and Speaker verification. **[4]**

Total No. of Questions : 8]

SEAT No. :

PE737

[Total No. of Pages : 2

[6585]-117

First Year M.E. (E&TC) (Signal Processing)

COMPUTER VISION

(2017 Pattern) (Semester-II) (Elective-II) (504409)

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

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable electronic pocket calculator is allowed.***
4) ***Assume suitable data; jf necessary.***

Q1) a) Explain working principle colour image camera. **[5]**

b) Explain the working principle of a Pinhole Camera Model. **[5]**

Q2) a) Explain the working of RANSAC Algorithm for feature alignment. **[5]**

b) Explain the use of Kalman Filter in Motion Tracking Systems. **[5]**

Q3) a) Explain eight point algorithm in stereo vision for calibrated cameras. **[5]**

b) Explain Stereo parameters. **[5]**

Q4) a) Explain any one application of computer vision. **[5]**

b) Explain different types of 2D and 3D Transformations used in Computer Vision. **[5]**

P.T.O.

Q5) a) What is Camera Calibration? Discuss intrinsic and extrinsic parameters. **[5]**

b) Write short note on Scale Invariant Feature Transform. **[5]**

Q6) a) Explain how to do feature alignment using least squares. **[4]**

b) Explain with neat diagram image stitching. **[4]**

c) Define following image features: - **[2]**

i) Edge &

ii) Line

Q7) a) Describe any two applications of Thermal Imaging in Computer Vision. **[5]**

b) Mention different Camera Parameters. **[5]**

Q8) a) Describe any one differential technique for motion estimation. **[5]**

b) What are the different types of Color Models? Explain any one in detail. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE738

[Total No. of Pages : 1

[6585]-118

S.Y.M.E. (Electronics and Telecommunications) (Signal Processing)
STATISTICAL SIGNAL PROCESSING
(2017 Pattern) (Semester - III) (604401)

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

Instructions to the candidates:

1) ***Atempt any five questions out of eight.***
2) ***All Questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Make suitable assumptions wherever necessary.***

Q1) a) Explain with example AR Processes. **[5]**

b) Describe the concept of Spectral Factorization in detail. **[5]**

Q2) a) Explain Weiner Filter application for Noise Cancellation. **[5]**

b) Describe in detail filtering of Random Processes. **[5]**

Q3) a) What are the least square methods for modelling the signal? **[5]**

b) Determine the lattice coefficients corresponding to the FIR filter with system function $H(Z) = 1 + (13/24)\, z^{-1} + (5/8)z^{-2} + (1/3)\, z^{-3}$

Also Sketch the lattice structure. **[5]**

Q4) a) State and explain Prony's signal modelling method. **[5]**

b) Describe in detail Yule Walker Equations for the AR Coefficients. **[5]**

Q5) a) Explain the need of adaptive filter with its applications. **[5]**

b) Describe in detail use of lattice structures for linear prediction. **[5]**

Q6) a) Write a short note on Levinson-Durbin algorithm. **[5]**

b) Explain in detail Least Mean Square (LMS) algorithm with its applications. **[5]**

Q7) a) Discuss in detail Principle of estimation and its applications. **[5]**

b) Differentiate Minimum Variance Estimate and Maximum Likelihood Estimate. **[5]**

Q8) a) Explain and derive the algorithm for Bartlett Method. **[5]**

b) Discuss in detail Welch method for power spectral estimation. **[5]**

ꕥ ꕥ ꕥ

Total No. of Questions : 7]

SEAT No. :

PE-5511

[Total No. of Pages : 1

[6585]-119
M.E. (E & TC) (Signal Processing)
STILL IMAGE & VIDEO COMPRESSION
(2017 Pattern) (Semester - III) (604402)

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

Instructions to the candidates:

1) ***Attempt any Five Question.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume the suitable data, if necessary.***

Q1) a) How vector quantization works? Explain with example. What are the advantages of vector quantization over scalar quantization. **[5]**

b) Explain Linde-Buzo-Gray Algorithm in details. **[5]**

Q2) a) Explain with the neat schematic two band sub-band encoder & decoder in detail. **[5]**

b) Explain Embedded zero tree coder with example. **[5]**

Q3) a) Explain layer III-mp3 coding in detail. **[5]**

b) What is temporal redundancy? How motion estimation algorithm is useful in reducing temporal redundancy. **[5]**

Q4) a) Explain MPEG-I video compression standard in detail. **[5]**

b) Explain Dolby AC3 (Dolby Digital) MPEG1-Video structure. **[5]**

Q5) a) Explain the Hybrid scalability in detail. **[5]**

b) Explain the MPEG - I decoder in detail. **[5]**

Q6) a) Explain the following concepts. **[6]**

i) Block based motion estimation & compensation.

ii) Motion compensated prediction of macro block.

b) Explain the Overview of MPEG-7 and MPEG - 21. **[4]**

Q7) a) Explain JPEG 2000 standard with respect to **[6]**

i) Preprocessor

ii) Core encoder

b) Write the difference between MPEG 1 and MPEG 2. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE739

[Total No. of Pages : 2

[6585]-120

First Year M.E. (E & TC) (VLSI & Embedded Systems)

DIGITAL CMOS DESIGN

(2017 Pattern) (Semester -I) (504201)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of nonprogrammable calculator is allowed.***

Q1) a) Draw ac equivalent circuit for MOSFET and give details of capacitances involved. Compare these capacitances w.r.t. regions of operation of MOSFET. **[5]**

b) Explore wiring paracitics in detail. What is sheet resistance? What is its significance? How does it play a role during on-chip wiring? **[5]**

Q2) a) Explain any one type of CMOS fabrication process in detail. **[5]**

b) What is significance of static & short circuit power dissipation? How to minimize them? **[5]**

Q3) a) Explore equivalent circuit of MOSFET. Explain the gm, Cgs & their significance **[5]**

b) Explain fan in & fan out of CMOS logic. Give the expressions & explain dependencies. **[5]**

Q4) a) What is significance of Power Delay Product? Derive the expression. **[4]**

b) What are the types of hazards? Explore any one with suitable example. **[4]**

c) Why is MOSFET sizing necessary? What are the effects if sizing is not followed? **[2]**

P.T.O.

Q5) a) Design CMOS logic for X= ABCD+EF+G. Calculate area on chip. **[4]**

b) What are sources of cross talk? Explain cross talk mechanism. **[4]**

c) Explain limitations of Transmission Gate? What are the solutions? **[2]**

Q6) a) Draw FSM diagram & write HDL code for 4 bit ring counter.Write test bench for it. **[5]**

b) What is metastability? What are the reasons? Explain the solution in detail. **[5]**

Q7) a) What is the concept behind ratioed circuits? Explain in brief. **[4]**

b) What are merits of differential circuits? Explore sense amplifier-based circuit in detail. **[4]**

c) Write note on materials for performance improvement. **[2]**

Q8) a) Explore domino logic with appropriate example. **[5]**

b) What are different techniques for low power logic design? Explore any one in detail. **[5]**

● ● ●

Total No. of Questions : 8]

SEAT No. :

PE740

[Total No. of Pages : 2

[6585]-121

First Year M.E. (E&TC-VLSI & Embedded Systems)

RECONFIGURABLE COMPUTING

(2017 Pattern) (Semester-I) (504202)

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

Instructions to the candidates:

1) ***Answer any five questions from questions (Q.1 to 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 the concept of Single-context and Multi-context processors with diagrams. **[4]**

b) Differentiate between Fine-grained and Coarse-grained fabrics in FPGA. **[4]**

c) Discuss Application-Specific Processors with an example. **[2]**

Q2) a) Discuss the Integration of Reconfigurable Processing Fabric (RPF) into Traditional Computing Systems. **[4]**

b) Explain Pipeline and Block Reconfigurable Architectures. **[4]**

c) Describe PAM as an early system of Reconfigurable Computing. **[2]**

Q3) a) Define Reconfiguration and explain Partial Reconfiguration with respect to ASIC. **[5]**

b) Explain DSP Processors as domain-specific processors with an example. **[5]**

Q4) a) Draw and explain the structure of FPGA. **[5]**

b) Explain Relocation and Defragmentation in the context of Reconfigurable Computing. **[5]**

P.T.O.

Q5) a) What is SoPC? Explain the main components of a System on Programmable Chip. **[5]**

b) Explain the FPGA Design Flow with the help of a flow diagram. **[5]**

Q6) a) Discuss Bitstream Manipulation with JBits Design Approaches. **[5]**

b) What are the computational characteristics and performance parameters of FPGA? **[5]**

Q7) a) Explain the architecture of Adaptive Cryptographic Systems. **[5]**

b) State the application of Reconfigurable Computing in Video Streaming. **[5]**

Q8) a) Explain High-Performance Computing with respect to FPGA. **[5]**

b) Elaborate on Reconfigurable Computing for Software-Defined Radio. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE741

[Total No. of Pages : 2

[6585]-122

First Year M.E. (E & TC) (VLSI & Embedded Systems)
EMBEDDED SYSTEM DESIGN
(2017 Pattern) (Semester - I) (504203)

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

Instructions to the candidates:

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

Q1) a) What is the role of an Integrated Development Environment (IDE) in embedded system design? Give examples of common IDEs used in embedded systems. **[5]**

b) Highlight the features, applications and suitable use cases of Arduino, Raspberry Pi and Intel Galileo Gen 2 as development platforms for embedded systems **[5]**

Q2) a) Draw and explain waterfall and V design model for embedded system. **[5]**

b) Compare the different types of development platforms trends in terms of IDE, board details and applications. **[5]**

Q3) a) What is the need of pin connect block in LPC-1768? Explain use of PINSE:x register. **[5]**

b) Explain the USB protocol with suitable diagram with reference to CORTEX M3 controller. **[5]**

Q4) a) Which ARM Cortex core is right for your application: A, R or M? Explain with reason. **[5]**

b) What is the role of Barrel Shifter in ARM processor. Explain it in details with suitable example. **[5]**

P.T.O.

Q5) a) How space initialization is carried out in Embedded Linux? **[5]**

b) What are the steps to implement device driver for blinking of LED. **[5]**

Q6) a) Discuss the bootloader's role in loading the Linux kernel. **[5]**

b) Compare and contrast the role of BIOS and bootloaders in the context of embedded Linux systems. **[5]**

Q7) a) Explain importance of EMI/RFI certification in embedded product. **[5]**

b) Discuss the embedded system design of a wearable health monitoring device. **[5]**

Q8) a) Explain Digital Camera in embedded system with respect to Block diagram, design consideration and flow chart. **[5]**

b) Explain testing and documentation for embedded system. **[5]**



Total No. of Questions : 8]

SEAT No. : [ ]

PE742

[Total No. of Pages : 2

[6585]-123

First Year M.E. (E & TC - VLSI & Embedded Systems)

ANALOG CMOS DESIGN

(2017 Pattern) (Semester - II) (504207)

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

Instructions to the candidates:

1) ***Answer any five questions from questions (Q.1. to Q.8.)***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Explain the working of a CMOS inverter as an amplifier. What are its advantages and limitations in analog applications? **[6]**

b) Briefly explain the concept of weak inversion and its impact on subthreshold current in MOSFETs. **[4]**

Q2) a) Differentiate between current references and voltage references. Explain the principle and design considerations of a bandgap voltage reference.**[6]**

b) What is the basic principle of operation of a current mirror? Mention one practical application. **[4]**

Q3) a) What is a cascode amplifier? Explain its working and mention how it improves gain and output resistance. **[6]**

b) Define an operational amplifier (Op Amp). What are the key performance parameters to consider in its CMOS implementation? **[4]**

Q4) a) What is Micro power Op-Amp? Explain the techniques used in Micro power Op-Amp. **[6]**

b) Compare low noise Op-Amps with standard Op-Amps in terms of design and performance. **[4]**

P.T.O.

Q5) a) Describe the concept of frequency compensation in two-stage operational amplifiers. Why is it necessary and what impact does it have on amplifier performance? **[6]**

b) What is phase margin? How does it affect the stability of an operational amplifier in a feedback loop? **[4]**

Q6) a) Explain the different compensation techniques used in operational amplifiers. Compare the Miller compensation with other methods. **[6]**

b) Define gain margin and explain its relevance in ensuring the stability of feedback systems in operational amplifiers. **[4]**

Q7) a) What are the key design considerations in Low Noise Amplifier (LNA) design? Explain how noise figure (NF) and power consumption are balanced during the design process. **[6]**

b) Discuss the challenges in designing a multistage amplifier for high bandwidth. What steps can be taken to optimize performance in such designs? **[4]**

Q8) a) Discuss the advanced trends in Radio Frequency (RF) chip design. What are the major challenges faced in the design of modern RF chips, and how have recent advancements helped address them? **[6]**

b) What are the common types of mixers used in RF systems? Explain the difference between passive and active mixers and their applications. **[4]**

x x x

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

PE743 **[Total No. of Pages : 2**

[6585]-124

First Year M. E. (E & Tc) (VLSI & Embedded System)

SYSTEM ON CHIP

(2017 Pattern) (Semester - II) (504208)

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

Instructions to the candidates:

1) ***Answer any five questions. Each question carries 10 marks & each bit carries 5 marks.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define the concept of Metastability? Explain the problems occuring due to Metastability. **[5]**

b) Explain in detail the RTL based chip design flow. **[5]**

Q2) a) How to determine the hardware implementation of an FSMD? **[5]**

b) What are pipeline hazards? How pipeline hazards can be handled? **[5]**

Q3) a) Explain time multiplexing of two hardware. Module posts over a single control shell. **[5]**

b) Write a short note on : Any one **[5]**

i) Control harzard & data harzard

ii) Delayed branch & conditional branch

Q4) a) What do you mean by control design? Explain in detail the Hierarechical control design approach. **[5]**

b) Explain various synchronization schemes adopted by Hardware & Software interface. **[5]**

Q5) a) Which are the factors affecting Delay & Slew? **[5]**

b) Write a short note on Simulation-Synthesis Mismatch. **[5]**

Q6) a) Explain the difference between the One-way & Two-way Handshake. **[5]**

b) What are causes of power dissipation? **[5]**

P.T.O.

Q7) a) Explain different timming parameters for Digital Logic? **[5]**

b) Explain the Important issues for Embedded compilers. **[5]**

Q8) a) Explain energy management techniques for SOC design. **[5]**

b) What is Hybrid Power Management technique? **[5]**

✡ ✡ ✡

Total No. of Questions : 8]

SEAT No. :

PE744

[Total No. of Pages : 2

[6585]-125

First Year M.E. (E&TC-VLSI & Embedded Systems)

EMBEDDED AUTOMOTIVE SYSTEMS

(2017 Pattern) (Semester-II) (504209)

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

Instructions to the candidates:

1) ***Answer any five questions from questions (Q. 1. to Q. 8.)***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data wherever necessary.***

Q1) a) Explain what is wiring harness and how a wiring harness is created? **[6]**

b) Write short note on Automotive Lighting Systems: External. **[4]**

Q2) a) Explain Automotive cabin comfort system. **[6]**

b) Discuss different Dashboard Instruments. **[4]**

Q3) a) What is the Engine Speed sensor and how does it work? **[6]**

b) Write short note on Definition and importance of Sensor calibration. **[4]**

Q4) a) Explain Car Knock sensor with its construction and working principle. **[6]**

b) What is curve fitting in automotive sensor calibration? **[4]**

P.T.O.

Q5) a) Explain electronic steering control with reference to how it works and its benefits. **[6]**

b) What is ABS and how does it works? **[4]**

Q6) a) Explain electronic suspension system, its working and its benefits. **[6]**

b) Explain what is Variable Valve Timing does and its benefits? **[4]**

Q7) a) Write short note on various automotive communication protocols. **[6]**

b) What is use of Vehicle network simulation and how does it work? **[4]**

Q8) a) Explain working of CAN Bus protocol and its features. **[6]**

b) Explain LIN bus Protocol and its applications. **[4]**



Total No. of Questions : 8]

SEAT No. :

PE745

[Total No. of Pages : 1

[6585]-126

S.Y.M.E. (E&TC) (VLSI & Embedded Systems)

TESTING AND VERIFICATION OF VLSI CIRCUITS

(2017 Pattern) (Semester - III) (604201)

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

Instructions to the candidates:

1) ***Answer any five questions. Each question carries 10 marks.***
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 VHDL code and test bench code for 8 bit counter. **[5]**

b) Define : Observability and Controllability. **[5]**

Q2) a) Write a short on "SoC Testing". **[5]**

b) Write a short note on "Embedded Core Testing" **[5]**

Q3) a) Explian combinational circuit test generation using suitable Example. **[5]**

b) Write Short Note on "Analog Fault Models". **[5]**

Q4) a) Explain IDDQ Current testing. **[5]**

b) Explain LFSR and Signature compcation of BIST. **[5]**

Q5) a) State need and limitation of Formal verification Techniques. **[5]**

b) Write Short Note on techniques of Memory testing. **[5]**

Q6) a) What is Functional Verification? Explain with a suitable example. **[5]**

b) What is a ATPG. Explain in brief. **[5]**

Q7) a) Briefly discuss how VLSI technology trends have a affected the domain of testing. **[5]**

b) Explain different test pattern generation methods for BIST. **[5]**

Q8) a) Compare and Contrast between Functional and Formal verification techniques. **[5]**

b) Differentiate between Defect, Fault and Error with suitable example. **[5]**

ꕥ ꕥ ꕥ

Total No. of Questions : 8]

SEAT No. :

PE746

[Total No. of Pages : 2

[6585]-127
S.Y. M.E. (E & TC) (VLSI & Embedded Systems)
ASIC DESIGN
(2017 Pattern) (Semester - III) (604202)

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

Instructions to the candidates:

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

Q1) a) Design a basic testbench in Verilog for a 2-to-1 multiplexer and explain how simulation helps in validating ASIC functionality before fabrication. **[5]**

b) Draw design flow of ASIC Design process and explain each step in detail. **[5]**

Q2) a) What are different types of ASIC? Classify and explain in details. **[5]**

b) What is testbench? Explain with example. **[5]**

Q3) a) Classify the placement algorithms. Explain the min-cut algorithm with the help of example. **[5]**

b) Compare global routing and detailed routing. **[5]**

Q4) a) Explain with example need of time optimization. **[5]**

b) How is false path detection is carried out in application specific integrated circuits? **[5]**

P.T.O.

Q5) a) Explain the different timing parameters for Static Timing Analysis. **[4]**

b) Explain with example different SI issues in ASIC design. **[4]**

c) What is the time related constraints? Explain with one example. **[2]**

Q6) a) Compare pre layout simulation and post layout simulation techniques. **[4]**

b) How delay calculation in done in static timing analysis? **[4]**

c) Give example of Left-edge algorithm and comment on it. **[2]**

Q7) a) Differentiate between BILBO and JTAG architectures in terms of structure, application, and flexibility in testing. **[4]**

b) Write short note on DFT? **[4]**

c) What are the goals and objectives of placement? **[2]**

Q8) a) Explain in detail physical faults occurred in ASIC. **[4]**

b) Compare and contrast structural testing and functional testing in A design. **[4]**

c) How to estimate delays in ASIC Design. **[2]**



Total No. of Questions : 8]

SEAT No. :

PE747

[Total No. of Pages : 2

[6585]-136

First Year M.E. (Electronics-Digital Systems)

ANALOG & DIGITAL CMOS DESIGN

(2017 Pattern) (Semester-I) (504101)

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

Instructions to the candidates:

1) ***Answer any five questions from the following.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain advantages of stick diagram and draw it for 3 input NAND Gate. **[5]**

b) What are the various lithographic techniques in CMOS fabrication process? Explain photolithography process. **[5]**

Q2) a) What are the three different modes of MOSFET operation? Explain with proper diagrams. **[5]**

b) What are MOSIS Scalable CMOS Design Rules? What are the advantages using it? **[5]**

Q3) a) Write short notes MOS on MOSFET ,Fan-In-and Fan-Out. **[5]**

b) Explain the various components of Delay in Logic gates. **[5]**

Q4) a) Write the short note on parasitic delays of MOSFET Gate. Give one example with an illustration to calculate the parasitic delay. **[5]**

b) Write short note on interconnects and RC model. **[5]**

Q5) a) Explain with circuit diagram, how to use CMOS Inverter as an Amplifier? **[5]**

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

i) Current mirrors

ii) Voltage Reference

P.T.O.

Q6) a) With neat diagram explain Cascode Amplifiers. What are the advantages? **[5]**

b) Explain the operation of sense Amplifier in SRAM & DRAM. **[5]**

Q7) a) What are the specific methodologies used for Low Power Logic Design? **[5]**

b) Draw and explain BiCMOS Circuits. **[5]**

Q8) a) Compare different logic circuit families. **[5]**

b) Write short note on : Ratioed circuits. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE748

[Total No. of Pages : 2

[6585]-137

First Year M.E. (Electronics) (Digital Systems)

MULTIRATE SIGNAL PROCESSING

(2017 Pattern) (Semester-I) (504102)

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

Instructions to the candidates:

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

Q1) a) What is the need of Multirate signal processing? Explain the terms: Decimation and Interpolation with example. **[5]**

b) What are the characteristic of polyphase filters? How filter structure is efficient? **[5]**

Q2) a) Explain the use of subband coding for speech. What is the advantage of subband coding? **[5]**

b) Explain DFT filter bank. **[5]**

Q3) a) Define gradient in the steepest decent algorithm. What are the limitation of this algorithm. **[5]**

b) Explain least mean square algorithm for adaptive filtering. **[5]**

Q4) a) What is image resizing? Explain with suitable example. **[5]**

b) Explain oversampling in ADC/ DAC. **[5]**

Q5) a) Explain any one application of DCT with the help of suitable block diagram. **[5]**

b) Explain the design of QMFs. **[5]**

Q6) a) Explain the Haar wavelet and wavelet filter bank with suitable equation. **[5]**

b) Find the Haar wavelet transform of following sequence. S=[2, 2, 0, 2, 3, 5, 4, 4] **[5]**

Q7) a) Explain FIR direct form realization for decimation using suitable diagram. **[5]**

b) Describe any two standard wavelet functions. **[5]**

Q8) a) Explain the Pade approximation technique. **[5]**

b) Explain the Prony's method. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE749

[Total No. of Pages : 2

[6585]-138

First Year M.E. (Electronics-Digital Systems)

EMBEDDED SYSTEM DESIGN

(2017 Pattern) (Semester - I) (504103)

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

Instructions to the candidates:

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

Q1) a) Define embedded systems and explain their key characteristics. **[5]**

b) Explain the fundamental concepts of a real-time operating system (RTOS). **[5]**

Q2) a) What are the different phases in the embedded system design life-cycle model? Explain briefly. **[5]**

b) What are the different kernel services provided by RTOS? Explain any two in detail. **[5]**

Q3) a) Compare the features and applications of ARM Cortex-A, Cortex-R, and Cortex-M processor series. **[5]**

b) Discuss the structure of Android applications and the process of Android application development. **[5]**

Q4) a) Discuss the architecture of the ARM-M3-based LPC 1768 microcontroller with the help of a block diagram. **[5]**

b) Describe the task creation and management process in MicroC/OS-II. **[5]**

P.T.O.

Q5) a) What is embedded Linux? Discuss the process of porting Linux onto an ARM platform. **[5]**

b) Explain the design and working of an automated meter reading (AMR) system as an embedded system. **[5]**

Q6) a) Explain the concepts of Linux kernel configuration and kernel initialization. **[5]**

b) What are the key steps involved in certification and documentation of embedded systems? **[5]**

Q7) a) Write a short note on device driver development for an LED. **[5]**

b) Discuss testing, reliability, and failure analysis in the context of embedded system design. **[5]**

Q8) a) Describe the module utilities and methods used in device driver development. **[5]**

b) Describe any one real-life embedded product in detail, highlighting its design and application. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE750

[Total No. of Pages : 2

[6585]-139

First Year M.E. (Electronics) (Digital Systems)

ADVANCED DSP PROCESSORS

(2017 Pattern) (Semester - II) (504107)

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

Instructions to the candidates:

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

Q1) a) Explain MAC unit and Barrel Shifters used in DSP Processors. **[5]**

b) Explain Very Long Instruction Word Architecture. **[5]**

Q2) a) Describe Multiplier/Adder Unit of TMS320C54XX Processor with block diagram. **[5]**

b) Discuss Bus Structure of TMS320C54XX Processor. **[5]**

Q3) a) Draw and Explain TMS320C6713 Architecture. **[5]**

b) Explain interrupt resources available for any DSP Processor. **[5]**

Q4) a) What is the use of circular addressing mode? **[5]**

b) Describe pipelining operation of TMS320C54XX Processor. **[5]**

P.T.O.

Q5) a) How to create and build project in Code Compressor? **[5]**

b) Draw and explain architecture of Blackfin processor. **[5]**

Q6) a) Explain the linking process rules in Visual DSP++. **[5]**

b) Explain software development flow of Blackfin Processor. **[5]**

Q7) a) Describe Power Consumption and Management Aspects of a DSP Processor. **[5]**

b) What is the role of Compiler, Assembler, Linker, Simulator and Emulator? **[5]**

Q8) a) Explain Coder and Decoder in DSP Processors. **[5]**

b) Discuss Selection Criteria of Digital Signal Processor. **[5]**

x x x

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

PE751 **[Total No. of Pages : 2**

[6585]-140

First Year M. E .(Electronics-Digital Systems)

PLD'S & ASIC DESIGN

(2017 Pattern) (Semester - II) (504108)

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

Instructions to the candidates:

1) ***Answer any five questions from the following.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain resource sharing in system design with suitable example. **[5]**

b) What are data path and control path? **[5]**

Q2) a) Explain the Behavioral and Data Flow VHDL modeling techniques with example. **[5]**

b) Differentiate between functions and procedures in VHDL? **[5]**

Q3) a) With the help of primitive building blocks draw & explore (for XC9500): **[6]**

i) macrocell

ii) Product term allocator

iii) I/Os

b) What are different power dissipation in CMOS, Explain. **[4]**

Q4) a) Explain the sequential and concurrent statements in VHDL programming with suitable example. **[5]**

b) Write short note w.r.t VDHL on **[5]**

i) Test Bench and Packages

ii) Operator Interface

Q5) a) Draw and explain basic logic block of FPGA. **[5]**

b) What is process of Debugging? Explain debugging step in FPGA design. **[5]**

P.T.O.

Q6) a) Explain the architecture of Xilinx Spartan II. **[5]**

b) What is Boundary Scan? Explain Boundary Scan Method. **[5]**

Q7) a) Explain the types of Application Specific Integrated Circuits (ASIC)? **[5]**

b) What does EDA tool refer to? Explain different EDA tools used in ASIC. **[5]**

Q8) a) Explain RTL to GDS -II flow in detail. **[5]**

b) What is Custom IC? Explain Custom IC Design Flow. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE752

[Total No. of Pages : 2

[6585]-141

First Year M.E. (Electronics) (Digital Systems)

IMAGE PROCESSING AND COMPUTER VISION

(2017 Pattern) (Semester-II) (504109)

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

Instructions to the candidates:

1) ***Answer any five questions out of eight.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***All questions carry equal marks.***

Q1) a) What is binary image processing operation? Explain any one in detail. **[5]**

b) Explain the PCA Algorithm. **[5]**

Q2) a) Write a short note on Hough Transform. **[5]**

b) Explain the Concept of DCT image transform. **[5]**

Q3) a) Define the terms Hue, Saturation and Intensity. **[5]**

b) Explain the term noise in color images. **[5]**

Q4) a) Explain the HIS color model in detail. **[5]**

b) Write a short note on Pseudo color Image Processing. **[5]**

P.T.O.

Q5) a) Explain Head and hat algorithm. **[5]**

b) Write a short note on Image Registration. **[5]**

Q6) a) Explain the Weighted geometrical feature algorithm. **[5]**

b) Give the classification of Image registration methods in brief. **[5]**

Q7) a) Write a short note on 3D surface reconstruction. **[5]**

b) Explain Epipolar geometry in detail. **[5]**

Q8) a) Explain Range data merging with respect to 3D reconstruction. **[5]**

b) Write a short note on 3D photography. **[5]**



Total No. of Questions : 7]

SEAT No. :

PE753

[Total No. of Pages : 1

[6585]-142
S.Y. M.E. (Electronics) (Digital Systems)
SYSTEM ON CHIP DESIGN
(2017 Pattern) (Semester - III) (604101)

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

Instructions to the candidates:

1) ***Answer any five of the following questions.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Compare different memories with respect to technology, speed, cost and applications. **[6]**

b) List technical specifications of DDR-II RAM. **[4]**

Q2) a) Explain with example the Manchester carry chain. **[6]**

b) How to perform reconfiguration overhead analysis? **[4]**

Q3) a) Explain software configurable processors with suitable examples. **[5]**

b) Explain in detail the array processor model. **[5]**

Q4) a) Explain importance of low power, How power analysis plays a vital role in SOC designs. **[5]**

b) Explain different sequential arcs with examples. **[5]**

Q5) a) Which IPs are used in SOC chip design of digital still camera. **[5]**

b) Which techniques are employed for reading leakage power. **[5]**

Q6) a) What is fundamental philosophy to enabled synchronization? **[5]**

b) How synchronizers are overcoming metastability problem? Explain with an example. **[5]**

Q7) a) Explain dynamic voltage scaling. **[5]**

b) Draw a typical SOC test design flow. **[5]**

ꕥ ꕥ ꕥ

Total No. of Questions : 8]

SEAT No. : ____

PE754

[Total No. of Pages : 2

[6585]-143

S.Y. M.E. (Electronics) (Digital Systems)

WIRELESS SENSOR NETWORK FOR IOT

(2017 Pattern) (Semester - III) (604102)

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

Instructions to the candidates:

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

Q1) a) Explain any one real-time application of WSN. **[5]**

b) What are the hardware components of Wireless Sensor Network? List and explain. **[5]**

Q2) a) Write short note on energy consumption in wireless sensor node. **[5]**

b) Draw and Explain architecture of Wireless Sensor Network. **[5]**

Q3) a) Explain IEEE 802.15.4 in detail. **[5]**

b) Explain how target detection and tracking achieved in sensor network. **[5]**

Q4) a) What is ISM band? What are frequencies available with this band? **[5]**

b) Explain Zigbee protocol for WSN. **[5]**

P.T.O.

Q5) a) What are the link layer technologies in IoT? **[5]**

b) Compare any five points between IPv4 and IPv6. **[5]**

Q6) a) List and explain the Elements of an IoT ecosystem. **[5]**

b) Explain the characteristics of Big data. **[5]**

Q7) a) List and explain any two IoT data protocols. **[5]**

b) Explain IoT reference architecture. **[5]**

Q8) a) Explain the application of IoT in Energy and Environment. **[5]**

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

i) Security and privacy in IoT.

ii) Data Aggregation Techniques.

x x x

Total No. of Questions : 6]

SEAT No. :

PE755

[Total No. of Pages : 2

[6585]-144

First Year M.E. (Computer Engg.)

BIO - INSPIRED OPTIMIZATION ALGORITHMS

(2017 Pattern) (Semester - I) (510102)

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

Instructions to the candidates:

1) ***Answer any Five questions, Each question carries equal marks.***
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 philosophy of natural computing with suitable example. **[6]**

b) Illustrate the process of problem solving as a search track. **[4]**

Q2) a) Define mutation, crossover, and selection in the context of genetic algorithms. **[6]**

b) Describe the role of fitness functions in evolutionary algorithm. **[4]**

Q3) a) Compare and contrast Ant Colony Optimization (ACO) and Particle Swarm Optimization (PSO) in terms of working principles and applications. **[6]**

b) How does swarm intelligence differ from traditional AI algorithms? **[4]**

P.T.O.

Q4) a) Explain CUCKOO search algorithm. **[6]**

b) Explain Bat algorithm and discuss rules of Bat algorithm. **[4]**

Q5) a) Explain importance and Key Mechanisms for the development of a clonal selection algorithm (CSA). **[6]**

b) Summarize aiNet learning algorithm. **[4]**

Q6) a) Discuss architecture of framStick. **[6]**

b) Illustrate boid flocking. **[4]**



Total No. of Questions : 12]

SEAT No. :

PE756

[Total No. of Pages : 2

[6585]-145

First Year M.E. (Computer Engineering)

SOFTWARE DEVELOPMENT AND VERSION CONTROL

(2017 Pattern) (Semester -I) (510103)

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

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, Q.No.11 or Q.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) Explain the incremental and Object- based software development Process. **[8]**

OR

Q2) Describe any two Distributed Architecture styless with their advantages and limitations. **[8]**

Q3) Describe with suitable example the design workflow of Unified process. **[8]**

OR

Q4) Explain the architectural views and models for an inventory management system with order processing. **[8]**

Q5) Describe the components of the data centered software architecture with its benefits and limitations. **[9]**

OR

Q6) How can system visualization help in improving the quality of processes? **[9]**

P.T.O.

Q7) Explain Environment configuration control w.r.t:- **[8]**

a) Goals

b) Principles and importance

c) Release management

d) Deployment

OR

Q8) Explain SCM with scope and source code management core concepts **[8]**

Q9) Explain in brief: **[8]**

a) Mercurial

b) Bazaar

OR

Q10) Explain Subversion Distributed Version Control with reference to: **[8]**

a) Basics

b) Advantages

c) Weaknesses.

Q11) Explain the types of version control in systems in details **[9]**

OR

Q12) Explain the following version control tools in brief **[9]**

a) Apache Subversion

b) GitHub

c) SVN



Total No. of Questions : 12]

SEAT No. :

PE757

[Total No. of Pages : 2

[6585]-146

First Year M.E. (Computer Engineering)

EMBEDDED AND REAL TIME OPERATING SYSTEMS

(2017 Pattern) (Semester - I) (510104)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the software tools used for embedded system development. **[5]**

b) What is the use of watchdog timer in embedded system? **[3]**

OR

Q2) a) Define Embedded System. Explain different characteristics of Embedded system. **[5]**

b) What are the challenges in the design of embedded system? **[3]**

Q3) a) Explain the features of ARM processor. **[4]**

b) Explain embedded systems on chip with neat diagram. **[4]**

OR

Q4) a) What factors have to be considered while selecting processor for an application? **[4]**

b) With neat diagram explain System on Chip (SOC). **[4]**

Q5) a) Explain about parallel port interfacing with switches & keypad. **[5]**

b) Enlist the differences between ISA and PCI buses. **[4]**

OR

Q6) a) Explain any two Mobile System protocols. **[5]**

b) What is the use of PCI and PCI-X buses? **[4]**

P.T.O.

Q7) a) Define the Temporal parameters of real-time process. **[4]**

b) What are the three important categories of parameters with characterize the tasks. **[4]**

OR

Q8) a) What is precedence graph and task graph? Give details. **[4]**

b) What is RTOS. List the real Time applications. **[4]**

Q9) Explain priority inversion with an example. **[9]**

OR

Q10) Explain the steps in priority inheritance algorithm with example. **[9]**

Q11) Write short note on any two **[8]**

a) RTLinux
b) Embedded software development tools
c) MicroC/OS-II

OR

Q12) With neat diagram explain software development process for embedded system. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE758

[Total No. of Pages : 2

[6585]-147
F.Y.M.E. (All Computer branches)

RESEARCH METHODOLOGY
(2017 Pattern) (Semester - I) (510101)

Time : 3 Hours]

Instructions to the candidates: *[Max. Marks : 50*

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

Q1) a) Explain the meaning, nature, and significance of research. Discuss how research impacts technological advancements. **[5]**

b) Describe the research process workflow. How does each stage contribute to successful research outcomes? **[5]**

Q2) a) How do you define a research problem? Give two examples to illustrate your answer. **[5]**

b) What is research design? Discuss the basis of stratification to be employed in sampling public opinion on inflation. **[5]**

Q3) a) Define the t-test and describe its application in research. Provide an example illustrating its use. **[5]**

b) Explain the concept of Null Hypothesis Testing. How does it help in validating research conclusions? **[5]**

Q4) a) Distinguish between an experiment and survey. Explain fully the survey method of research. **[5]**

b) Comment on: *(i) IPR Services in India (ii) US Patent* **[5]**

Q5) a) What are the key factors to consider when designing a survey for engineering research? **[5]**

b) Discuss the importance of obtaining ethical approval for conducting surveys. Provide examples where ethical issues may arise. **[5]**

P.T.O.

Q6) a) Summarize the difference in publications by Journal Papers compared to Conference Papers with examples. **[5]**

b) Explain the Citation and *I-Index* with respect to publication and also Explain how these factors are correlate to each other. **[5]**

Q7) a) State the use of the following tools **[5]**

i) ANOVA

ii) SOFA

iii) CAT (Qualitative analysis tool)

b) Elaborate the significance of the following in research methodology **[5]**

i) h-index

ii) Research Gate in literature survey

iii) Paraphrasing in literature survey

Q8) a) What are the key factors to consider when designing a survey for engineering research? **[5]**

b) Discuss the importance of obtaining ethical approval for conducting surveys. Provide examples where ethical issues may arise. **[5]**

Total No. of Questions : 10]

SEAT No. : ____

PE759

[Total No. of Pages : 2

[6585]-148

First Year M.E. (Computer Engineering) (Computer Networks) (All Computer Branches)

OPERATION RESEARCH

(2017 Pattern) (Semester - II) (510108/510208)

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

Instructions to the candidates:

1) ***Attempt all questions***
2) ***Assume Suitable Data, if necessary.***
3) ***Neat Diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Solve the following Linear Programming problem using the Simplex Method: **[5]**

Maximize: $Z = 3x_1 + 2x_2$

Subject to:

$x_1 + x_2 \leq 4$

$x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

Q2) Explain the concept of duality in the context of the Simplex Method. **[5]**

Q3) Solve the following Transportation Problem using the Least Cost Method: **[5]**

	W1	W2	W3	Supply
S1	4	6	8	30
S2	2	5	7	50
S3	3	4	5	40
Demand	40	50	30	

Q4) Consider the following game with two players. Player 1 has two strategies: A and B, and Player 2 has three strategies: X, Y, and Z. **[5]**

P1/P2	X	Y	Z
A	3	1	2
B	4	3	5

Identify and eliminate any dominated strategies using the Principle of Dominance.

P.T.O.

Q5) Draw a network diagram for a project that has the following activities and their respective durations and dependencies: **[5]**

Activity	Duration(days)	Predecessor(S)
A	7	None
B	2	A
C	3	A
D	4	B
E	5	C

Q6) Indicate the difference between decision making under risk and uncertainty in decision theory. **[5]**

Q7) A firm makes two products P1 & P2 and has production capacity of 18 tonnes per day. P1 & P2 required the same production capacity. The firm must supply at least 4t of P1 and 6t of P2 per day. Each tonne of Pl & P2 requires 60 hours of machine work each. Maximum machine hours available are 720. Profit per tonne for P1 is Rs. 160 & P2 is Rs. 240.Find optimal solution by graphical method. **[5]**

Q8) What are the limitations of using dynamic programming to solve large-scale Knapsack Problems? **[5]**

Q9) Explain the "Unbalanced Assignment Problem" with example. **[5]**

Q10)Calculate the optimal solution for assignment problem of following cost matrix.**[5]**

	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

Total No. of Questions : 12] **SEAT No. :**

PE760 **[Total No. of Pages : 2**

[6585]-149

First Year M.E. (Computer)

SYSTEM SIMULATION AND MODELING

(2017 Pattern) (Semester - II) (510109)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Describe system & Modeling with an example. **[4]**

b) What are the characteristics of simulation model? How the simulation models are Classified? **[4]**

OR

Q2) a) What is an initial Value Problem? What are the examples of IVP? **[4]**

b) Explain Multiple-Time-Based Dynamical Systems with an example. **[4]**

Q3) a) Why are Non-Uniform Random Variates Important? How They generated? **[4]**

b) What are the properties of white noise? **[4]**

OR

Q4) a) Differentiate Between deterministic and Stochastic Models. **[4]**

b) What is ARMA model? Explain with the help of suitable block diagram. **[4]**

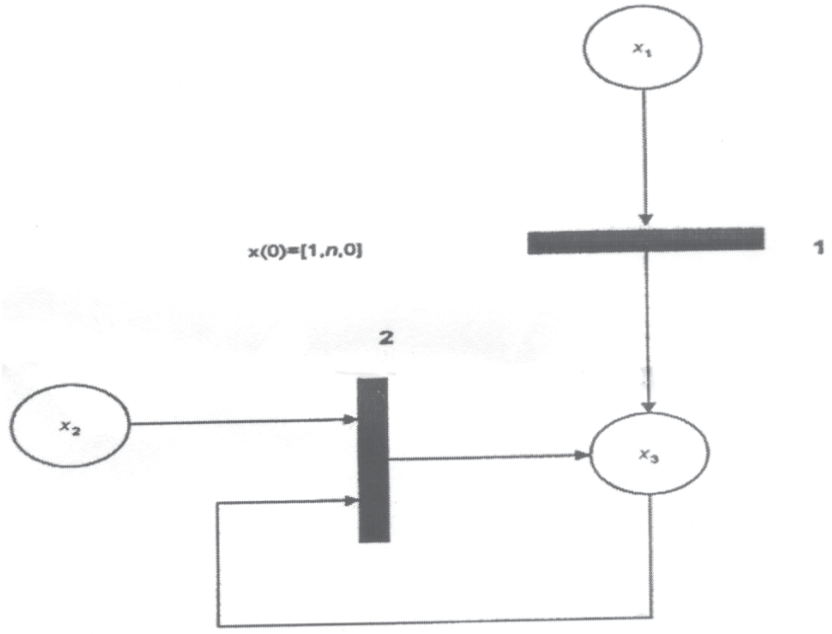
Q5) a) What is Spatial System? Why Spatial Modeling Matters? **[4]**

b) Explain finite state machines (FSM) with block diagram. **[5]**

OR

P.T.O.

Q6) a) Consider an automobile system in which a key is used to initiate a starter sequence, followed by the car idling and the vehicle moving. Model this sequence using the basic petri net constructs described below **[4]**



b) What are Disturbance Signals? Explain with example & block diagram. **[5]**

Q7) a) Explain two primary varieties of Delays? **[4]**

b) What is M/M/1 queue? Explain M/M/1 queue with graphical representation. **[4]**

OR

Q8) a) Why the replication/deletion approach for estimation of mean is preferred over other methods justify the answer. **[4]**

b) Describe Queuing theory? **[4]**

Q9) a) Explain output analysis for termination simulation. **[4]**

b) Explain measures of performance for simulation system. **[4]**

OR

Q10)a) What is the problem of the Initial Transient? **[4]**

b) Difference between transient & steady state behavior of stochastic process. **[4]**

Q11)a) Write short note on Verification and Validation of model building. **[4]**

b) Explain different objectives of simulations in manufacturing. **[5]**

OR

Q12)a) Explain any one simulation software used for manufacturing application. **[4]**

b) Explain Modeling System Randomness with extended example. **[5]**

✡ ✡ ✡

Total No. of Questions : 12]

SEAT No. :

PE761

[Total No. of Pages : 2

[6585]-150

First Year M.E. (Computer Engineering)

MACHINE LEARNING

(2017 Pattern) (Semester-II) (510110)

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

Instructions to the candidates:

1) ***Attempt Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.7 or 8, Q.9 or 10, Q.11 or l2.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Differentiate between Predictive and descriptive learning. **[5]**

b) What is reinforcement learning? Explain it with example. **[5]**

OR

Q2) a) Define Multi-class classification. Explain One vs One and One vs All methods of multi-class classification in detail with example. **[5]**

b) Explain the difference between grouping and grading machine learning models. Also, give examples of each model. **[5]**

Q3) a) What is concept learning? Explain hypothesis space in detail. **[4]**

b) Define factor analysis. State and explain different types of factor analysis. **[4]**

OR

Q4) a) What is multidimensional scaling? Explain in detail how it is done and where is it is required. **[4]**

b) What is Linear discriminant analysis? What is the main goal of Linear discriminant analysis? **[4]**

Q5) a) Define and explain Multivariate Linear regression with example. **[4]**

b) What is perceptron? How to train perceptron. **[4]**

OR

P.T.O.

Q6) a) Write K-nearest neighbor algorithm. **[4]**

b) Explain support vector machines as a linear and non-linear classifier in detail. **[4]**

Q7) a) What is decision tree? Write a decision tree algorithm and explain with an example. **[4]**

b) What is Bagging and Boosting ensemble methods? **[4]**

OR

Q8) a) Using k-means algorithm, cluster following data into two clusters. Show each step of clustering. {2, 4, 10, 12, 3, 20, 30, 11, 25}. **[4]**

b) Write and explain association rule mining algorithm with example. **[4]**

Q9) a) What is Hidden Markov model? Explain with an example. **[4]**

b) Explain Expectation Maximization method. **[4]**

OR

Q10)a) Explain normal distribution and its geometric interpretations in detail. **[4]**

b) What is Naive Bayes Classifier? Explain how it works with example. **[4]**

Q11)Write a short note on: **[8]**

a) Learning to rate vulnerabilities and predict exploits.

b) Topic models of the underground Internet economy.

OR

Q12)Write a short note on: **[8]**

a) Fraud Detection.

b) Detecting malicious websites in adversarial classification.



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

PE762 **[Total No. of Pages : 2**

[6585]-151

S.Y.M.E. (Computer Engg.)

FAULT TOLERANT SYSTEMS

(2017 Pattern) (Semester - III) (610101)

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

Instructions to the candidates:

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

Q1) a) Discuss in detail information redundancy with respect to following term using examples **[6]**

i) Error detecting codes

ii) Borden Codes

iii) Berger Code

b) Establish the fault diagnosis methods using diagnosttic tree. **[6]**

OR

Q2) a) Explain in detail fault modeling levels. How path sensitization establishes the following model:- **[6]**

i) Stuck-at fault model

ii) Bridging fault model

iii) Single stuck-fault model

b) Explain the e-cube routing algorithm in detail? **[6]**

Q3) a) Describe in detail The Turn Model. What are the different node labelling techniques. **[6]**

b) Explain what is the possible classification for adpative routing algorithms. in Hypercube & Mesh Networks. **[6]**

OR

P.T.O.

Q4) a) Draw a suitable diagram to describe a daisy-chain network and architecture. **[6]**

b) Draw a suitable diagram of 4-cube architecture for Fault Tolerance in Hypercube Networks. **[6]**

Q5) a) Discuss Block Shift Network for **[6]**

i) BSN Connectivity

ii) BSN Fault Diameter

b) Draw a suitable diagram to describe the main components of fault Simulator. **[6]**

OR

Q6) a) Explain in detail step-to-step development of Iterative based Heuristic Algorithm. **[6]**

b) Discuss in detail Fault Tolerance in Loop Network. **[6]**

Q7) a) Draw and explain in detail the general architecture of the HTN. **[7]**

b) Design serial algorithm in nutshell. **[7]**

OR

Q8) a) Draw a suitable diagram to describe the main components of fault simulator. **[7]**

b) Elaborate in detail how consistency of message is maintained in message Logging based checkpoints. **[7]**



Total No. of Questions : 12]

SEAT No. : ____

PE763

[Total No. of Pages : 2

[6585]-152

S.Y. M.E. (Computer Engineering) (Artificial Intelligence)

INFORMATION RETRIEVAL

(2017 Pattern) (Semester - III) (610102)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What are the key principles behind phonetic correction? **[4]**

b) Construct k-gram indexes for query retrieval (wild card query). **[5]**

OR

Q2) a) Find two differently spelled proper nouns whose soundex codes are the same. **[4]**

b) Explain the forms of spelling correction. **[5]**

Q3) What are gamma codes, and how are they used in postings file compression? **[9]**

OR

Q4) You are asked to design a modern information management system for a large multi-volume encyclopedia like the Encyclopedia Britannica. Describe in detail the ways in which you would organize and index the encyclopedia text, and the facilities you would offer the system user. **[9]**

Q5) What is the vector space model for scoring, and how does it represent documents and queries? **[8]**

OR

P.T.O.

Q6) How does weighted zone scoring work, and what factors influence the weighting process? **[8]**

Q7) a) What are the main challenges in XML retrieval and how do they impact search performance? **[4]**

b) What are language models in information retrieval, and how do they Work? **[4]**

OR

Q8) a) How does text-centric XML retrieval differ from data-centric XML retrieval? **[4]**

b) Explain the challenges in XML retrieval. **[4]**

Q9) What is the query likelihood model, and how is it applied in information retrieval? **[8]**

OR

Q10) Suppose we have collection that consists of the four documents given in the below. **[8]**

Doc id	Document Text
1	Click go the shears boys click click click
2	Click click
3	Metal here
4	Metal shears click here

Build a query likelihood language model (unigram model) for this document collection for the query 'click shears' and rank the documents.

Q11) What is flat Clustering, and how does it differ from hierarchical clustering? **[8]**

OR

Q12) Explain Text Classification and Naive Bayes classifiers with suitable example. **[8]**



Total No. of Questions : 12] **SEAT No. :**

PE764 **[Total No. of Pages : 2**

[6585]-153

First Year M.E. (Computer Engg./Master of Data Science) (AI&DS)

MATHEMATICAL FOUNDATION FOR DATA SCIENCE

(2017 Pattern) (2020) (Semester - I) (510301)

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

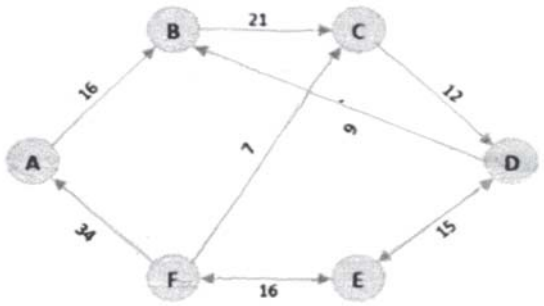
Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Assume suitable data wherever necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) Explain insertion and deletion of nodes in B tree with example. **[8]**

OR

Q2) Represent the following graph using adjacency matrix and solve the problem using travelling salesman algorithm. **[8]**



Q3) Bag A contains 10 marbles of which 2 are red and 8 are black. Bag B contains 12 marbles of which 4 are red and 8 are black. A ball is drawn at random from each bag. Find the probability that: **[9]**

a) Both are red.

b) Both are black.

c) One black and one red.

d) At least one red.

OR

P.T.O.

Q4) In a box of switches, it is known 10% of the switches are faulty. A technician is wiring 30 circuits, each of which needs one switch. What is the probability that: **[9]**

a) All 30 works
b) At most 2 of the circuits do not work

Q5) Explain Chi-Square Tests and t-test with example. **[9]**

OR

Q6) Explain Anova Coefficient with example. **[9]**

Q7) Explain Baysian Classification algorithm with example. **[8]**

OR

Q8) Calculate Standard Deviation, Variance, skewness, Kurtosis and five number summary from the following grouped data. **[8]**

X	Frequency
0	1
1	5
2	10
3	6
4	3

Q9) Explain one example of each Jacobian Matrix and Hessian Matrix. **[8]**

OR

Q10) Solve the system of equations $x_1 + x_2 + x_3 = 5$, $3x_1 + x_2 - 3x_3 = 5$ and $x_1 - 2x_2 - 5x_3 = -7$ by LU decomposition method. **[8]**

Q11) Calculate the regression coefficient and obtain the lines of regression for the following data **[8]**

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

OR

Q12) Explain Gradient descent with example. **[8]**

✡ ✡ ✡

Total No. of Questions : 12]

SEAT No. :

PE765

[Total No. of Pages : 2

[6585]-154
F.Y. M.E. Computer (M.D.S.)/AI&DS/AI)
BASICS OF DATA SCIENCE
(2017 Pattern) (Semester - I) (510302)

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or 10, Q11 or Q12***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) *a)* Explain Data Science and its importance in today's era. **[5]**

b) Explain Big Data and characteristic of Big Data. **[4]**

OR

Q2) a) Explain how a Data Scientist acts as a bridge between Data and Machine learning **[5]**

b) Differentiate between structured and Unstructured data also write role of Structured and Unstructured Data in Data Science **[4]**

Q3) Explain different types of data distributions in statistics and machine learning in detail. **[9]**

OR

Q4) Explain importance and need of data Preparation.Explain in detail Data Preparation steps with suitable example. **[9]**

Q5) What is linear regression? Explain its various types with suitable example. **[8]**

OR

P.T.O.

Q6) Write KNN algorithm and explain with example. State the limitations of the KNN algorithm. **[8]**

Q7) Define Data visualization. Explain the types of data visualization with real time example of Health care or Finance. **[8]**

OR

Q8) What are Retinal Variables in data visualization? Explain their role in mapping data to visual encodings and how they impact the interpretation of graphical representations. **[8]**

Q9) What is a recommender system? Explain long tail phenomenon in recommendation system. State the applications of recommendation system. **[8]**

OR

Q10) How does content- based recommendation system work? State advantages and disadvantages of content -based recommendation system. **[8]**

Q11) What are the different types of Social Network Graphs? Explain the concept of graphs with several node types and how clustering techniques are applied to analyze social-network structures. **[8]**

OR

Q12) Explain Girvan-Newman Algorithm with example. **[8]**

● ● ●

Total No. of Questions : 12] **SEAT No. :**

PE766 **[Total No. of Pages : 2**

[6585]-155

F.Y.M.E. (Computer Engineering) (Data Science 2020)

BIG DATA ANALYTICS

(2017 Pattern) (Semester - I) (510303)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams whenever necessary.***
4) ***Assume suitable data if necessary.***

Q1) Explain data analytics life cycle in detail. How does it help in deriving insights from Big Data **[9]**

OR

Q2) What are the major steps involved in pre-processing of data for Big Data analytics? Why it is important? **[9]**

Q3) Explain the concept of Distributed and parallel computing in the context of Big Data **[8]**

OR

Q4) What is cloud computing? How does cloud computing supports Big Data processing? Discuss the key services offered by cloud platforms for Big Data applications. **[8]**

Q5) Explain the role of sqoop in hadoop ecosystem. Describe the key features of Apache Flume. **[8]**

OR

Q6) Describe Big Data Analytics using Hive and Impala, Mahout Zookeeper with example. **[8]**

P.T.O.

Q7) Explain **[8]**

a) Apache Spark

b) Spark Shell

OR

Q8) What is an RDD? Explain its features and operations **[8]**

Q9) Describe the architecture of Apache Spark and how it process large scale Data. **[8]**

OR

Q10)Explain **[8]**

a) Text mining example in RHadoop

b) Data mining example in Hive

Q11)Explain the importance of data visualization in Big Data analytics and also explain challenges faced in visualization of Big Data. **[9]**

OR

Q12)What is the need for advanced visualization techniques and explain Tools used in Big Data analytics visualization? **[9]**



Total No. of Questions : 12]

SEAT No. :

PE767

[Total No. of Pages : 2

[6585]-156

First Year M.E. (Computer Engineering) (Data Science) (2020) (AIDS) (AI)

DATA WAREHOUSING AND MINING

(2017 Pattern) (Semester - II) (510308)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of Scientific Calculator is permitted.***

Q1) Why is it important to store multiple types of data in the data warehouse? Give examples of unstructured data likely to be found in the data warehouse of a health management organization (HMO). **[9]**

OR

Q2) How are the top-down and bottom-up approaches for building a data warehouse different? Discuss the merits and disadvantages of each approach. **[9]**

Q3) Explain the Data Acquisition Technical architecture of the data warehouse in detail with suitable diagram. **[9]**

OR

Q4) What are the platform options for the staging area of the Data Warehouse? Compare the options and mention the advantages and disadvantages. **[9]**

Q5) List and explain in brief four metadata types used in each of the three major areas of the Data Warehouse. **[8]**

OR

Q6) Explain the essential differences between the MOLAP and ROLAP models? Also list a few similarities. **[8]**

P.T.O.

Q7) Explain the information Delivery framework in detail. Also Explain the role of all users in the framework. **[8]**

OR

Q8) Describe briefly two major features of the Web-enabled data warehouse. Explain How do the Internet, intranet, and extranet apply to the data warehouse? **[8]**

Q9) What are multidimensional databases? List OLAP operations and explain the Rollup and Drill down with example. **[8]**

OR

Q10) Suppose that the data mining task is to cluster points (with (x, y) representing location) into three clusters, where the points are

A1(2,10), A2(2,5), A3(8,4), B1(5,8), B2(7,5), B3(6,4), C1(1,2), C2(4,9).

The distance function is Euclidean distance. Suppose initially we assign A1, B1, and C1 as the center of each cluster, respectively. Use the k-means algorithm to show only the three cluster centers after the first round of execution. **[8]**

Q11) What are the considerations for deploying the data warehouse in stages? Under what circumstances is staged deployment recommended? Describe in detail. **[8]**

OR

Q12) List the Post deployment administration areas for data warehousing and explain any two in details. **[8]**



Total No. of Questions : 12]

SEAT No. : [ ]

PE768

[Total No. of Pages : 2

[6585]-157
F.Y.M.E. Computer Engg. (Data Science) (AIDS) (AI) (2020)
MACHINE LEARNING
(2017 Pattern) (Semester - II) (510309)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, 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) ***Assume suitable data, if necessary.***

Q1) a) Elaborate five types of machine learning models. **[5]**

b) What is Reinforcement learning and their techniques. **[4]**

OR

Q2) a) What is Classification and their types. **[5]**

b) Differentiate Predictive and descriptive learnings in Machine learnings. **[4]**

Q3) What is the Bias-Variance Tradeoff? How does it affect model performance? **[8]**

OR

Q4) Explain the concept of Probably Approximately Correct (PAC) Learning with its assumptions. **[8]**

Q5) a) What is Logistic Regression? Explain its working mechanism with an example. **[5]**

b) Discuss the advantages and disadvantages of the KNN algorithm in classification tasks. **[4]**

OR

Q6) Explain the Perceptron Algorithm with its working mechanism and limitations. How does a Multi-Layer Perceptron (MLP) overcome these limitations? Describe its applications. **[9]**

P.T.O.

Q7) What is Association Rule Mining? Explain with an example. **[8]**

OR

Q8) What is Clustering Around Medoids? Explain the Silhouette Score and its role in cluster evaluation. **[8]**

Q9) Describe the working of the Naïve Bayes Classifier. Explain the structure and working of Bayesian Networks. How do they differ from Naïve Bayes Classifiers? **[8]**

OR

Q10)Explain HMM and GMM and how they are used in machine learning. **[8]**

Q11)a) Write short note on Learning to rate vulnerabilities. **[4]**

b) How can machine learning help law enforcement agencies track illegal activities on the darknet? **[4]**

OR

Q12)a) Explain all steps to Detect malicious websites in adversarial classification. **[4]**

b) How can web scraping and NLP techniques be used to detect counterfeit product listings? **[4]**

❋ ❋ ❋

Total No. of Questions :12]

SEAT No. : ____

PE769

[Total No. of Pages : 2

[6585]-158

F.Y. M.E. (Computer Engineering) (Data Science)

SOFT COMPUTING

(2017 Pattern) (2020) (Semester-II) (510310)

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

Instructions to the candidates:

1) ***Attempt Q.No. 1 or 2, Q. No.3 or 4, Q.No.5 or 6, Q.7 or 8, Q.9 or 10, Q.11 or 12.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain features and components of Soft Computing in detail. **[5]**

b) Compare hard computing and soft computing methods. **[4]**

OR

Q2) a) What is Fuzzy relation? Explain with example. **[5]**

b) What are the operations on Fuzzy relations? **[4]**

Q3) a) How is membership value assignment carried out? Explain any four methods. **[5]**

b) Explain the Fuzzy inference system and Fuzzy Control system. **[4]**

OR

Q4) a) Explain two defuzzification methods. **[5]**

b) How fuzzy decision making is used in expert system? **[4]**

Q5) Explain the operators in Genetic algorithms with two examples each. **[8]**

OR

Q6) How genetic algorithm is applied in optimization problem? **[8]**

Q7) a) Explain the perception training network with flow chart. **[4]**

b) How back propagation learning is carried out? Give with an example. **[4]**

OR

P.T.O.

Q8) a) Explain perceptron neural network with architecture and learning rule. **[4]**

b) Explain in brief, the terminologies of neural network: Bias, weight, Threshold and learning rate. **[4]**

Q9) Give the working of content addressable memory (CAM). **[8]**

OR

Q10) Explain the architecture of hetero associative memory network. **[8]**

Q11) How unsupervised learning is carried out with neural network? **[8]**

OR

Q12) Explain with block diagram genetic neuro hybrid system. **[8]**



Total No. of Questions : 12] **SEAT No. :**

PE770 **[Total No. of Pages : 2**

[6585]-159

S.Y.M.E. (Computer) (Data Science)

DEEP LEARNING

(2017 Pattern) (2020) (Semester - III) (610301)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, 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) ***Assume suitable data, if necessary and clearly state.***
5) ***Use of cell phone is prohibited in the examination hall.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) Differentiate between shallow and deep neural networks. **[9]**

OR

Q2) Explain Multilayer Feed-Forward Networks. Explain Algorithm for Backpropagation and Forward propagation. **[9]**

Q3) Explain Gradient-Based Learning. How to Implement Gradient Descent with Batch, Stochastic and Mini batch. **[9]**

OR

Q4) What is Principal Component Analysis (PCA), and why is it used? Explain the mathematical intuition behind PCA. **[9]**

Q5) What is Bias Variance trade-off ? Explain with suitable examples. **[8]**

OR

Q6) Explain how ensemble methods combine multiple models to achieve better predictive performance compared to a single model. **[8]**

P.T.O.

Q7) What is Guided Backpropagation, and how does it work? What modifications are made to ReLU activations in Guided Backpropagation? **[8]**

OR

Q8) What are the Pooling Types in CNN? What are their characteristics ? **[8]**

Q9) How do GANs work? Explain the role of the generator and discriminator.**[8]**

OR

Q10)What are the primary reasons to use dimensionality reduction techniques, and how can you integrate them into a neural network architecture. **[8]**

Q11)Explain the architecture of an LSTM network. In what situations would you prefer to use LSTMs over simple Neural Nets? **[8]**

OR

Q12)Explain the vanishing gradient problem in RNNs and how do LSTM networks address it? **[8]**

✡ ✡ ✡

Total No. of Questions : 12]

SEAT No. : ____

PE771

[Total No. of Pages : 2

[6585]-160
S.Y. M.E. Computer (Data Science) (2020)
DATA MODELING AND VISUALIZATION
(2017 Pattern) (Semester - III) (610302)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) What are the advantages of data visualization? **[8]**

OR

Q2) Explain the three state model of visual information processing. **[8]**

Q3) How the Histograms and bar charts are useful in visualization of Numerical data? **[8]**

OR

Q4) Explain how the box plot is used in understanding the data dispersion and to identify outlier with the help of diagram. **[8]**

Q5) Explain different type of maps in Tableau with example. **[8]**

OR

Q6) How Tree maps and Heat maps are used for visualization data? Explain with example. **[8]**

P.T.O.

Q7) Explain the steps of Principle Component Analysis (PCA) with example. **[9]**

OR

Q8) Explain subspace clustering approach. **[9]**

Q9) Explain the Gestalt laws of Proximity and similarity with Example. **[9]**

OR

Q10) Explain the Gestalt laws of connectedness and Continuity with Example. **[9]**

Q11) What are the evaluation methods based on cognitive psychology? **[8]**

OR

Q12) Explain different features of Tableau used for visualisation. **[8]**



Total No. of Questions : 7]

SEAT No. :

PE772

[Total No. of Pages : 1

[6585]-161

First Year M.E. (Computer Networks)

NETWORK SECURITY

(2017 Pattern) (Semester-I) (510202)

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

Instructions to the candidates:

1) ***Question No. 7 is compulsory, Solve any five from Q.No.1 to Q.No.6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) What are some common attacks that target the Layer 1, 2, 3 and 4? **[8]**

Q2) How to detect black hole attack in Mobile Adhoc Network? Explain with an example? **[8]**

Q3) Explain Types of sniffing with example? Explain tools used for sniffing? How does sniffer work? **[8]**

Q4) What are the three function of Nmap,explain? How can we perform UDP scan? What are the applications of UDP scan? **[8]**

Q5) What strategies used to prevent SQL injection? How SQL injection work? What are web injections? **[8]**

Q6) What are the different types of attacks related to MITM, Explain in details? What are tools for MITM attacks? **[8]**

Q7) How VLAN hopping attack is executed? State and explain the consequences of VLAN Hopping? What is a practice that protects a network from VLAN hopping attacks. **[10]**



Total No. of Questions :8]

SEAT No. : ____

PE773

[Total No. of Pages : 2

[6585]-162

First Year M.E. (Computer Networks Engineering)

WIRELESS SENSOR NETWORKS

(2017 Pattern) (Semester-I) (510203)

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

Instructions to the candidates:

1) ***Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Use of Non-Programmable scientific calculator is allowed.***

Q1) a) Discuss Challenges and constraints of WSN **[6]**

b) Discuss about aggregation of Points **[6]**

OR

Q2) a) Draw and Explain architecture of Wireless Sensor Network **[6]**

b) With suitable diagram explain XYZ Node architecture. **[6]**

Q3) a) Explain Single-hop localization: i] RADAR ii] Cricket. **[6]**

b) Describe Contention Free MAC Protocol:Y-MAC **[6]**

OR

Q4) a) Explain positioning in multihop environments: iterative and collaborative multilateration **[6]**

b) Describe Contention-Based MAC Protocol: Pattern MAC? **[6]**

Q5) a) Explain the Coverage of random deployments: general sensing model **[6]**

b) Explain several data transport tasks to provide reliability requirements in sensor networks. **[7]**

OR

P.T.O.

Q6) a) Explain Single packet delivery using multiple path **[7]**

b) In Pump slowly Fetch Quickly(PSFQ) block delivery in the sink-to-sensors protocol how a duplicate packet, an in-sequence packet and an-out-of-order packet in handled **[6]**

Q7) a) Explain Security Protocols for Sensor Networks **[7]**

b) Explain with figure examples of attacks and the CIA model. **[6]**

OR

Q8) Write Short Notes on (Any Two) **[13]**

a) Key Management.

b) Security attacks on Routing and on Transport Layer.

c) Defenses Against DoS Attack.



Total No. of Questions : 12] **SEAT No. :**

PE774 **[Total No. of Pages : 2**

[6585]-163

First Year M.E. (Computer Engineering) (Computer Networks)

HIGH PERFORMANCE NETWORKS

(2017 Pattern) (Semester - I) (510204)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data if necessary.***

Q1) Explain wireless networks such as 802.11, 802.16 **[9]**

OR

Q2) Write a short note on: **[9]**

a) X.25
b) Frame Relay
c) SONET

Q3) What is MAC? Explain the use of MAC in networking. **[8]**

OR

Q4) What is gigabit Ethernet? Explain Ethernet frame format in detail. **[8]**

Q5) Define the terms: **[8]**

a) Input Port Processor (IPP)
b) Output Port Processor (OPP)

OR

Q6) What is multicast in router? Explain Multicast Packets forwarding mechanism in Routers. **[8]**

Q7) Explain the MPLS signaling and routing protocols in detail. **[8]**

OR

Q8) What are the benefits of using MPLS? Discuss various MPLS services in detail. **[8]**

P.T.O.

Q9) Which are the factors that affect the overall performance and cost of an integrated optical switch? Discuss two practical topologies for large scale optical switching networks **[8]**

OR

Q10) Explain the Structure of Optical Cross Connects (OXCs). How does the routing happen in these types of networks. **[8]**

Q11) Explain in detail: Borderless Network Architecture. **[9]**

OR

Q12) Discuss the various design options for each layer in the Borderless Campus 1.0 Architecture. **[9]**



Total No. of Questions : 6]

SEAT No. :

PE-775

[Total No. of Pages : 1

[6585]-164
M.E. (Computer Networks)
NETWORK DESIGN AND ANALYSIS
(2017 Pattern) (Semester - II) (510209)

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

Instructions to the candidates:

1) ***Solve any 5 questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Discuss general principles of network design? **[5]**

b) Elaborate performance metrics for a network? **[5]**

Q2) a) What is IP fragmentation? Elaborate with example how does it help in network. **[5]**

b) Elaborate M/M/1 Queueing model. **[5]**

Q3) a) Explain various network QoS parameters? How to achieve them? **[5]**

b) What is priority queueing? Which applications require it? How it is implemented. **[5]**

Q4) a) Differentiate between physical addressing and logical addressing with suitable examples? **[5]**

b) Summarize the characteristics of the M/G/1 queueing system? **[5]**

Q5) a) Explain how networks can be represented using graphs? **[5]**

b) Construct a logical network diagram using a specific topology and IP addressing scheme? **[5]**

Q6) a) Explain various key features of next-generation networks? **[5]**

b) Explain Bellman-Ford algorithm? **[5]**



Total No. of Questions : 12]

SEAT No. :

PE-776

[Total No. of Pages : 2

[6585]-165
M.E. (Computer Network)
DATA ALGORITHMS
(2017 Pattern) (Semester - II) (510210)

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

Instructions to the candidates:

1) ***Attempt Q.No. 1 or 2, Q.No.3 or 4, Q,No. 5 or 6, Q.7or Q.8, Q.9 or 10, Q. 11 or 12.***
2) ***Figure to the right indicates full marks.***
3) ***Assume suitable data, if necessary.***

Q1) What is POJO moving average? Write solution using queue. **[8]**

OR

Q2) In secondary sorted, Give the example of your choice to explain the following terms and their importance: Logical (Key, value) pair, Natural key, Natural value and composite key. **[8]**

Q3) Left Outer Join (T1, T2, K) = {(k, t 1, t 2) where k$\in$ T1. K and k $\in$ T2 .K} Y {(k, t 1 , null) where k $\in$ T1. K and k$\notin$ T2 .K} Above is the given a mathematical definition in term of set theory for left outer join. What K, T1 and T2 signifies, take suitable example and explain? **[8]**

OR

Q4) What is left outer join operations in database? What is significance of left outer join in real world situation? Give suitable SQL for the same? With the help of SQL explain what is mean by Left in left outer join. **[8]**

Q5) What is Order inversion? Write down code for order inversion and In what sense does it invert order? Give the advantages of order inversion. **[9]**

OR

Q6) What is moving average? And how do we calculate it? Give the suitable example. **[9]**

Q7) What is the purpose of market basket analysis? Give suitable example of application and explain market basket analysis using spark. **[8]**

P.T.O.

OR

Q8) What is the significance of following terms in Market basket analysis (Justiy your answer with suitable example): **[8]**

a) Minimum support

b) Minimum improvement

c) Minimum confidence

Q9) What is scatter search? Which are comparative algorithms for scatter search? Give any three comparison points. **[9]**

OR

Q10) What is the scatter search algorithm? What are its characteristics? And Give the algorithmic procedure. **[9]**

Q11) Formulate the Minimum Cost Network flow problem for following instance: **[8]**

Given a network G = (N, A), with a cost Cij, upper bound Uij and

Lower Bound Lij associated with each directed arc (i, j) and supply by each node.

Find the cheapest integer valued flow such that it satisfies:

a) the capacity constraints on the arcs

b) the supplies/demands at the nodes

c) that the flow is conserved through the network. Assume suitable data if required. Justify how it is better than others.

OR

Q12) Explain Bellman's equation and acyclic graph? What is significance of bellman's equation in shortest path finding? **[8]**



Total No. of Questions : 12]

SEAT No. :

PE-777

[Total No. of Pages : 2

[6585]-166
M.E. (Computer Networks)
FAULT TOLERANT SYSTEMS
(2017 Pattern) (Semester - III) (610201)

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

Instructions to the candidates:

1) ***Answer six questions.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right side of question indicate full marks.***

Q1) Explain Hardware Redundancy in detail with example? **[9]**

OR

Q2) Explain Reliability Modeling and Evaluation in detail with examples? **[9]**

Q3) Explain in detail Serial Fault Simulation Algorithm? **[9]**

OR

Q4) Explain in detail about Concurrent Fault Simulation algorithm? **[9]**

Q5) Explain Depth-First search routing algorithm for fault tolerant in Hypercube? **[8]**

OR

Q6) Explain in detail A FT Routing Scheme for Meshes with Non-convex Faults? **[8]**

Q7) Write short notes on **[8]**

a) BSN Fault Diameter

b) BSN Reliability

OR

Q8) Explain in detail HINs and Hierarchical Cubic Network (HCN). **[8]**

Q9) Explain in detail Classification of Fault-Tolerant Switching Architectures? **[8]**

OR

P.T.O.

Q10) Explain various Classifications of Fault - Tolerant Switching Architectures? **[8]**

Q11) Explain the following terms : **[8]**

a) Faults

b) Errors

c) Failures

d) Process resilience.

OR

Q12) Explain the Minimal Snapshot Collection Algorithm with diagram. **[8]**

❖❖❖

Total No. of Questions : 12]

SEAT No. : ____

PE778

[Total No. of Pages : 2

[6585]-167
S.Y. M.E. (Computer Networks)
MOBILE AD HOC NETWORKS
(2017 Pattern) (Semester - III) (610202)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and clearly state.***

Q1) Explain Wireless Communication Fundamentals. Which ADHOC wireless network problems are most common? **[9]**

OR

Q2) What features distinguish a wireless channel? Give a detailed explanation of the IEEE 802 Networking Standard. **[9]**

Q3) Describe MAC protocol design flaws. How Can MAC Protocols Use an Effective Flooding Mechanism? **[9]**

OR

Q4) What are goals and classification in Routing Protocols? Elaborate the steps in Power-Aware Routing Protocols. **[9]**

Q5) What are the multicast routing design issues? Describe the Architecture Reference Model and its effects. **[8]**

OR

Q6) Explain how TCP over Ad Hoc Networks works. What are different Transport Layer protocols? **[8]**

Q7) How to improve the quality of service by resolving MAC layer problems and challenges. **[8]**

OR

P.T.O.

Q8) What is the need of Energy Management Schemes for Battery Management? Elaborate the significance of it in Quality of service. **[8]**

Q9) Explain Next Generation Hybrid Wireless Architectures in detail. **[8]**

OR

Q10) What are the WSN MAC Protocols? Describe the methods used for data dissemination in WSN. **[8]**

Q11) What recent developments have occurred in wireless networks? Give an example to illustrate it. **[8]**

OR

Q12) Explain Meghadoot Architecture in detail? **[8]**



Total No. of Questions :12]

SEAT No. : [ ]

PE779

[Total No. of Pages : 2

[6585]-168

F.Y.M.E. (Computer Engg.) (Cyber Security 2020)

MATHEMATICAL FOUNDATIONS FOR CYBER SECURITY

(2017 Pattern) (Semester-I) (510401)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2 Q.3 or Q.4 Q.5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***

Q1) a) Explain the concept of binary operations. Give an example. **[4]**

b) What is a set? Provide an example of a set of integers. **[4]**

OR

Q2) a) State and explain the properties of modular arithmetic. **[4]**

b) Give an example of a set where addition is performed, but multiplication is not closed. **[4]**

Q3) a) What is a cyclic group? Provide an example and explain why it is cyclic. **[4]**

b) What is a lattice in algebra? Provide an example of a simple lattice structure. **[4]**

OR

Q4) a) What is a finite field? Provide an example of its elements and operations. **[4]**

b) Define a subring. How does it differ from a ring? Also, explain what an ideal in a ring is, with an example. **[4]**

Q5) a) Explain an application of Fermat's Little Theorem and Congruence. **[4]**

b) What is the AKS primality test? How does it differ from the naive methods of primality testing? **[5]**

OR

Q6) a) Explain the Miller-Rabin primality test with example. **[4]**

b) Describe the basic steps involved in checking whether a number is prime. How would you check if 29 is prime? **[5]**

P.T.O.

Q7) a) What are some more efficient methods of factorization compared to the Fermat, Pollard p-1, and Pollard rho methods? **[4]**

b) What is a prime number? How do prime numbers differ from composite numbers? **[4]**

OR

Q8) a) Describe the Fermat method of factorization. How does it work to find factors of a large number? **[4]**

b) Explain the Pollard rho method of factorization. Provide a brief step-by-step overview of how the method works. **[4]**

Q9) a) What is the basic definition of probability and conditional probablity? What is the range of probability values for any event? **[4]**

b) What is a Markov Chain? Explain the property of the Markov property, where the future state depends only on the current state and not on the past states. **[4]**

OR

Q10)a) What is a random variable? Explain the difference between a discrete and a continuous random variable with examples. **[4]**

b) Use Bayes' Theorem to find the probability of event A given that event B has occurred, if P(A)=0.3, P(B|A)=0.5 and P(B)=0.6. **[4]**

Q11)a) What is a code in coding theory? Explain the concept of a codeword and its importance in error detection and correction. **[4]**

b) Why are linear codes important in modern communication systems? Discuss their applications in areas such as data transmission and storage. **[5]**

OR

Q12)a) What does it mean for two codes to be equivalent? Provide an example to explain the concept of code equivalence. **[5]**

b) What is a Hadamard code? Describe its construction and provide an example of how it can be used for error correction. **[4]**



Total No. of Questions : 6]

SEAT No. :

PE-780

[Total No. of Pages : 2

[6585]-169
M.E. (Cyber Security 2020)
Modern Cryptography
(2017 Pattern) (Semester - I) (510402)

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

Instructions to the candidates :

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

Q1) a) Explain the cryptanalysis of Caesar cipher and Vigenère cipher, with examples to illustrate their weaknesses. **[4]**

b) Explain the limitations of perfect secrecy achieved by the One-Time Pad. **[4]**

Q2) a) Explain the role of multiple encryptions in enhancing the security of encryption schemes. Discuss the potential drawbacks of this approach. **[4]**

b) Compare block ciphers modes, CBC (Cipher Block Chaining) and CTR (Counter Mode) **[4]**

Q3) a) Explain the working of the Diffie-Hellman key exchange algorithm. **[4]**

b) Find the private key for RSA algorithm, if the parameters given are p = 7, q = 11, e = 17
Also find the encrypted text for plain text “6”. **[4]**

P.T.O.

Q4) a) Differentiate between steganography and cryptography. **[4]**

b) Explain the process of image steganography. **[4]**

Q5) a) Differentiate between proactive countermeasures and reactive countermeasures in dealing with cybersecurity threats. Provide examples. **[4]**

b) Explain the concept of botnets. **[4]**

Q6) a) Explain the importance of cybersecurity metrics. **[5]**

b) Explain how each security goal contributes to creating a secure information system. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-781

[Total No. of Pages : 2

[6585]-170

M.E.Cyber Security (Computer Engineering)

SECURE SOFTWARE DESIGN, CODING PRACTICES AND ETHICS

(2017 Pattern) (Semester - I) (510403)

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

Instructions to the candidates:

1) ***Figure to the right side indicate full marks.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the benefits of early detection of defects? **[5]**

b) Explain the properties of secure software? **[4]**

OR

Q2) a) What is mean by system complexity? What is role of software assurance in system development? **[5]**

b) What are the threats and sources present in system design? Explain each in detail. **[4]**

Q3) a) Discuss about SQUARE Model and Output in detail. **[5]**

b) What is the architectural risk analysis in secure software? Explain in detail. **[4]**

OR

Q4) a) Discuss about requirement elicitation method in detail? **[5]**

b) Explain Security Principals in details. **[4]**

Q5) a) Discuss about OWASP Security knowledge framework. **[8]**

b) Explain software security breach. What are the main causes of security breaches? **[8]**

OR

P.T.O.

Q6) a) Explain in details OWASP secure coding practices checklist? **[8]**

b) Explain **[8]**

i) Code analysis

ii) Coding practices

Q7) a) Discuss about software penetration testing. **[8]**

b) What is risk based security testing? **[8]**

OR

Q8) a) What do you mean by Agile development process? Explain with suitable example. **[8]**

b) Explain agile threat modeling with suitable example? **[8]**



Total No. of Questions : 12]

SEAT No. :

PE-782

[Total No. of Pages : 2

[6585]-176

M.E. (Cyber Security)

CYBER SECURITY AND IT INFRASTRUCTURE PROTECTION

(2017 Pattern) (Semester - III) (610402)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or 4, Q.5 or Q.6, Q.7or,Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) Why is cyber security important in the modern digital landscape? Provide a brief overview of the key objectives of cyber security. **[8]**

OR

Q2) Define cybercrime and discuss two examples of cybercrimes. Explain how cybercrimes can impact individuals and organizations. **[8]**

Q3) Enumerate five basic cyber security steps that individuals or organizations can take to enhance their online security. Provide a brief explanation of each step. **[8]**

OR

Q4) Define risk management in the context of cyber security and explain why it is crucial for businesses. Provide two examples of cyber security risks and discuss how they can be managed effectively. **[8]**

Q5) Highlight two major benefits of implementing an Infrastructure Management system and provide examples or scenarios illustrating their practical importance. **[8]**

OR

Q6) Explain the concept of Infrastructure Management and outline three primary types of infrastructure management. **[8]**

P.T.O.

Q7) Discuss the significance of data storage in IT infrastructure and mention two common data storage technologies or methods. **[9]**

OR

Q8) Discuss in detail the strategies and methods used to achieve operational excellence and customer intimacy in business. Provide specific examples to illustrate how these two objectives can be realized. **[9]**

Q9) Elaborate on how operational excellence and customer intimacy is achieved? **[8]**

OR

Q10) Write a note on **[8]**

i) Ethical Issues in Information Systems

ii) Social Issues in Information Systems

Q11) Define the risk triad in the context of storage security. Describe each element of the risk triad and explain how they are interconnected. **[9]**

OR

Q12) Explain the concept of a storage security framework and its significance in safeguarding data. Provide one example of a security measure commonly used within this framework. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-783

[Total No. of Page : 1

[6585]-177

M.E. (Electrical) (Control System)

OPTIMIZATION TECHNIQUES IN CONTROL SYSTEM

(2017 Pattern) (Semester - I) (503101)

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

Instructions to the candidates:

1) ***Answer Qu1 or 2, Qu3 or 4, Qu 5 or 6, Qu7 or 8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of algorithmic tables slide rule, Mollier charts, and electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Explain limitations of method of differential calculus. **[9]**

OR

Q2) Find the Maxima and Minima if any of the function $F(X) = 4x^3 - 8x^2 + 10x - 2$. **[9]**

Q3) Find the maximum of $F=X(1.5 - X)$ in the interval 0 - 1 within 10% of the exact value by Dichotomous search method. **[9]**

OR

Q4) What do you understand by optimization and write the necessary condition for relative minimum of function of single variable. **[9]**

Q5) Explain the method of conversion of non-serial system to serial system problem. **[16]**

OR

Q6) Explain concept of sub optimization and principle of optimality. **[16]**

Q7) a) Conversion of a Zero-One Polynomial Programming Problem into a Zero-One LP Problem. **[8]**

b) Explain the integer nonlinear programming. **[8]**

OR

Q8) Minimize $F= -3X_1 - 4X_2$ **[16]**

Subject to $3X_1 - X_2 + X_3 = 10$

$3X_1 + 11X_2 + 2X_4 = 64$

$Xi \geq 0$, I= 1to 4 and Xi is integer

❖❖❖

Total No. of Questions : 6]

SEAT No. :

PE-784

[Total No. of Pages : 2

[6585]-178

M.E. (Electrical) (Control System)

AUTOMATION IN MANUFACTURING

(2017 Pattern) (Semester - I) (503102)

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

Instructions to the candidates:

1) ***Answer questions from Q1.or Q.2, Q3 or Q4, Q5 or Q6.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Classify the main types of industrial timers. **[5]**

b) Illustrate the advantages of using PLCs in industrial automation. **[5]**

c) Describe the main challenges in tuning a PID controller. **[4]**

d) Explain the working of directional control valve work, and its common types. **[4]**

OR

Q2) a) Explain when PID gains are not properly tuned. **[4]**

b) Illustrate the common wear and failure issues in cam systems. **[5]**

c) Classify the advantages of micro sensors over traditional sensors. **[5]**

b) Explain the architecture of Cyber Physical System. **[4]**

Q3) a) Explain the key components of a Digital Manufacturing System. **[8]**

b) Classify the different operation modes of Digital Manufacturing. **[8]**

OR

P.T.O.

Q4) a) Elaborate the digital manufacturing modeling, and why is it important. **[8]**

b) Explain Operation Reference Mode of Digital Manufacturing. **[8]**

Q5) a) How does Industry 4.0 differ from previous industrial revolutions? Explain key technologies driving Industry 4.0? **[8]**

b) Explain characteristics of Industry 4.0. **[8]**

OR

Q6) a) Explain the impact of cyber security and data protection in Inustry 4.0. **[8]**

b) Illustrate the End-to-End Digital Integration mean in Industry 4.0. **[8]**



Total No. of Questions : 5] **SEAT No. :**

PE-785 **[Total No. of Page : 1**

[6585]-179
M.E. (Electrical) (Control System)
NON LINEAR CONTROL SYSTEM
(2017 Pattern) (Semester - I) (503103)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of algorithmic tables slide rule, Mollier charts, and electronic pocket calculator and steam table is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Q5 is compulsory.***

Q1) a) Explain following terms : **[6]**
   i) Positive definite
   ii) Positive Semi-definite
   iii) Negative definite

b) Explain physical non-linearity's observed in physical control system. **[6]**

c) Explain Liapunov stability criterion. **[6]**

OR

Q2) a) Express Scalar function given below in Quadratic form & test it for definiteness $V(x)= 8x^2_1+ x^2_2+ 4x^2_3 + 2x_1x_2 - 4x_1x_3 - 2x_2x_3$ **[6]**

b) Explain delta method of constructing a phase plane trajectory. **[6]**

c) Explain Popov criterion for absolute stability. **[6]**

Q3) a) Write short note on notion of sliding mode control. **[6]**

b) Write a short note on Input State Linearization. **[5]**

c) Write a short note on Chattering as used in Sliding Control. **[5]**

OR

Q4) Explain the following (any two) : **[16]**

a) Concept of Variable Structure Control

b) Properties of Sliding Mode Control

c) Effect of disturbance on Sliding Mode Control

Q5) Explain any two of the following : **[16]**

a) Explain any non-linear system design using sliding mode technique.

b) Effect of disturbance on Sliding Mode Control.

c) Matched & Unmatched uncertainty in case of Sliding Mode Control.

❖❖❖

Total No. of Questions : 6]

SEAT No. :

PE786

[Total No. of Pages : 2

[6585]-180

First YearM.E. (Electrical) (Control Systems)

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - I) (503104)

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

Instructions to the candidates:

1) *Answer Questions from Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*

Q1) a) How does a well-defined research problem contribute to the success of a research project? **[5]**

b) Enlist the various funding agencies for engineering research grants. Explain any one in detail. **[5]**

c) Explain with illustration Linear Dependence and independence. **[4]**

d) Explain key differences between Quantitative and Qualitative research. **[4]**

OR

Q2) a) Explain how does hypothesis development contribute to scientific research? **[4]**

b) Explain the process of defining and formulating a research problem. **[5]**

c) Explain the standard formats for different research funding schemes under AICTE and DST. **[5]**

d) Explain different types of IPR, such as copyrights, patents, trademarks. **[4]**

Q3) a) Explain linear dependence and independence of vectors with examples from controllability and observability analysis in control system research. **[8]**

b) Explain different types of research hypothesis with suitable example. **[8]**

OR

P.T.O.

Q4) a) Explain homogeneous and non-homogeneous systems with illustration. What are various types of linear equations? **[8]**

b) What is a subspace of a vector space? Explain with an example of state-space subspaces. **[8]**

Q5) a) Explain the significance of eigenvalues and eigenvectors in the diagonalization process. **[8]**

b) Explain the concepts of null space and rank apply to research problems. **[8]**

OR

Q6) a) Compare diagonalization and Jordan form representation. **[8]**

b) Explain the Gaussian elimination method for solving a system of linear equations. **[8]**

Total No. of Questions : 6]

SEAT No. :

PE787

[Total No. of Pages : 2

[6585]-181

First Year M.E. (Electrical Engineering) (Control Systems)
MULTIVARIABLE AND OPTIMAL CONTROL SYSTEM
(2017 Pattern) (Semester - II) (503107)

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

Instructions to the candidates:

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

Q1) a) Discuss the merits and demerits of representing the multivariable control system into **[5]**

i) Differential operator form

ii) Transfer matrix form

iii) State space form

b) State the condition for controllability and observability of multivariable control system. **[4]**

c) What is the observer? Explain the neat block diagram of state estimation problem using observer. **[5]**

d) Discuss the formulation of an optimal control problem using quadratic performance criterion. **[4]**

OR

Q2) a) Outline the procedure for obtaining the optimal control law for time invariant state regulator problem. **[5]**

b) Explain in decoupling or non-interactive control for multivariable control system design. **[4]**

c) Elaborate sliding mode observer and give it's robustness properties. **[4]**

d) Explain with block diagram pole allocation using Linear state variable feedback in multivariable control system. **[5]**

P.T.O.

Q3) a) Explain the Bang-Bang control strategy and state the merits of Bang - Bang controller. **[8]**

b) Discuss step by step procedure of solving optimal control problem using Pontryagin's minimum principle. **[8]**

OR

Q4) a) Explain the optimal control theory. **[10]**

b) Define Hamiltonian. Derive state, Co-state and control equations. **[6]**

Q5) a) Explain in details Numerical solution of matrix Riccati equation. **[8]**

b) Explain in details the applications of optimal control in discrete and continuous systems. **[8]**

OR

Q6) a) Define and explain the singular control solutions. **[8]**

b) State and explain comparison between sliding mode observer and nonlinear Extended state observer (Nonlinear ESO). **[8]**



Total No. of Questions : 6]

SEAT No. : ____

PE-788

[Total No. of Pages : 2

[6585]-182

M.E. (Electrical) (Control Systems)

CONTROL OF POWER ELECTRONIC CIRCUITS

(2017 Pattern) (Semester - II) (503108)

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

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of algorithmic tables slide rule, Mollier charts and electronic pocket Calculator and steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain the roles & objectives of power electronic converters. **[6]**

b) Write brief a note on Sampled data type model, averaged models, large-signal and small-signal models, behavioural models **[12]**

OR

Q2) a) Explain in brief Control families of Power Electronic Converters. **[12]**

b) Explain relations between modelling and control of power electronic converters. **[6]**

Q3) a) Draw the circuit diagram of Buck-Boost Converter & explain circuit topologies of it. **[12]**

b) Write a note on switched type model. **[4]**

OR

P.T.O.

Q4) a) Explain pole placement based on observer design for linear feedback control. **[8]**

b) Discuss the example of Grid connected single phase DC-AC converter. **[8]**

Q5) a) Explain variable structure control of power electronic converters **[8]**

b) Draw neat diagram of three phase voltage source grid connected inverter connected with associated d-q frame control structure and Explain system modelling steps. **[8]**

OR

Q6) Explain variable structure control design with one application as DC-DC power stage. **[16]**



Total No. of Questions : 8]

SEAT No. : ____

PE-789

[Total No. of Pages : 2

[6585]-183
M.E. (Electrical - Control System)
DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS
(2017 Pattern) (Semester - II) (503109)

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

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) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Determine inverse z–transform by partial fraction expansion method **[5]**

$$X(z) = \frac{z+2}{2z^2 - 7z + 3}$$

For (i) ROC: |z| > 3 (ii) ROC: 0.5 < z < 3

b) Discuss the sampling theorem. Explain the Sampling and processing of any continuous time signal. **[4]**

OR

Q2) a) Describe elementary discrete-time signals. How discrete time systems are classified? **[5]**

b) For two-sided z–transform state and prove following properties : **[4]**

i) Differentiation in z –domain or Multiplication by Ramp

ii) Convolution of time-domain

Q3) a) What is the difference between DFT and DTFT? Compare Radix-2 DIT and DIF FFT algorithms. **[4]**

b) Classify FFT algorithms. Explain Radix-2 DIF FFT algorithm. **[5]**

OR

Q4) a) Explain in detail low pass Butterworth filter approximation. Comment on the Passband and Stopband characteristics of Butterworth filter. **[5]**

b) Realize the IIR systems by Direct form I and Direct form II. **[4]**

P.T.O.

Q5) a) Explain the process of windowing using illustrations. What is a Kaiser window function? Obtain its frequency-domain characteristics. **[8]**

b) Compare FIR and IIR filters. What is Hanning window function? Obtain its frequency-domain characteristics. **[8]**

OR

Q6) a) Obtain Direct form and Cascade form realizations for the transfer function of an FIR system. **[6]**

b) A low pass filter is to be designed with the following desired frequency response : **[10]**

$$H_d\left(e^{jw}\right)=\begin{cases} e^{-j2w} & \pi/4 \le \omega \le \pi \\ 0 & -\pi/4 \le \omega \le \pi/4 \end{cases}$$

Determine the filter coefficients $h_d(n)$, if the window function is defined as

$$w(n)=\begin{cases} 1 & 0 \le n \le 4 \\ 0 & otherwise \end{cases}$$

Also, determine the frequency response $H(e^{jw})$ of the designed filter.

Q7) a) Explain various methods of measurement of frequency by DSP. **[8]**

b) Discuss advanced PWM generation by DSP. **[8]**

OR

Q8) a) Discuss the various methods of speed control of electrical machines by DSP. **[8]**

b) Discuss design of Discrete PID controller using DSP. **[8]**



Total No. of Questions : 6]

SEAT No. :

PE-790

[Total No. of Pages : 2

[6585]-184

M.E. (Electrical Engineering) (Control System)

ADVANCED DRIVES AND CONTROL

(2017 Pattern) (Semester - III) (603101)

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

Instructions to the candidates:

1) ***Attempt : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Figures to the right indicate full marks.***

Q1) a) State and explain the factors affecting the time and energy during starting of electric drive System. **[4]**

b) Explain static krammer control drive of induction motor. **[5]**

c) Draw a neat diagram of the system model and derive the transfer function of the converter fed DC motor. **[5]**

d) Write a note on PWM inverters. **[4]**

OR

Q2) a) Explain criteria for selection of drive components. **[4]**

b) Compare the performance of converter fed DC motor with chopper fed DC motor. **[5]**

c) Explain the effect of space harmonics and pulsating torques developed in the inverter fed three phase induction motor. **[5]**

d) Explain sensorless vector control of induction motor. **[4]**

Q3) With reference to synchronous motor drives explain following : **[16]**

a) D-q axis equivalent circuit.

b) Flux weakening operation- the control strategy.

OR

Q4) Explain the following in detail:

a) Switched Reluctance Motor. **[8]**

b) Sinusoidal SPM drive. **[8]**

P.T.O.

Q5) a) Explain the industrial application of PID controller. **[8]**

b) Explain design procedure of current control in closed loop control of electric drive. **[8]**

Q6) a) Explain micro computer control of electric drive. **[8]**

b) Explain phase locked loop in closed loop control of electric drive. **[8]**

❖❖❖

Total No. of Questions : 6]

SEAT No. :

PE-790

[Total No. of Pages : 2

[6585]-184

M.E. (Electrical Engineering) (Control System)

ADVANCED DRIVES AND CONTROL

(2017 Pattern) (Semester - III) (603101)

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

Instructions to the candidates:

1) ***Attempt : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Figures to the right indicate full marks.***

Q1) a) State and explain the factors affecting the time and energy during starting of electric drive System. **[4]**

b) Explain static krammer control drive of induction motor. **[5]**

c) Draw a neat diagram of the system model and derive the transfer function of the converter fed DC motor. **[5]**

d) Write a note on PWM inverters. **[4]**

OR

Q2) a) Explain criteria for selection of drive components. **[4]**

b) Compare the performance of converter fed DC motor with chopper fed DC motor. **[5]**

c) Explain the effect of space harmonics and pulsating torques developed in the inverter fed three phase induction motor. **[5]**

d) Explain sensorless vector control of induction motor. **[4]**

Q3) With reference to synchronous motor drives explain following : **[16]**

a) D-q axis equivalent circuit.

b) Flux weakening operation- the control strategy.

OR

Q4) Explain the following in detail:

a) Switched Reluctance Motor. **[8]**

b) Sinusoidal SPM drive. **[8]**

P.T.O.

Q5) a) Explain the industrial application of PID controller. **[8]**

b) Explain design procedure of current control in closed loop control of electric drive. **[8]**

Q6) a) Explain micro computer control of electric drive. **[8]**

b) Explain phase locked loop in closed loop control of electric drive. **[8]**

❖❖❖

Total No. of Questions : 7]

SEAT No. :

PE-791

[Total No. of Pages : 2

[6585]-185

M.E. (Electrical) (Control Systems)

SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL

(2017 Pattern) (Semester - III) (603102)

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

Instructions to the candidates:

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

Q1) a) Compute the QR factorization of matrix : $\begin{bmatrix} 12 & 27 \\ 4 & 2 \\ 6 & 10 \end{bmatrix}$ **[5]**

b) Explain non-parametric methods of system identification. **[4]**

OR

Q2) a) What is the importance of persistently exciting input signal in system identification? What order of p.e. is white noise? **[5]**

b) Describe model validation process. **[4]**

Q3) Write short notes on : **[9]**

a) Recursive estimation

b) Pattern recognition

c) Bayesian learning

OR

Q4) a) With the help of block diagram explain 'self tuning regulator' **[4]**

b) Prove the matrix inversion lemma : **[5]**

$[A + BCD]^{-1} = A^{-1} - A^{-1}B[C^{-1} + DA^{-1}B]^{-1}DA^{-1}$

$[A + BCD]^{-1} = [A + BCD]\{A^{-1} - A^{-1}B[C^{-1} + DA^{-1}B]^{-1}DA^{-1}\}$

$I = I$

P.T.O.

Q5) a) Write a Short note on discrete time Kalman Estimator and Prediction as filtering. **[8]**

b) What are various adaptive schemes and how they are implemented?**[8]**

Q6) Consider a position servo described by $\frac{dv}{dt} = -av + bu$ and $\frac{dy}{dt} = v$; where a and b are unknown. Assume the control law $u = \theta_1(u_c - y) - \theta_2 v$ is used and that it is desired to control the system in such a way that the transfer function from command signal to process output is given by $G_m(s) = \frac{w^2}{s^2 + 2\xi\omega s + \omega^2}$ determine an adaptive control law that adjusts the parameters so that the desired objective is obtained. **[16]**

OR

Q7) With the help of both MIT rule and Lyapunov theory, design an MRAS for system described by $G(s) = \frac{b}{s+a}$ where a and b are unknown. The controller is given by $u(t) = \theta_1 u_c(t) + \theta_2 y(t)$ and the desired closed loop model is $\frac{dy_m}{dx} = -a_m y_m + b_m u_c$. Draw simulation diagram and compare two methods. Assume $V(\theta) = \frac{1}{2}\left[e^2 + \frac{1}{b\gamma}(b\theta_2 + a - a_m)^2 + \frac{1}{b\gamma}(b\theta_1 - b_m)^2\right]$ **[16]**

Total No. of Questions : 4]

SEAT No. :

PE-792

[Total No. of Pages : 3

[6585]-186

M.E. (Electrical) (Power Electronics & Drives)

LINEAR SYSTEMS THEORY AND DESIGN

(2017 Pattern) (Semester - I) (503301)

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

Instructions to the candidates:

1) ***Solve All Questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) Use the vector product to show whether the following sets of vectors are orthogonal or not. **[5]**

i) $a = i + 3j + 2k$, _ $b = i + 3j - 5k$

ii) $a = 5i - 5j$, $b = 3i$

iii) Prove your answers using the dot product.

b) For the vectors $a = 5i + 4j + 2k$, $b = 4i - 5j + 3k$ and $c = 2i - 1j - 2k$, find the direction cosines of the vector product (a × b) and the angle that the product vector makes with the vector c **[4]**

OR

c) Consider the vectors $a = 3i + 8j + k$ and $b = 6i + 8j + 2k$

i) Deduce the direction cosine of $\overline{A}$ and $\overline{B}$

ii) Deduce direction of cosine of $\overline{AB}$

Q2) a) Describe the span of the following set of vectors. **[5]**

i) $v_1 = (0, 1, 1)$ and $v_2 = (1, 1, 0)$

ii) $v_1 = 1$, $v_2 = x$ and $v_3 = x^3$

b) For the two bases for R^2, B = {(1 ,–l), (0,6)} and C = {(2,1), (–1, 4)}, find the transition matrix from C to B. **[4]**

OR

P.T.O.

c) Explain, with examples, the following characteristics of square matrices: **[4]**

i) Symmetric

ii) Skew-symmetric

iii) Diagonal

iv) Unit

Q3) a) The heights of a certain group of boys follow a normal distribution with mean 150.3 cm and variance 25 cm. Find the probability that a boy picked at random has height : **[8]**

i) less than 1 53 cm

ii) More than 158 cm

iii) Between 150 cm and 158cm

iv) More than 10 cm difference from the mean height.

b) For the following data sets, compare the mean, standard deviation, variance and range. **[8]**

Group A	196	198	198	199	200	200	201	201	202	205
Group B	192	194	195	198	200	201	203	204	206	207

OR

c) Explain in detail central limit theorem. **[8]**

Q4) a) Explain any two methods of data representation and parameter estimation in detail. **[8]**

b) The time taken by the milkman to deliver to the High Street is normally distributed with a mean of 12 minutes and standard deviation 2 minutes. He delivers milk every day. Estimate the number of days during the year when he takes : **[8]**

i) Longer than 17 minutes

ii) Less than ten minutes

iii) Between 9 and 13 minutes

OR

c) In air cooled engine cylinder simulation study, a circular cooling fin was heated in the central region & placed in the air stream. Ten thermocouples were placed at equal distance redially on the fin for temperature measurement. Following data was obtained: **[8]**

Radius r (cm)	2	4	6	8	10	12	14	16	18	20
Temp T (deg C)	75.5	73.1	70.5	67.7	64.2	62.1	59.4	57.2	54.8	52.2

Determine the coefficient for the curve of the form T = CO + C1R by:

i) Method of sequential differences

ii) Method of Extended differences

Total No. of Questions : 8]

SEAT No. : ____

PE-793

[Total No. of Pages : 2

[6585]-187

M.E. (Electrical) (Power Electronics and Drives)

Modelling and Analysis of Electrical Machines

(2017 Pattern) (Semester - I) (503302)

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

Instructions to the candidates :

1) ***Solve Q1or Q2 , Q3 or Q.4, Q.5 or Q.6 ,Q.7 or Q.8***
2) ***Figure to the right indicate full marks.***
3) ***Use of electronic calculator is allowed***
4) ***Assume suitable data, if necessary***

Q1) a) Explain Kron's primitive machine with respective equations. **[5]**

b) Explain transformation of 2 phase to 2 phase stationary axes with respective mathematical expressions. **[4]**

OR

Q2) a) Explain the concept of leakage flux in machine with more than 2 windings Write mathematical expressions for the same.
With respective mathematical expression justify that the magnitude of the speed voltages is maximum, when the moving coil is magnetically at right angles to the other coil. **[5]**

b) Elaborate the Concept of transformation. Explain transformations from a displaced brush axis with respective mathematical expressions. **[4]**

P.T.O.

Q3) a) Derive transfer function of DC motor with usual notations. **[5]**

b) Develop generalized mathematical model of 3 phase induction motor. Write down respective mathematical equations. **[4]**

OR

Q4) a) Explain dynamics of DC motor with respective equations at loaded condition. **[5]**

b) Explain stator reference frame model of 3 phase induction motor with respective mathematical expressions. **[4]**

Q5) a) Using impedance matrix, derive expression of instantaneous torque in case of synchronous motor. **[8]**

b) Explain abc frame to dq frame transformation ia case of synchronous machine. **[8]**

OR

Q6) a) Write down the equations for modeling of synchronous machine based on per unit system. State meaning of respective terms in the equation **[8]**

b) Explain dq0 transformations in case of synchronous machine **[8]**

Q7) a) What is meant by small displacement stability? **[8]**

b) Write down the linearization equations for voltage and torque. State the meaning of each notation used I the equation. **[8]**

OR

Q8) a) Write a detail note on performance prediction of-Induction machine with stator electric transients neglected. **[8]**

b) List out various applications of linearization techniques. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-794

[Total No. of Pages : 2

[6585]-188

M.E. Electrical (Power Electronics and Drives)

POWER CONVERTER - I

(2017 Pattern) (Semester - I) (503303)

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

Instructions to the candidates :

1) ***Answer any one from 1 & 2, 3 & 4, 5 & 6,7 & 8.***
2) ***Neat Diagrams to the right indicate full marks.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain dynamic V-I characteristic of SCR durin turn on and turn off. **[5]**

b) Explain 1 ph fully controlled converter for firing angle of 90 degrees and RL load. **[4]**

OR

Q2) a) Explain the following ratings related to SCR : **[4]**

i) Surge current Rating

ii) di/dt rating

b) Explain 3 ph fully controlled bridge converter with discontinuous conduction mode. **[5]**

Q3) a) Explain cuk converter operation. **[4]**

b) Explain different voltage control techniques in inverters. **[5]**

OR

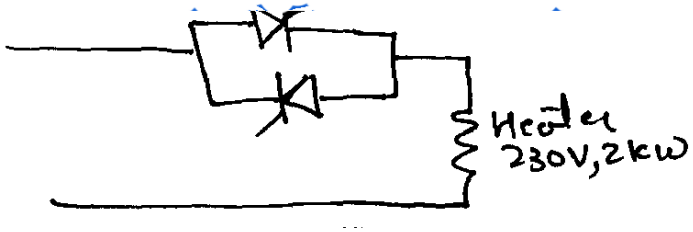
Q4) a) Explain boost converter with its modes of operation for RL load. **[5]**

b) Compare VSI and CSI. **[4]**

P.T.O.

Q5) a) Explain 1 Ph bidirectional AC voltage controller derive output rms voltage. **[8]**

b) In the circuit bidirectional AC voltage regulator for input of 230V, 50Hz and load of 2kW, 230V heater. Calculate i) RMS output voltage ii) Power dissipated in heater for $\alpha = 45$. **[8]**



OR

Q6) a) Explain 3 ph. Ac voltage controller with star connected RL load. **[8]**

b) Calculate firing angle α if the bidirectional controller operates from 230V, 50Hz mains and supplies 851.2 watt to 50Ω resistive load. **[8]**

Q7) a) With a neat diagram and relevant waveform explain the working of a single phase to single phase bridge step down type cycloconverter supplying RL load for discontinuous load current. **[8]**

b) Explain limitations, advantages and applications of cycloconverter. **[8]**

OR

Q8) a) With a neat diagram and relevant waveform explain the working of a three phase to three phase step down midpoint type cycloconverter supplying RL load. **[8]**

b) With a neat diagram and relevant waveform explain the working of a single phase to single phase midpoint step down type cycloconverter supplying RL load for discontinuous load current. **[8]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. : ____

PE795

[Total No. of Pages : 2

[6585]-189

First Year M.E. Electrical Engineering (Power Electronics & Drives)

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - I) (503304)

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

Instructions to the candidates:

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

Q1) a) Define the term research and list out any two objectives of research? **[4]**

b) Explain the difference between correlation and regression. **[5]**

OR

Q2) a) Explain how to select a problem in research. **[4]**

b) What are the advantages and disadvantages of collecting primary data? **[5]**

Q3) a) What is copyright? **[4]**

b) How are mathematical equations written and formatted in LaTeX?? **[5]**

OR

Q4) a) What is a royalty? **[4]**

b) How is the title page created in LaTeX? Write the basic commands required? **[5]**

P.T.O.

Q5) a) What is the importance of the future work section, and how should it be structured? **[8]**

b) What are the typical components included in a research budget? **[8]**

OR

Q6) a) What is a survey paper? How is it useful to a new researcher? **[8]**

b) What is the purpose of a poster paper? Where and how is it typically presented? **[8]**

Q7) a) Compare and contrast different types of reports with examples. **[8]**

b) Discuss the importance of effective communication in oral presentations? **[8]**

OR

Q8) Write short notes on. **[16]**

a) Explain the steps involved in preparing a thesis or a technical report.

b) List any four components of a typical thesis structure.



Total No. of Questions : 8]

SEAT No. : [ ]

PE796

[Total No. of Pages : 1

[6585]-190

First Year M.E. (Electrical) (Power Electronics and Drives)

AC AND DC DRIVES

(2017 Pattern) (Semester - II) (503307)

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

Instructions to the candidates:

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

Q1) With suitable diagrams and waveforms, explain working principle and operation of full wave converter fed single phase separately excited DC motor. **[10]**

OR

Q2) Write detail note on review of converters topologies of motor drives. **[10]**

Q3) Explain the operation of Chopper fed separately excited DC motor with waveforms and respective equations. **[10]**

OR

Q4) With suitable diagram explain CSI fed induction motor operation. **[10]**

Q5) For speed control , why voltage to frequency ratio of 3 phase induction motor is to be kept constant? Explain V/f method of speed control in detail. State its advantages. **[15]**

OR

Q6) State the merits of sensor-less vector control of induction motor. Explain the method of sensor-less vector control. **[15]**

Q7) Draw and Explain performance characteristics of stepper motor. **[15]**

OR

Q8) Explain control strategy for PMDC motor drive. **[15]**

✕ ✕ ✕

Total No. of Questions : 6]

SEAT No. :

PE-797

[Total No. of Pages : 2

[6585]-191

M.E. (Electrical) (Power Electronics and Drives)

POWER CONVERTERS - II

(2017 Pattern) (Semester - II) (503308)

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain about the following with neat circuit diagrams **[10]**

i) Sinusoidal Pulse Width Modulation

ii) Phase displacement control

b) Explain about the following with neat circuit diagrams **[8]**

i) Multilevel Inverters for Electric Vehicles

ii) Application of Multilevel Inverter

OR

Q2) a) How do resonant converters improve efficiency and reduce switching losses compared to traditional converters? **[10]**

b) What are the key design considerations when selecting components for an efficient SMPS, and how do they impact the overall performance? **[8]**

P.T.O.

Q3) a) With neat diagram explain Thermal modelling of power switching devices **[8]**

b) Explain about Electrical equivalent thermal model of heat sink and derive the necessary equations. **[8]**

OR

Q4) a) Explain the design procedure for heat sink for power electronics devices and derive the required equations. **[8]**

b) Explain the Selection procedure for Heat Sink for Single phase inverter **[8]**

Q5) a) With a neat diagram and relevant waveform explain the Magnetic design for Specific inductor and its procedure. **[8]**

b) Explain about the Need of Snubber circuit and Types of Snubber circuit **[8]**

OR

Q6) a) What are the main differences between the turn-on, turn-off, and over-voltage snubber circuits in terms of their construction and application? **[8]**

b) How does an over-voltage snubber circuit protect the switching device from high-voltage transients? **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PE-798

[Total No. of Pages : 2

[6585]-192

M.E. (Electrical) (Power Electronics & Drives)

ADVANCED CONTROL SYSTEMS

(2017 Pattern) (Semester - II) (503309)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Assume suitable data if necessary.***
3) ***Use of scientific calculator is allowed.***

Q1) a) Define and Explain sliding mode control in detail. **[3]**

b) Define all performance indices related to the optimal control system. **[6]**

OR

Q2) a) Explain how chattering is eliminated in Sliding mode control. **[3]**

b) A system is given by **[6]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & 1 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = [1\ 0]\ x$$

Design an observer to place the observer poles at –5, –5.

Q3) a) What is observer? Explain in detail nonlinear sliding mode observer. **[5]**

b) Explain observer based sliding control for Boost DC/DC converter. **[4]**

OR

Q4) a) Explain in detail nonlinear extended state observer. **[5]**

b) Explain observer based sliding control for Buck DC/DC converter. **[4]**

Q5) a) State the condition/s for a scalar function V(x) to be (i) Positive definite (ii) Negative definite and (iii) Indefinite. Give one example for each. **[8]**

b) Describe direct method for constructing the Lyapunov's function to determine the stability of nonlinear system. **[8]**

OR

P.T.O.

Q6) a) Explain Lyapunov function? Using Lyapunov function, V(x), state the condition/s for the system to be (i) stable (ii) asymptotically stable in the large and (iii) unstable. **[8]**

b) Consider the system described by **[8]**

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = -x_1 - x_2^3$$

Check the stability of the system for the Lyapunov function $V(x) = x_1^2 + x_2^2$

Q7) a) With example clearly explain Normal form in concern with the input output linearization. **[8]**

b) What is Input-Output linearization? Explain in detail. **[8]**

OR

Q8) a) Clearly explain Zero dynamics in concern with the input output linearization. **[8]**

b) What is Input-State linearization? Explain in detail. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-799

[Total No. of Page : 2

[6585]-193

M.E. (Electrical Engineering) (Power Electronics & Drives)

SPECIAL APPLICATION OF POWER ELECTRONICS

(2017 Pattern) (Semester - III) (603301)

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

Instructions to the candidates:

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

Q1) a) What is HVDC Light technology? List any two key features. **[4]**

b) Describe the control mechanism used in TCSC. **[5]**

OR

Q2) a) Explain the working principle of a Voltage Source Converter (VSC). **[4]**

b) Compare Thyristor Controlled Reactor (TCR) and Thyristor Switched Reactor (TSR). **[5]**

Q3) a) List any two sensors commonly used in smart grids and their functions. **[4]**

b) Differentiate between Zigbee and Bluetooth in terms of range, data rate, and applications. **[5]**

OR

Q4) a) What is a smart home? **[4]**

b) Name two open-source hardware platforms used in IoT applications. **[5]**

Q5) a) Define Distributed Energy Resources (DERs) and give four examples. **[8]**

b) What are the challenges associated with the integration of microgrids into the main grid? **[8]**

OR

P.T.O.

Q6) a) What are the main functions of a smart grid in modern power systems? **[8]**

b) What is a Wide Area Measurement System (WAMS)? What are its components? **[8]**

Q7) a) What is a Hybrid Electric Vehicle (HEV)? How does it differ from a fully Electric Vehicle (EV)? **[8]**

b) What are the advantages of using regenerative braking in hybrid vehicles? **[8]**

OR

Q8) a) What are the advantages and disadvantages of Switched Mode Power Supply (SMPS)? **[8]**

b) Explain the basic working principle of an AC-DC electric locomotive. **[8]**

❖❖❖

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

PE3251 **[Total No. of Pages : 2**

[6585]-194

S.Y.M.E. (Electrical) (Power Electronics & Drives)

ENERGY MANAGEMENT AND POWER QUALITY

(2017 Pattern) (Semester - III) (603302)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***
4) ***Use of scientific calculator is allowed.***

Q1) a) What are the key factors affecting the starting efficiency of induction motors? **[5]**

b) What are the primary purposes of grounding in electrical power systems? **[4]**

OR

Q2) a) What is the difference between system grounding and equipment grounding according to IEEE? **[5]**

b) What is energy efficient improvement opportunities in motors? **[4]**

Q3) a) What are the typical causes of voltage sags and interruptions in power systems? **[5]**

b) Explain how transformer energizing can lead to transient overvoltage. **[4]**

OR

Q4) a) How do harmonics affect transformers, motors and capacitors? **[5]**

b) Define voltage sag and explain how it differs from a momentary interruption. **[4]**

Q5) a) How do voltage flicker and voltage variations affect sensitive electrical equipment? **[8]**

b) Define Total Harmonic Distortion (THD) and its significance in power quality assessment. **[8]**

OR

Q6) a) What is power quality benchmarking and why is it important for electrical utilities? **[8]**

b) Explain the phenomenon of voltage flicker and its causes. **[8]**

P.T.O.

Q7) a) How can intelligent systems improve power quality monitoring and fault diagnosis? **[8]**

b) What is the importance of continuous versus periodic power quality monitoring? **[8]**

OR

Q8) a) What types of equipment are commonly used for power quality measurement and analysis? **[8]**

b) What key factors should be considered when monitoring power quality in an electrical distribution system? **[8]**



Total No. of Questions : 3]

SEAT No. :

PE-800

[Total No. of Page : 1

[6585]-195

M.E. (Electrical) (Power Systems)

COMPUTER APPLICATIONS IN POWER SYSTEM

(2017 Pattern) (Semester - I) (503201)

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

Instructions to the candidates:

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

Q1) **Attempt any three :**

a) Derive equations used for NR load flow method using polar ordinates. **[6]**

b) What are the theorems used in optimizing single variable functions? **[6]**

c) Derive the equations used in three phase load flow analysis. **[6]**

d) Explain Fibonacci for unconstrained optimization technique **[6]**

Q2) **Attempt any two :**

a) Two units of the system have following cost curves **[8]**

$$f(P_{G1}) = 0.00889\,P_{G1}^2 + 10.333P_{G1} + 200 \text{ Rs/h}$$

$$f(P_{G2}) = 0.00741\,P_{G2}^2 + 10.833P_{G2} + 240 \text{ Rs/h}$$

The transmission loss are given by

$$P_L = 0.001\,P_{G1}^2 + 0.002\,P_{G2}^2 - 0.0004\,P_{G1}P_{G2}$$

where P_G is in MW. Determine the economic operating schedule to meet the demand of 150 MW using classical method perform one iteration.

b) Explain classical economic load dispatch with algorithm considering limits. **[8]**

c) Explain solution of economic load dispatch problem using NR method. **[8]**

Q3) **Attempt any two :**

a) Show that transmission loss formula is a function of generation and load. **[8]**

b) Derive general formula of fault current and fault voltage for LLG type fault. **[8]**

c) Explain economic load dispatch for active and reactive power balance. **[8]**

❖❖❖

Total No. of Questions : 5]

SEAT No. :

PE-801

[Total No. of Pages : 2

[6585]-196

M.E. (Electrical-Power Systems)

POWER SECTOR ECONOMIC AND MANAGEMENT

(2017 Pattern) (Semester - I) (503202)

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

Instructions to the candidates:

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

Q1) Attempt any three from following. **[18]**

a) Explain need of deregulation in Indian power sector.

b) Discuss the regulatory process in India.

c) For a project initial investment of Rs.2000000 is required. The cash flows generated for five years are Rs.400000, Rs.400000, Rs.500000, Rs. 500000 and Rs. 600000. Calculate net present value for a project with discounting factor as 8%.

d) Explain various key performance parameters used by regulator to access the performance of various utilities.

e) Explain Max ISO and Mini ISO models.

Q2) a) What is market clearing price? How it is arrived at? Explain factors affecting market clearing price. **[8]**

b) What are the ancillary services? Explain ancillary service market. **[8]**

OR

P.T.O.

Q3) a) Explain future market and a day ahead market. **[8]**

b) Explain the process of market settlement. Also discuss the factors affecting market settlement process. **[8]**

Q4) a) What are the firm transmission rights? What are the effect of these on system operation? **[8]**

b) Explain transmission cost allocation methods. **[8]**

OR

Q5) a) Explain transmission pricing model in India. Also explain transmission ownership model. **[8]**

b) How to tackle congestion occuring power market? **[8]**



Total No. of Questions : 6]

SEAT No. : ____

PE-802

[Total No. of Pages : 2

[6585]-197
M.E. Electrical (Power Systems)
POWER SYSTEM MODELING
(2017 Pattern) (Semester - I) (503203)

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

Instructions to the candidates:

1) ***Solve Total Three questions. Answer 1 question from Q1 and Q2, Q3 or Q4, and Q5 or Q6 each.***
2) ***Assume suitable data if necessary.***
3) ***Write down all the assumptions made.***
4) ***Given F^{abc} = [P] F^{dq0}, where Park's transformation***

$$[\mathrm{P}] = \begin{bmatrix} k_d \cos\theta & k_q \sin\theta & k_0 \\ k_d \cos\left(\theta - \frac{2\pi}{3}\right) & k_q \sin\left(\theta - \frac{2\pi}{3}\right) & k_0 \\ k_d \cos\left(\theta + \frac{2\pi}{3}\right) & k_q \sin\left(\theta + \frac{2\pi}{3}\right) & k_0 \end{bmatrix}$$

$\left(\text{where, } K_d = K_q = \sqrt{2/3} \text{ and } K_0 = \sqrt{1/3}\right)$

Q1) A synchronous generator is represented by an EMF behind a synchronous reactance. For this machine governor controls the shaft input power and the excitation system controls the internally generated EMF E_g. A synchronous generator is operating at a lagging power factor with current I_1, internally generated voltage E_{g1}, and terminal voltage V_t,Assume that the input power is held constant by governor. With these initial operating conditions, assume that the excitation is *increased* to new value E_{g2}. Assume that the bus voltage is held constant by other machine operating in parallel with this machine. Draw equivalent circuit diagram and with the help of phasor diagram, determine the new value of current I_2, the new power factor cos Φ_2, and the new torque angle δ_2. **[18]**

OR

P.T.O.

Q2) Derive the model 'pi' circuit medium transmission line. Draw its equivalent circuit diagram. Also comment about the symmetry of the model. Write down assumptions involved in it if any. **[18]**

Q3) Explain with the help of suitable diagram working of brushless excitation control scheme of alternator. **[16]**

OR

Q4) Explain need of excitation system in the power system. Explain working of static excitation control scheme of alternator with the help of neat and suitable block diagram. **[16]**

Q5) Discuss the need of load modeling in power system? Discuss in details the various types of static load modeling represented in power system. **[16]**

OR

Q6) What is Clarke's transformation and Kron's transformation in power system. Explain their application in power system. **[16]**

Total No. of Questions : 6]

SEAT No. :

PE803

[Total No. of Pages : 1

[6585]-198
First Year M.E. (Electrical) (Power Systems)
RESEARCH METHODOLOGY
(2017 Pattern) (Semester - I) (503204)

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

Instructions to the candidates:

1) ***Attempt any three questions from question 1 to 4.***
2) ***Questions 5 and 6 are compulsory.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table, slide rule and non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) What is the importance of literature Survey? Explain in detail. **[6]**

Q2) What are the types of technical papers? And How to write a research proposal? **[6]**

Q3) Describe the process of drafting and filing the patent along with the legal procedure. **[6]**

Q4) Explain the Simplex method of linear programming. **[6]**

Q5) Solve any two.

a) Explain the characteristics of a constrained problem. **[8]**

b) Describe the concept of finite difference approximations of partial derivatives with example. **[8]**

c) Write a short note on convex programming problem with example. **[8]**

Q6) Write short note on the following with applicable example in Electrical Engineering(Attempt any two)

a) Particle Swarm Optimization. **[8]**

b) Linear and Multi regression. **[8]**

c) Ant Colony Method. **[8]**

✪ ✪ ✪

Total No. of Questions : 6]

SEAT No. :

PE-804

[Total No. of Pages : 2

[6585]-199

M.E. Electrical (Power Systems)

POWER SYSTEM DYNAMICS

(2017 Pattern) (Semester - II) (503207)

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

Instructions to the candidates:

1) ***Solve Total Three questions. Answer any One from Q1 or Q2, from Q3 or Q4. and Q5 or Q6 each.***
2) ***Assume suitable data if necessary.***
3) ***Write down all the assumptions made.***

Q1) Derive an equivalent swing equation for two interconnected coherent machines. The machines are having inertia constants H_1, and H_2 and load angles $\delta_1$and δ_2. Prove that the equation of such case is equivalent to swing equation of single machine connected to infinite bus system. Also state the mode in which system can operate. Write the equivalent swing equation if the same machines split in to two non-coherent groups and about their behaviour in that condition. **[18]**

OR

Q2) Describe in brief

i) Small disturbance voltage stability

ii) Voltage stability and

iii) Voltage collapse. Also, discuss various factors affecting voltage instability and collapse. **[18]**

Q3) Draw the diagram representing synchronous generator by model 1.2 and derive stator voltage equations for it. **[16]**

OR

P.T.O.

Q4) Derive rotor voltage equations for synchronous generator by model 1.1 **[16]**

Q5) State the Heffron-Phillips constants and their significance to maintain system stability for the SMIB system. **[16]**

OR

Q6) Derive the stator voltage expressions for the small signal analysis of single machine model with field circuit only. Write down assumptions involve in it. **[16]**



Total No. of Questions : 6]

SEAT No. :

PE-805

[Total No. of Pages : 2

[6585]-200

M.E. (Electrical) (Power System)

POWER SYSTEM PLANNING & RELIABILITY

(2017 Pattern) (Semester - II) (503208)

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

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

Q1) a) Explain co-relation method of load forecasting. **[6]**

b) Explain weather sensitive forecasting in details. **[6]**

c) Explain Markov process in details for reliability evaluation. **[6]**

OR

Q2) a) Explain steepest descent method for reliability evaluation. **[6]**

b) A power system having 5 units of 100 MW each with of FOR - 0.03.The load model is linear in nature having maximum load of 400 MW and minimum load of 150 MW. Calculate the system LOLE. **[6]**

c) Explain generation system model. **[6]**

Q3) a) Explain the role of construction monitoring of transmission line projects. **[8]**

b) Explain goals of short term transmission planning in details. **[8]**

OR

Q4) a) Explain load point indices in a transmission line. **[8]**

b) Write short note on analysis of causes of failure of transmission line. **[8]**

P.T.O.

Q5) a) Explain effects of weather on distribution system. **[8]**

b) Explain network re-configuration method in distribution systems. **[8]**

OR

Q6) a) Explain the effect of weather in distribution system planning in details. **[8]**

b) Explain effects of dis-connectors, circuit breakers and isolators on distribution systems. **[8]**



Total No. of Questions : 4]

SEAT No. :

PE-806

[Total No. of Pages : 2

[6585]-201

F.Y. M.E. (Electrical) (Power Systems)

HVDC and Flexible A C Transmission

(2017 Pattern) (Semester - II) (503209)

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

Instructions to the candidates :

1) ***Neat diagram must be drawn wherever necessary.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculators is allowed***

Q1) Attempt any three of the following : **[18]**

a) Explain HVDC protection schemes used against over-voltage and over-current.

b) Explain the 12-pulse converter operation in HVDC system.

c) Explain the difference between EHVAC and HVDC transmission.

d) Describe the Harmonics in HVDC systems.

e) Draw & explain the individual & combined CC & CEA converter control characteristics

Q2) Write a short notes on (any two) : **[16]**

a) STATCOM

b) Working principle of SSSC

P.T.O.

c) Working principle of TCSC

Q3) a) Explain the need of FACTS controller in modern power systems. **[8]**

b) Compare UPFC with other FACTS devices in terms of their improvements in power systems. **[8]**

OR

Q4) a) Explain how a UPFC is different than a simple SVC. **[8]**

b) Explain the block diagram of overall UPFC control structure. **[8]**



Total No. of Questions : 3]

SEAT No. :

PE-807

[Total No. of Pages : 2

[6585]-202
M.E. (Electrical) (Power Systems)
ADVANCED POWER SYSTEM PROTECTION
(2017 Pattern) (Semester - III) (603201)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of Non programmable scientific calculator is allowed. .***
5) ***Assume suitable data wherever necessary.***

Q1) **Attempt any three :**

a) Derive the equivalent circuit of a CCVT. **[6]**

b) Elaborate how injection of sub-synchronous component can protect a synchronous generator digitally. **[6]**

c) State sampling theorem and explain the importance of sampling theorem in digital protection of power system. **[6]**

d) Elaborate various types of faults in power systems. **[6]**

e) A 1200/5, C400 with secondary resistance 0.61Ω and a 2.0Ω is the relay burden. Based on the accuracy classification, what is the maximum symmetrical fault current that may be applied to this CT without exceeding a 10% ratio error? **[6]**

Q2) **Attempt any two :**

a) Why overcurrent relays are replaced by digital distance relays for protection of transmission lines. **[8]**

b) Explain the working of impedance relay, mho relay and quadrilateral relay for protection of transmission line with the help of R-X diagram. **[8]**

c) With help of lattice diagrams explain the principle of UHV-high speed relaying scheme based on travelling wave for high voltage long transmission line.**[8]**

P.T.O.

Q3) **Attempt any two :**

a) Write a note on integrated operation of national power system in terms of features, size and trends. **[8]**

b) With help of line diagram explain multi zone protection scheme using distance relay. **[8]**

c) Explain how primary and backup relay settings are calculated to get proper relay coordination. **[8]**

❖❖❖

Total No. of Questions : 5]

SEAT No. :

PE-808

[Total No. of Pages : 2

[6585]-203

M.E. Electrical (Power System)

POWER QUALITY ASSESSMENT AND MITIGATION

(2017 Pattern) (Semester - III) (603202)

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

Instructions to the candidates:

1) ***Q.1 compulsory, Q.2 or Q.3 and Q.4 or Q.5***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, wherever necessary.***
5) ***Use of non-programmable scientific calculator is allowed.***

Q1) Attempt any three

a) Explain harmonic generated by transformer and three phase arc furnaces. **[6]**

b) Explain CBEMA and ITI curves? How these are useful. **[6]**

c) Does power quality issues get aggravated due earthing? Explain method of earthing for sensitive and critical loads. **[6]**

d) How transients are classified? Explain different conditions which induce over voltages in power systems. **[6]**

e) Explain term distortion power, displacement and distortion Power Factor. Discuss different causes of transient over voltages in power system. **[6]**

Q2) a) Explain principle of active filtering. With suitable example/diagram explain shunt active filter. **[8]**

b) Discuss effect of system response under presence of harmonics. Also Explain Principles of harmonic controls. **[8]**

OR

P.T.O.

Q3) a) Explain the role of computer tools in harmonic analysis. **[8]**

b) Explain different passive filters used for harmonic control. **[8]**

Q4) a) Why selection of transducers is Important in power quality assessment **[8]**

b) Explain different instruments are used for power quality assessment and what are their special requirements. **[8]**

OR

Q5) a) Discuss the process of flicker monitoring and also discuss the controlling limits of waveform distortion as per IEEE standard. **[8]**

b) Discuss requirement for transient monitoring and event recording. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-809

[Total No. of Pages : 2

[6585]-204

M.E. (AIDS/Computer Engg./MDS/A.I.)

ARTIFICIAL INTELLIGENCE

(2017 Pattern) (Semester - I) (510501)

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

Instructions to the candidates :

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

Q1) Explain the role of intelligent agent in an AI application. **[9]**

OR

Q2) Give the rule based method for uncertain reasoning. **[9]**

Q3) What is the use of AND OR Search trees? Explain with an example. **[9]**

OR

Q4) How learning is carried out in decision tree? **[9]**

Q5) a) Explain Forward chaining in First order logic inference. **[8]**

b) Explain the elements of PDDL with an example. **[8]**

OR

P.T.O.

Q6) a) How AI can be applied in healthcare applications? **[8]**

b) How collaborative filtering predicts the rating for recommendation? **[8]**

Q7) a) Give the PDDL actions for Blocks world problem. **[8]**

b) Explain semantic networks with an example. **[8]**

OR

Q8) a) Give the algorithm for depth limited search and explain with an example. **[8]**

b) Explain online local search with an example. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-810

[Total No. of Pages : 2

[6585]-205

M.E. (AIDS/MDS/AI)

VIRTUAL REALITY AUGMENTED REALITY

(2017 Pattern) (Semester - II) (510504)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q3. 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 concept of the virtuality continuum and its components. **[5]**

b) What is the significance of the Birds-Eye View in the Geometry of Virtual World and Illumination? **[5]**

OR

Q2) a) Explain the Taxonomy of Mixed Reality and its components. **[5]**

b) How does Reproduction Fidelity (RF) affect user experience in virtual environments? **[5]**

Q3) a) Discuss the significance of visual perception in the context of rendering. **[5]**

b) Explain the significance of color perception in visual rendering and how it affects the viewer's experience. **[5]**

OR

Q4) a) What are the main techniques used in ray tracing and shading models to achieve realistic images? **[5]**

b) What techniques are employed to improve latency and frame rates in visual rendering, and why are these improvements crucial for user experience? **[5]**

P.T.O.

Q5) a) What are the key components involved in marker creation and tracking in augmented reality? **[5]**

b) Explain the concept of Simultaneous Localization and Mapping (SLAM) in the context of augmented reality. **[5]**

OR

Q6) a) Describe the role of Natural Feature Tracking by Detection in augmented reality applications. **[5]**

b) What are the major software components required for developing augmented reality systems? **[5]**

Q7) a) What is the marker-based approach in tracking and what are its key components? **[5]**

b) What are the different types of markers used in marker-based tracking? **[5]**

OR

Q8) a) What is the marker-less approach in tracking and how does it differ from the marker-based approach? **[5]**

b) What are the different tracking methods. **[5]**

Q9) a) What are the different types of head-mounted displays used in virtual reality? **[5]**

b) What technical skills are important for virtual reality content creation? **[5]**

OR

Q10) a) What is the purpose of debugging VR projects in Unity? **[5]**

b) What is the purpose of using AR tools like ARCore and ARToolkit in application development? **[5]**



Total No. of Questions : 12]

SEAT No. :

PE-811

[Total No. of Pages : 2

[6585]-206

M.E. (Artificial Intelligence and Data Science) (AI)

SOFT COMPUTING AND DEEP LEARNING

(2017 Pattern) (Semester - III) (610501)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8, Q9 or Q10, Q 11 or Q12.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) What are the significant characteristics of soft computing? Discuss the role of soft computing in financial forecasting. **[9]**

OR

Q2) Explain the importance of fuzzy relations in knowledge representation. How do fuzzy operations differ from classical set operations? **[9]**

Q3) Explain the traditional optimization and search techniques. **[9]**

OR

Q4) What are different mutation methods in genetic algorithms? **[9]**

Q5) Explain the advantages of Deep Neural Networks (DNNs) over shallow networks. How does depth impact representation learning? **[9]**

OR

Q6) How does backpropagation use gradient descent? Explain their relationship in training neural networks. **[9]**

Q7) Compare Stochastic Gradient Descent (SGD) with Batch Gradient Descent (BGD). When is SGD preferred? **[9]**

OR

Q8) Explain Nesterov Accelerated Gradient Descent. How does it improve optimization over standard momentum-based Gradient Descent? **[9]**

P.T.O.

Q9) Explain the architecture of a Convolutional Neural Network (CNN). How does it learn hierarchical features from image data? **[9]**

OR

Q10) Describe the Inception module in GoogleNet. How does it improve computational efficiency compared to VGGNet? **[9]**

Q11) Compare LSTMs and GRUs in terms of architecture, computation time, and efficiency. **[5]**

OR

Q12) What is the attention mechanism in deep learning? **[5]**

❖❖❖

Total No. of Questions : 12]

SEAT No. :

PE-812

[Total No. of Pages : 2

[6585]-207

M.E. (Artificial Intelligence and Data Science)

SCALABLE DATA SCIENCE

(2017 Pattern) (Semester - III) (610502)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8, Q9 or Q1O, Q 11 or Q12.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Explain the key challenges faced in big data analytics and describe how bloom filters can be applied to address specific issues with an appropriate example, **[9]**

OR

Q2) Describe the architecture and workflow of a Machine Learning Pipeline in Apache Spark. **[9]**

Q3) Describe the process of dimensionality reduction and how techniques like PCA can be integrated with Spark for high-dimensional data analysis. **[9]**

OR

Q4) Explain the concept of parallelism in Apache Spark using RDDs. How can this be leveraged to perform statistical computations like mean, standard deviation, skewness and kurtosis efficiently on big data. **[9]**

Q5) Describe the key features of programming with SparkR and explain function name masking, application of column functions and operations on grouped data. **[9]**

OR

Q6) Illustrate how Spark ensures fault-tolerant and parallel computation while handling large datasets. **[9]**

Q7) Explain the architecture and components of a Machine Learning Pipeline in Apache Spark. **[9]**

OR

Q8) Explain default level of parallelism in Apache Spark and give suitable example of K-Means clustering in Spark **[9]**

Q9) Explain uses of file system API in Apache spark? What are the structural operators provided in the Grapx library? **[9]**

OR

Q10) Explain the architectural features of Apache Spark that support low-latency computation. **[9]**

Q11) Elaborate set opertions using SparkR data frames. **[5]**

OR

Q12) Describe in detail function name masking in SparkR. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE-813

[Total No. of Pages : 3

[6585]-208

M.E. (Chemical Engineering)

MATHEMATICAL AND STATISTICAL METHODS

(2017 Pattern) (Semester - I) (509101)

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

Instructions to the candidates :

1) ***Answer total 5 questions from the following.***
2) ***Neat diagrams must be wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Solve the following Legendre's equation using power series **[5]**

$(1 - x^2)y'' - 2xy' + n(n + 1) = 0$

b) Solve the differential equation using power series. **[5]**

$y^2 - y = 0$

Q2) a) Find the potential in the interior of a sphere of unit radius when the potential on the surface is $f(\theta) = \cos^2\theta$. **[6]**

b) Explain Laplace equation in cylindrical form. **[4]**

Q3) a) Find Talor's expansion of $f(z) = 1/(z + 1)^2$ about the point of $z = -i$. **[3]**

b) If $w = 1\ g\ z$, find dw/dz and determine where w is non-analytical. **[2]**

c) Write a note on series of complex terms. **[5]**

Q4) a) Solve the following system of ODE using Laplace transform method using initial conditions as $x(0) = 1$; $y(0) = 0$. **[6]**

$x' - y = e^t$

$y' + x = \sin t$

b) Find the Laurent's expansion of $f(z) = (7z - 2)/[(z + 1)z(z - 2)]$ in the region $1 < z = 1 < 3$. **[4]**

P.T.O.

Q5) a) Genetic theory states that children having one parent of blood type A and the other blood type B will always be of one of three types. A, AB, B and that the proportion of three types will on an average be as 1:2:1. A report states that out of 300 children having one A parent and B parent, 30 percent were found to be types A, 45 percent type AB and remainder type B. Test the hypothesis by χ^2 test. (P* = Probability under Ho that of $x^2 > \chi^2$ at 5%). **[8]**

Degree Freedom	1	2	3	4	5
P*	3.841	5.991	7.815	9.488	1l.070

b) Distinguish between experimental and extraneous variables. **[2]**

Q6) a) The joint probability mass function of (X, Y) is given by $p(x, y) = k(2x + 3y)$, $x = 0, 1, 2$, $y = 1, 2, 3$. Find all the marginal and conditional probability distributions. Also find the probability distribution of (X+Y). The joint probabilities are given below: **[7]**

X		Y	
	1	2	3
0	$3k$	$6k$	$9k$
1	$5k$	$8k$	$11k$
2	$7k$	$10k$	$13k$

b) Write note on rank correlation coefficient. **[3]**

Q7) a) In a random sample of size 16 has 53 are mean. The sum of deviation taken from mean is 135 with LOS of 1%. Can this sample regarded as taken from the population having 56 as mean? Also obtain 95% and 99% confidence limits of the mean of the population

(given for $v = 15$, $t_{0.05} = 2.13$, $t_{0.01} = 2.95$). **[5]**

b) Test the normality of the following distribution by using chi-square test of goodness of fit. Take $\chi^2_{0.05}(v = 2) = 5.99$ **[5]**

x	125	135	145	155	165	175	185	195	205
f	1	1	14	22	25	19	13	3	2

Q8) a) Write note on rank correlation coefficient. **[5]**

b) Fit a straight-line $y = a + bx$ to the following data by method of least squares. **[5]**

x :	0	1	3	6	8
y :	1	3	2	5	4

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

PE-814

[Total No. of Page : 1

[6585]-209
M.E. (Chemical Engg)
PROCESS OPTIMIZATION
(2017 Pattern) (Semester - I) (509102)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) Discuss the classification of Optimization Problems. Give details of any one type of Optimization Problem. **[10]**

Q2) Use the golden-section search to find the maximum of:
$f(x) = 2 \sin x - (x^2/10)$
within the interval $x_L = 0$ and $x_U = 4$. Solve for first three iterations. **[10]**

Q3) Optimize the given function : $f(x) = x^2 + 54/x$,
to compute, its minimum using the Gradient-based Newton Raphson method. Solve for three iterations from any appropriate initial guess of your choice.**[10]**

Q4) Describe the Cauchy's Steepest Descent method of multivariable optimization in detail along with the algorithm. **[10]**

Q5) Explain the Kuhn - Tucker optimally conditions to be evaluated for an optimum point in detail. **[10]**

Q6) Discuss about the Simplex Method of Optimization along with the graphical and matrix methods of solution. **[10]**

Q7) Explain Quadratic Programming in brief. For the minimization of the quadratic function:
$f(x) = 2x_1^2 + x_2^2 - 4x_1 - 2x_2 - 2x_1x_2$
determine the Hessian matrix 'H' as required in the formulation of the Quadratic Programming problem. **[10]**

Q8) Describe the differences between Genetic Algorithms (GA) and Traditional Optimization methods. **[10]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-815

[Total No. of Pages : 2

[6585]-210

M.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(2017 Pattern) (Semester - I) (509103)

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

Instructions to the candidates:

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

Q1) a) Describe in short, Sirofloc filter used for solid - liquid separations. **[5]**

b) Explain in brief recent advances in separation techniques based on ionic properties with any example. **[5]**

Q2) a) Define reverse osmosis? Explain in detail any one application of reverse osmosis with suitable sketches. **[5]**

b) Explain in brief with neat sketches spiral wound membrane module. **[5]**

Q3) a) Explain in brief about Reactive absorption for removal of hazardous gases H2S. **[5]**

b) Explain in brief application of nanofiltration membrane. **[5]**

Q4) a) Give short notes on Pervaporation. **[4]**

b) Give short notes on transport through micro porous and dense membrane. **[6]**

Q5) a) Short notes on Foam Separation technique. **[5]**

b) Define adsorption? Explain in brief about advancement in adsorption with suitable examples. **[5]**

P.T.O.

Q6) a) Short notes on Recent Advances and Process Economics of Analytical Separation. **[5]**

b) Short notes on Ion exchange chromatography and electro dialysis. **[5]**

Q7) a) Short notes on Industrial effluent treatment by modern techniques. **[6]**

b) Give advantages and disadvantages of Ultrasound and Microwave assisted extraction over conventional extraction with suitable examples. **[4]**

Q8) a) Define reactive distillation? Explain in brief with suitable example. **[5]**

b) What is Supercritical fluid extraction? Explain in brief with suitable example. **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE816

[Total No. of Pages : 2

[6585]-211
First Year M.E. (Chemical)
RESEARCH METHODOLOGY
(2017 Pattern) (Semester - I) (509104)

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

Instructions to the candidates:

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

Q1) a) Explain Research Process with a neat sketch. **[5]**

b) Write a note on problems encountered by Researchers in India. **[5]**

Q2) a) Write a note on manpower needs of a research project. **[5]**

b) Discuss fundamentals of time series analysis and spectral analysis along with one application in research work. **[5]**

Q3) a) Explain One-way and Two-way ANOVA with suitable example. **[5]**

b) Justify "Design of experiments generates information on the effect of various factors have on a response variable". **[5]**

Q4) a) What do you mean by a 'case study'? Explain the steps involved in designing a case study to solve a research problem. **[5]**

b) What is data analysis? What are the main purpose and functions of data analysis. **[5]**

P.T.O.

Q5) a) Discuss the steps involved in publishing a research idea in a journal. **[5]**

b) Write a note on Chi-Square test for comparing variance. **[5]**

Q6) a) "Objective of research project decides the line of action of project completion" Explain. **[5]**

b) Write an explanatory note on citation methods for project writing. **[5]**

Q7) a) Elaborate on the various steps in publishing a research idea in research journal. **[5]**

b) Explain the scenario of Copyrights in India. **[5]**

Q8) a) Differentiate between "Interdisciplinary Research" and "Multidisciplinary research". **[5]**

b) Write an explanatory note on "Research hypothesis". **[5]**



Total No. of Questions : 8]

SEAT No. : ____

PE-817

[Total No. of Pages : 2

[6585]-212
M.E. (Chemical)
Advanced Transport Phenomena
(2017 Pattern) (Semester - II) (509107)

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

Instructions to the candidates :

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed***

Q1) A spherical tank of radius R and its drain-pipe of length L and diameter D are completely filled with heavy oil. At time t = 0 the valve at the bottom of the drain-pipe is opened. Derive the time equation for complete draining of the tank. There is an air vent at the very top of the spherical tank. Ignore the amount of oil that clings to the inner surface of the tank and assume that the flow in the drain-pipe is laminar. **[10]**

Q2) Determine the temperature distribution in an incompressible liquid confined between two coaxial cylinders, the outer one of which is rotating at steady angular velocity Ω_o. Consider the radius ratio K to be fairly small so that the curvature of the fluid streamlines must be taken into account. The temperatures of the inner and outer surfaces of the annular region are maintained at T_k and T_1 respectively, with $T_k \neq T_l$. Assume steady laminar flow and neglect the temperature dependence of the physical properties. **[10]**

Q3) Derive the final equation of energy change for Non-isothermal systems starting from the basic conservation of energy equations with suitable assumptions. **[10]**

P.T.O.

Q4) Develop the dimensionless wall heat flux relation for the temperature distribution for turbulent flow in tubes equipped with a heating coil which provides a constant wall flux q_0. **[10]**

Q5) Discuss the time-smoothing of the equations of continuity and motion for component 'A' disappearing by an nth order chemical reaction in rectangular coordinates. **[10]**

Q6) Derive the expression for concentration distributions with more than one independent variables. **[10]**

Q7) A liquid 'B' is flowing very slowly around a spherical bubble of gas 'A' of radius 'R' (creeping flow). Develop the relation for the determination of the rate of mass transfer of 'A' into the surrounding fluid 'NA_0', if the solubility of gas 'A' in liquid 'B' is CA_0. State the assumptions. **[10]**

Q8) a) State the analogies among heat and mass transfer at low mass-transfer rates in terms of the basic relations. **[5]**

b) Discuss Reynolds Stresses. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-818

[Total No. of Pages : 2

[6585]-213
M.E. (Chemical Engineering)
ADVANCED PROCESS CONTROL
(2017 Pattern) (Semester - II) (509108)

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

Instructions to the candidates :

1) ***Answer any five questions.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) Derive the dynamic process model equations of a non-isothermal CSTR with a first order rate equation, $-r_A = kC_A$. State assumptions and enlist all the variables involved. **[10]**

Q2) Discuss about the Impulse and Step Response models of linear processes. Derive the Impulse response model of a standard 1st order process from its transfer function and find the relations of its gain and time-constant with respect to the moments of its Impulse response function. **[10]**

Q3) a) Discuss about the various PID controller tuning methods with important equations. **[5]**

b) Design P, PI and PID controllers for a three-tank system using the Ziegler-Nichols tuning rules, The ultimate gain is Ku = 1.667 and frequency of sustained oscillation is $\omega_u = 0.5$ rad/min. **[5]**

Q4) a) Explain the issues with controller design for processes with time-delays. Discuss about the dead-time compensator system. **[5]**

b) Discuss about the issues with controller design for processes with inverse response. Discuss about the compensator system for such processes. **[5]**

Q5) Discuss about the Generalized and Simplified Decoupling of MIMO control systems. Design a Simplified Decoupler for the Wood and Berry Distillation Column having the transfer function : **[10]**

$$\begin{bmatrix} X_D(S) \\ X_B(S) \end{bmatrix} = \begin{bmatrix} \frac{12.8e^{-s}}{16.7s+1} & \frac{-18.9e^{-3s}}{21s+1} \\ \frac{6.6e^{-7s}}{10.9s+1} & \frac{-19.4e^{-3s}}{14.4s+1} \end{bmatrix} \begin{bmatrix} R(s) \\ S(s) \end{bmatrix}$$

Q6) Discuss about the digital approximations of the classical PID controllers with appropriate relations. **[10]**

Q7) Describe the extensions of the Dynamic Matrix Control (DMC) strategy to MIMO control systems. Elaborate on the equations to solve such a general constrained problem. **[10]**

Q8) Describe the Control system design strategies of a Plant-wide control system. **[10]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-819

[Total No. of Pages : 2

[6585]-214
M.E. (Chemical)
ADVANCED REACTION ENGINEERING
(2017 Pattern) (Semester - II) (509109)

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

Instructions to the candidates:

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

Q1) A batch of solids of uniform size is treated by gas in a uniform environment. Solid is converted to give a nonflaking product according to the shrinking-core model. Conversion is about 7/8 for a reaction time of 1h, conversion is complete in two hours. What mechanism is rate controlling? **[10]**

Q2) From a pulse input to a vessel, we obtain the following output signal **[10]**

Time, min	1	3	5	7	9	11
Concentration, (mol/l)	0	0	10	10	10	10

We want to represent the flow through the vessel with the tank in series model. Determine the number of tanks to be used.

Q3) Explain Mass and Heat Transfer Coefficients in Packed Bed. **[10]**

Q4) Derive the expression for the effectiveness factor of the single spherical pore of the catalyst for first order reaction. **[10]**

Q5) Explain isothermal and adiabatic fixed bed reactors with suitable illustration. **[10]**

Q6) Reactant 'A' is adsorbed on the catalyst surface and reacts with another component 'B' which is also adsorbed on the catalyst surface. The products of the reaction are: 'C' and 'D' both are adsorbed on the catalyst. Later both the products desorbed from the surface. Derive the rate equation for the mentioned reaction assuming Surface Reaction rate Controlling. **[10]**

P.T.O.

Q7) Write a short Note on : **[10]**

a) Dispersion Model

b) Shrinking Core Model

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

a) Mears' Criterion for external diffusion

b) Slurry Reactor

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-820

[Total No. of Pages : 1

[6585]-215
M.E. (Chemical)
PROCESS MODELING & SIMULATION
(2017 Pattern) (Semester - III) (509113)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.***

Q1) Explain different types of models. **[10]**

Q2) Explain it in detail, an unsteady state model with suitable examples. **[10]**

Q3) Explain different methods of Design of Experiments. **[10]**

Q4) Develop a model for PFR Reactor. **[10]**

Q5) Write an assumption for a model of Packed Extractor & develop a model. **[10]**

Q6) Give the simulation scheme for CSTR. Explain it with a case study. **[10]**

Q7) A patient just had surgery and is required to have at least 81 units of drug D1 and 120 units of drug D2 each day. Assume that an over dosage of either drug is harmless. Each gram of substance M contains 10 units of D1 and 8 units of drug D2 and each gram of substance N contains 2 units of D1 and 4 units of D2. Now suppose that both M and N contain an undesirable drug D3, 3 units per gram in M and 1 unit per gram in N. Find how many grams of substances M and N should be taken in order to meet the requirements and minimize the intake of D3 at the same time. **[10]**

Q8) Explain numerical methods pertaining to Chemical engineering. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-821

[Total No. of Pages : 2

[6585]-216
M.E. (Chemical Engineering)
ADVANCED THERMODYNAMICS
(2017 Pattern) (Semester - III) (Paper - III) (509114)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) a) Explain the main types of binary LLE solubility diagrams with neat figures in detail. **[5]**

b) Derive the following relation for a 2-phase binary LLE system at constant pressure : **[5]**

$$\ln\frac{\gamma_2^{\alpha}}{\gamma_2^{\beta}} = \ln\frac{1-x_1^{\beta}}{1-x_1^{\alpha}}$$

Q2) At 318 K and 24.4 kPa, the composition of the system ethanol (1) and toluene (2) at equilibrium is $x_1 = 0.3$ and $y_1 = 0.634$. The saturation pressure at the given temperature for the pure components are, $P_1^{\circ} = 23.06$ kPa and $P_2^{\circ} = 10.05$ kPa, respectively, Calculate : **[10]**

a) The liquid-phase activity coefficients .

b) The value of G^E/RT for the liquid phase

Comment on the Non-ideality of the system.

Q3) Acetylene is catalytically hydrogenated to ethylene at 1120°C and 1 bar according to the following reactions: **[10]**

$$C_2H_2 \rightarrow 2C + H_2 \text{ (I)}$$
$$2C + 2H_2 \rightarrow C_2H_4 \text{ (II)}$$

The equilibrium constants of the individual reactions are :

$K_1 = 4 \times 10^5$, $K_{11} = 2.5 \times 10^{-6}$

Determine the equilibrium composition of the product stream if equimolar mixture of acetylene and hydrogen is fed to the reactor.

P.T.O.

Q4) Explain in detail about the effects of following factors on the reaction equilibrium from thermodynamic point of view : **[10]**

a) Pressure for gas-phase reactions

b) Temperature

c) Effect of inerts concentration

Q5) Explain in detail about the Microstates and Gibb's Ensembles with descriptive figures. **[10]**

Q6) Discuss about the Onsager Reciprocal Relations Law in terms of non-equilibrium thermodynamics in detail. **[10]**

Q7) Explain the thermodynamic aspects of Conductors and Superconductors along with appropriate graphs and mathematical relations. **[10]**

Q8) Write a short note on the thermodynamics of Biochemical systems. **[10]**

Total No. of Questions : 8]

SEAT No. :

PE-822

[Total No. of Page : 1

[6585]-217

M.E. (Environmental Engineering) (Chemical)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERING

(2017 Pattern) (Semester - I) (509131)

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

Instructions to the candidates:

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

Q1) Discuss with cases the spearmans rank correlation coefficient limits. **[10]**

Q2) Explain coefficient of variance in detail. **[10]**

Q3) Use Cohen's method to estimate the mean and variance of a censored sample of n = 30 that is lognormally distributed. The 30 individual values (x_1, x_2,.....x_{30}) are not given but assume that a logarithmic transforamations $y = ln\,(x)$ will make the distribution normal with mean η_y and variance σ_y^2.**[10]**

Q4) Discuss relation between moments about mean in terms of moments about any point. **[10]**

Q5) State the advantages of completly randomized experimental design. **[10]**

Q6) Discuss the phases of experimental design. **[10]**

Q7) Explain graphical method for sequntial sampling. **[10]**

Q8) Discuss optimality test in detail. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-823

[Total No. of Pages : 2

[6585]-218

M.E. (Chemical Engg.) (Environmental)

ENVIRONMENTAL MANAGEMENT

(2017 Pattern) (Semester - I) (509132)

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

Instructions to the candidates :

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

Q1) a) Explain various approaches for Environmental Management in detail. **[5]**

b) Discuss the various advantages of Environmental Auditing. **[5]**

Q2) a) Discuss Green funding and taxes. **[5]**

b) Explain EIA evaluation in India. **[5]**

Q3) a) What is 74th amendment of the constitutions. **[5]**

b) What are the impacts of Economical sub-systems of environment on Business? **[5]**

Q4) a) Explain how a rule is notified and gazetted. **[5]**

b) What are the different environmental acts? **[5]**

Q5) Explain in detail the difference between Regulation, Law and Notification Bills. **[10]**

P.T.O.

Q6) Discuss the various factory acts passed by Indian government. **[10]**

Q7) Explain the role of Maharashtra Pollution Control Board for sustainable growth. **[10]**

Q8) Write short note on Ministry of Environment and Forests. **[10]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

PE-824

[Total No. of Pages : 1

[6585]-219

M.E. (Chemical) (Environmental)

ENVIRONMENTAL CHEMISTRY

(2017 Pattern) (Semester - I) (509133)

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

Instructions to the candidates:

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

Q1) Discuss greenhouse gases and global warming. **[10]**

Q2) What are Colloids? Explain the use of colloids in Enviromental Engineering with suitable example. **[10]**

Q3) What are the ill effects of particulate matter on human health? **[10]**

Q4) Explain the Fate of chemicals in aquatic environment. **[10]**

Q5) What are the sources of particulate matter in Thermal power plant? **[10]**

Q6) What is CO2 capture mechanism? **[10]**

Q7) What is Anion exchange capacity? How to determine it? **[10]**

Q8) What are different effects of Air pollutants on materials? **[10**



Total No. of Questions : 8]

SEAT No. :

PE-825

[Total No. of Pages : 2

[6585]-220

M.E. (Chemical Engineering(Environmental))

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - I) (509134)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) Explain the various steps in Research Process in detail. **[10]**

Q2) Discuss in detail about the Ethics in Research. Why Ethics is important in Research? **[10]**

Q3) What is Factorial Designs? **[10]**
Explain the:
a) Simple Factorial Design
b) Complex Factorial Design.

Q4) The following table shows per acre production data for three varieties of wheat, each grown on 4 plots. Set up an ANOVA table for the data and infer if the variety differences are significant or not. **[10]**

Plot of Land	**Per acre production**		
	Variety of wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

Data required: The 5% F-Limit from the standard F-table is F(2, 9) = 4.26.

Q5) Describe the mathematical method for one-way (or single factor) ANOVA technique. **[10]**

Q6) Discuss about the role of computers in Research with important applications. **[10]**

Q7) Write a short note on Research Report Preparation. **[10]**

Q8) Write a short note on the International Scenario of Intellectual Property Rights. **[10]**

❖❖❖

Total No. of Questions : 8]

SEAT No. : [ ]

PE-826

[Total No. of Pages : 1

[6585]-221

M.E. Chemical (Environmental Engineering)

WASTEWATER TREATMENT & DESIGN

(2017 Pattern) (Semester - II) (509137)

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

Instructions to the candidates:

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

Q1) Explain Mass balance analysis during design of process. **[10]**

Q2) A dual - medium filter bed composed of sand and anthracite is to be used for the filtration of settled secondary effluent. If the effective size of the sand in the dual- medium filter is to be 0.55 mm, determine the effective size of the anthracite to avoid significant intermixing. Data:
Specific gravity for sand = 2.65, Specific gravity for anthracite = 1.7. **[10]**

Q3) Explain Configurations of ideal and non-ideal reactors. **[10]**

Q4) Discuss general features of conventional rapid granular medium depth filters. **[10]**

Q5) Explain the concept ozone chemistry. **[10]**

Q6) Discuss Biological treatment processes in detail. **[10]**

Q7) Determine the capacity of a chlorinator for a treatment plant with an average wastewater flow of 1000 m^3/d. The peak daily factor for the treatment plant is 3.0 and the maximum required chlorine dosage is to be 20 mg/L. **[10]**

Q8) Explain activated sludge process. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-827

[Total No. of Pages : 1

[6585]-222

M.E. (Chemical) (Environmental Engineering)

SOLID WASTE MANAGEMENT

(2017 Pattern) (Semester - II) (509138)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) Explain the environmental effect of solid waste. Give the chemical and biological properties of the solid waste. **[10]**

Q2) Describe the industrial solid waste and illustrate the compositions of solid waste. **[10]**

Q3) Give the various types of solid waste collection system and explain the general consideration for waste storage at source. **[10]**

Q4) Analyze the economics of solid waste generation rate. **[10]**

Q5) Give the advantages and disadvantages of various technological options of composting of solid waste. **[10]**

Q6) Illustrate the parameters affecting on the recovery of energy from the solid waste. **[10]**

Q7) Explain the elements of functional management plan for solid waste system. **[10]**

Q8) Develop and explain the essential components required and site selection for the land filling methods. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-828

[Total No. of Pages : 1

[6585]-223

M.E. (Environmental Engineering) (Chemical)

INDUSTRIAL WASTE TREATMENT

(2017 Pattern) (Semester - II) (509139)

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

Instructions to the candidates :

1) ***Answer any 5 questions.***
2) ***Assume suitable data, if necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted***

Q1) Write down Classification and characterization of Industrial wastewater. **[10]**

Q2) Write short notes Vacuum Filters. **[10]**

Q3) Explain Secondary treatments for industrial Wastewater. **[10]**

Q4) What are clean up and cleaner technologies? Explain with proper examples.**[10]**

Q5) Explain the treatment techniques for the removal of organic pollutants from industrial wastewater with neat flow diagram. **[10]**

Q6) Draw the flow sheet for treatment of Paint industry waste and focus on its cost benefit analysis with details. **[10]**

Q7) Define COD. Explain the procedure to determine COD. What are the limitations of COD test? **[10]**

Q8) Write notes on: Flow chart for Waste Stabilization Ponds for Wastewater Treatment. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-829

[Total No. of Pages : 1

[6585]-224

M.E. (Chemical - Environmental Engineering)

REMOTE SENSING AND GIS APPLICATION IN ENVIRONMENTAL ENGINEERING

(2017 Pattern) (Semester - III) (509143)

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

Instructions to the candidates:

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

Q1) Explain the principle of classifying Imaging sensor. Explain thermal sensing system. **[10]**

Q2) What is remote sensing? Explain its application? Discuss Passive Remote Sensing system. **[10]**

Q3) Explain in brief about the various satellites in orbit and their sensors. **[10]**

Q4) What are the limitations of GIS? Explain it with case study. **[10]**

Q5) a) What is FCC and explain its significance in identification of surface object? **[5]**

b) Explain Digital system of remote sensing. **[5]**

Q6) Explain concept of G.I.S. and state any four components of G.I.S. **[10]**

Q7) Explain different GIS software's and explain one of them with suitable example. **[10]**

Q8) How remote sensing is useful in watershed management? Explain. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-830

[Total No. of Pages : 2

[6585]-225

M.E. Chemical Engg. (Environmental)

INDUSTRIAL POLLUTION PREVENTION & CLEANER PRODUCTION

(2017 Pattern) (Semester - III) (509144)

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

Instructions to the candidates:

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

Q1) Explain the Industrial Ecology concept. **[10]**

Q2) Discuss the historical evolution of pollution prevention and control. **[10]**

Q3) Explain the role of government and industry in pollution prevention and cleaner Production. **[10]**

Q4) Discuss the role of Process and Equipment Optimization in pollution prevention and control. **[10]**

Q5) Explain the applications of Internet Information pollution prevention and cleaner **[10]**

i) Production.

ii) Raw material substitution

P.T.O.

Q6) Discuss the technical and Environmental Feasibility analysis of pollution prevention and cleaner production program. **[10]**

Q7) Write a note on Environmental Audit for industrial pollution prevention and control. **[10]**

Q8) Write short notes on Elements of life cycle assessment. **[10]**



Total No. of Questions : 8]

SEAT No. :

PE-831

[Total No. of Pages : 3

[6585]-226
M.E. Civil-(Construction & Management)
APPLICATIONS OF STATISTICAL METHODS IN CONSTRUCTION
(2017 Pattern) (Semester - I) (501021)

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

Instructions to the candidates :

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

Q1) a) Explain Baye's Theorem. **[4]**

b) A bag contains 6 white, 4 red and 10 black balls. Two balls are drawn at random. Find the probability that they will both be black. **[5]**

OR

Q2) a) Explore the challenges and limitations associated with implementing random sampling technique in quality control for concreting activities. **[5]**

b) A population consists of 5 numbers 2, 3, 6, 8, 11 consider all possible samples of size 2, which can be drawn with replacement from this population. **[4]**

i) The mean of the population,

ii) Standard deviation of population,

iii) The mean of the sampling distributions of means

iv) Standard error of means

Q3) a) Explain Types of Correlation. **[4]**

b) Discuss concept of statistical significance in correlation analysis and how it is determined using hypothesis testing methods. **[5]**

OR

Q4) a) Write a note on analysis of variance on one way and two classification. **[5]**

b) Explain regression analysis with suitable example with respect construction industry. **[4]**

Q5) a) Explain Griffi's model with example from construction industry. Also explain the concept of Downtime cost of equipment. **[8]**

b) What is simulation explain with suitable example and what is significance of random numbers? **[8]**

OR

Q6) a) A Civil Engineering Firm is planning the construction of new highway interchange. They want to simulate traffic flow through the interchange to optimize its design and assess potential congestion during peak hours Fifteen sets of traffic flow data (in vehicles per hour) for different time periods are collected : **[8]**

1)	800	2)	850
3)	900	4)	950
5)	1000	6)	1050
7)	1100	8)	1150
9)	1200	10)	1250
11)	1300	12)	1350
13)	1400	14)	1450
15)	1500		

using simulation analysis, determine average traffic flow, peak traffic flow and evaluate whether the interchange can handle the anticipated traffic volume effectively.

b) A standardized procedure is expected to produce washers with very small deviation in their thicknesses. Suppose that 10 such washers were chosen and measured. **[8]**

If the thicknesses of these washers were, in mm,

0.123, 0.133, 0.124, 0.125, 0.126, 0.128, 0.120, 0.124, 0.130, 0.126

What is a 90 percent confidence interval for the standard deviation of the thickness of a washer produced by this procedure?

Q7) a) Explain the sensitivity Analysis mathematical model. in detail. **[8]**

b) The plumber uses valves at the rate of 2500 valves per year the cost the single valve is Rs. 1, while the inventory carrying cost is Rs. 20. The valves are supplied in lots and the cost of procurement including transportation cost is Rs. 40 per order. **[8]**

i) Suppose that the actual consumption of these valves increased by 500 valves over the year against the estimated requirements of 2500 valves determine the extent of loss of the plumber incurred by using the EOQ.

ii) If the order cost including transportation cost reduces by 25% what is its effect on total cost?

OR

Q8) a) What is down time cost of equipment? What the different situation where the down time cost is applicable. Give suitable example. **[8]**

b) Raj Agrotech' monthly demands 2500 bags of Urea. The unit cost of bag is Rs. 375/- and inventory carrying cost per unit per annum is 20% of average inventory cost. If the cost of procurement is Rs. 70/- **[8]**

Determine :

i) EOQ

ii) Number Order per annum

iii) Total cost of purchasing

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-832

[Total No. of Pages : 2

[6585]-227
M.E. Civil (Construction & Management)
MANAGEMENT & PROJECT PLANNING IN CONSTRUCTION
(2017 Pattern) (Semester - I) (501022)

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Figure to the right indicate full marks.***
3) ***No cells phones allowed, electronic calculators allowed.***
4) ***Assume data of required.***

Q1) a) Discuss in brief about factors bearing on size of firms. **[4]**

b) Elaborate the process about cash management for small constuction firm. **[5]**

OR

Q2) a) What are various modules available in ERP software. **[3]**

b) Explain the precedence network diagram with suitable example. **[6]**

Q3) a) Following is the data of project which needs to be crashed. State the activity to be crashed initially and by how many day? **[6]**

Name of activity	Preceding activity	Normal duration (days)	Cash duration	Cash slope
A	-	8	6	Rs. 1000/day
B	-	7	6	Rs. 500/day
C	B	10	7	Rs. 750/day
D	A,C	12	9	Rs. 450/day
E	B	9	7	Rs. 550/day
F	C	6	5	Rs. 800/day
G	C,E	8	7	Rs. 600/day

b) Explain the photography technique for work measurement an a construction site. **[3]**

OR

Q4) a) Explain the string diagram what are its applications? **[3]**

b) With the following data, draws. **[6]**

Name of activity	Preceding activity	Normal Duration (days)
A	-	8
B	A	9
C	A	4
D	A	6
E	B	8
F	C	3
G	C	10
H	B,F	11
I	B,D,F,G	9
J	B,F,D,G	7
K	E,H,I	5

Q5) a) Write the personal protective equipments. That can be used on construction site. State the used of each. **[8]**

b) Write saftey procedures for a concrete pump on site. **[8]**

OR

Q6) a) Explain Minimum Wages Act. **[8]**

b) What are direct indirect costs in an accident. **[8]**

Q7) a) What is meant by job Evaluation? Explain any one technique. **[8]**

b) Write note on :

i) Artificial Neusal Networks **[4]**

ii) B/M in construction **[4]**

OR

Q8) a) For the project of design of water distribution system for a town prediction of water requirement in the next 30 years is a crucial issue. Out of the fazzy logic technique, ANN & GA which technique is more suitable & Why? **[8]**

b) Write note on

i) Genetic algorithm **[4]**

ii) Softwares for Artificial intelligence techniques **[4]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PE-833

[Total No. of Pages : 2

[6585]-228

M.E. Civil (Construction & Management)

CONSTRUCTION TECHNOLOGY

(2017 Pattern) (Semester - I) (501023)

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and clearly state.***
5) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) Write a note on micro tunneling. **[4]**

b) Explain jet grouting technique and its applications. **[5]**

OR

Q2) a) Explain the factors affecting soil compaction. Explain any one method of soil compaction in detail. **[5]**

b) What are the main technologies used for soil compaction in underground construction? Explain any one technology in brief. **[4]**

Q3) a) Enlist various methods of shuttering. Explain any one in detail. **[4]**

b) Explain the construction details of precast concrete piles with their advantages and disadvantages. **[5]**

OR

P.T.O.

Q4) a) Explain the destructive and non-destructive pile load tests in detail. **[5]**

b) Explain in detail tremie method of underwater concreting with a suitable diagram. **[4]**

Q5) a) Explain the construction process of 'Single Wall Cofferdam' with a neat sketch. **[8]**

b) What are the factors affecting the design of cofferdams? Explain the different measures for prevention of leakage in cofferdams. **[8]**

OR

Q6) a) Explain the operations involved in diaphragm wall construction using bentonite slurry used for pedestrian tunnels. **[8]**

b) Explain the construction process of 'Ohio river type wood sheeting cofferdam' with a neat sketch. **[8]**

Q7) a) What is a Well foundation? Explain the different shapes of well foundation with their merits and demerits. **[8]**

b) Explain the preventive measures to be taken to avoid 'Caisson sickness' in detail. **[8]**

OR

Q8) a) Explain the construction procedure of box caisson with a neat sketch. **[8]**

b) Explain the various components of well foundation with a neat sketch. **[8]**

Total No. of Questions : 10]

SEAT No. : ____

PE-834

[Total No. of Pages : 2

[6585]-229

M.E. (Civil) (CONSTRUCTION & MANAGEMENT)

TQM IN CONSTRUCTION

(2017 Pattern) (Semester - I) (501024)

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q. 2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.and Q.9 or Q.10***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary and clearly state.***
5) ***Use of cell phone is prohibited in the examination hall***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) Explain the different methods required in training employees of construction Industry workers. **[5]**

b) Explain training and development impact human resources outcomes of works. **[5]**

OR

Q2) a) Explain the training process model in construction Industry. **[5]**

b) Explain evaluating the training effort and outcome in construction Industry. **[5]**

Q3) a) Explain will facilitators ensure that all members have an opportunity to participate in quality of work in construction. **[5]**

b) Explain the organization recognize and reward the contributions of quality circle members in construction Industry. **[5]**

P.T.O.

OR

Q4) a) Explain three ISO standards that Organisations use to ensure their Concrete quality on site. **[5]**

b) Explain certification mean my business will gain more customers in construction sector. **[5]**

Q5) a) Explain the main challenges of implementing quality management system in construction sector. **[5]**

b) Explain the benefits of quality management system in an organization **[5]**

OR

Q6) a) Explain the need of TQM in construction industry **[5]**

b) Explain the four main elements of TQM as applied to project control and project management. **[5]**

Q7) a) Explain in details "Workman ship is important parameter of quality work' in construction sector. **[5]**

b) Explain in details barriers affecting on the implementation of TQM in construction sector. **[5]**

OR

Q8) a) Explain in details probability distribution Six sigma ratings in concrete properties. **[5]**

b) Explain in details six sigma as an effective tool in TQM. **[5]**

Q9) a) Explain application of Six Sigma tool in RCC Work in building construction. **[5]**

b) Explain application of Six Sigma tool in DLC and PQC layers in road construction. **[5]**

OR

Q10) a) Six Sigma is a methodology which uses in building construction. **[5]**

b) Explain in details the steps civil engineer should take to improve quality of work as per customer service based on data in construction. **[5]**

Total No. of Questions : 10]

SEAT No. :

PE-835

[Total No. of Pages : 2

[6585]-230

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

CONSTRUCTION CONTRACTS ADMINISTRATION AND MANAGEMENT

(2017 Pattern) (Semester - II) (501027)

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

Instructions to the candidates :

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8. and Q.9 or Q.10.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figure to the rght indicatec full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of cell phone is prohibited in the examination hall.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) Define contact as per the Indian Contract Act (1872) and explain the term Valid contract. **[5]**

b) Define the role of project management services in construction project? **[5]**

OR

Q2) a) What are the potential remedies available to a contractor in case of a breach of contract by the client? **[5]**

b) Briefly explain the methods of inviting tenders and their suitability for different types of construction projects. **[5]**

Q3) a) State the circumstances under which the lowest tender is rejected? **[5]**

b) Discuss circumstances under which the contractor shall be entitled to terminate the contract. **[5]**

OR

Q4) a) Discuss the advantages of DRB over dispute resolution mechanism **[5]**

b) What are model forms of contracts and why are they important in the construction industry? **[5]**

P.T.O.

Q5) a) Explain Construction Claims, Types of construction claims and explain settlement of claims. **[5]**

b) List the FIDIC Colour-Coded Books and describe the purpose of the Red Book. **[5]**

OR

Q6) a) Explain the purpose of the Design & Build Contract under FIDIC conditions. **[5]**

b) What are the common causes of construction claims and how can they impact a project? **[5]**

Q7) a) Describe the clauses of escalation of cost: What is an arbitral proceeding. Explain with example.

i) Escalation formula for Material cost.

ii) Escalation formula for Labour cost. **[5]**

b) Explain in detail defect - liability period **[5]**

OR

Q8) a) Explain in detail difference between 1940 Act and 1996? **[5]**

b) Discuss the advantages and limitations of using mediation for resolving construction disputes. **[5]**

Q9) a) Define Indian Arbitration and Conciliation Act 1996. **[5]**

b) Explain the procedure for appealing against an arbitral award under the Arbitration and Conciliation Act, 1996? **[5]**

OR

Q10)a) Explain Conciliation and its provisions in the Act; also explain conduct of conciliation and arbitral proceedings? **[5]**

b) Discuss how the Arbitration and Conciliation Act, 1996 aligns with international arbitration practices **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-836

[Total No. of Pages : 2

[6585]-231

M.E. Civil (Construction & Management)

PROJECT ECONOMICS AND FINANCIAL MANAGEMENT

(2017 Pattern) (Semester - II) (501028)

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

Instructions to the candidates :

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q.5 or Q. 6 and Q. 7 or Q. 8.***
2) ***Use suitable data if necessary.***

Q1) a) What are the objectives of any successful busyness firm. **[5]**

b) How current knowledge about present economic situation is important factor for any busyness. **[4]**

OR

Q2) a) What are the various risks in construction management. **[5]**

b) What is technical appraisal? Explain with suitable example. **[4]**

Q3) a) What is break even analysis, Explain with neat sketch. **[5]**

b) What are different source of long term finance. **[4]**

OR

Q4) a) Discuss role of financial institutes in construction sector. **[5]**

b) Explain SEBI and its regulations. **[4]**

Q5) a) Discuss in detail about Escrow accounts in PPP projects. **[6]**

b) The financial details of a firm as on 2023 are as follows prepare balance sheet of the company. **[10]**

Particulars	Amount (Rs.)	Particulars	Amount (Rs.)
Equity share capital	100000	Creditors	5000
Stock	7500	Bill payable	3750
Cash at bank	2500	General Reserve	12500
P & l account	10000	Debtor	5000
Bill receivable	7500	Provident funds	7500
O/S expenses	1250	Preliminary expenses	10000
Land & building	50000	Plant & machinary	57500

OR

Q6) a) Discuss method of reporting and recording site accounts between project and head office. **[6]**

b) A construction company undertakes large contracts. The following are particulars related to contract carried during the year ended on 31st march 2021. Prepare a contract account and find out national profit. How much profit is transferred to P & L account and in reserve. **[10]**

Particulars	Amount (Rs.)	Particulars	Amount (Rs.)
Work certified	165000	Wages accured on 31st March	5800
Work not certified	5200	Direct expenses	6300
Plant installed at site	12500	Material on hand	3500
Values of plant	18500	Material returned on store	850
Material sent to site	76400	Direct expenses accured	900
Labor charges	70000	Contract price	210000
Establishment charges	5900	Cash received from contract	150000

Q7) a) Draft detail project appraisal report for construction of a Dam, considering technical, financial, social, environmental aspects. **[8]**

b) Discuss in detail any case study on Rapid bus transit system and its pros and cons. **[8]**

OR

Q8) a) Draft detailed project appraisal report for construction of a closed conduit canal system to replace existing open canal, considering technical, financial, social, environmental aspects. **[8]**

b) Discuss in detail a case study of any government funded construction project with respect to project appraisal, raising of fund, risks involved, cost analysis etc. **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-837

[Total No. of Pages : 3

[6585]-232

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

OPERATIONS RESEARCH

(2017 Credit Pattern) (Semester - II) (501029)

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

Instructions to the candidates :

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

Q1) a) Explain the various models are used in operations research? **[4]**

b) Explain the different steps used to solve simplex method of linear programming. **[5]**

OR

Q2) a) For each of the following function show whether it is convex, concave or neither. **[5]**

i) $f(x) = x^3 + x^4$

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

b) Define the following terms : **[4]**

i) Constraint

ii) Objective function

Q3) a) Give the different applications of Assignment problem in OR? **[4]**

b) Explain the following terms : **[5]**

i) Unimodal function

ii) Local and Global maxima

OR

P.T.O.

Q4) a) In a job shop operation, five jobs may be performed on any of four machines. The hours required for each job on each machines are presented in the following table : **[5]**

	1	2	3	4
A	13	14	16	10
B	12	13	15	12
C	11	12	12	8
D	16	16	18	14
E	10	12	13	12

The plant foreman would like to assign the jobs so that the total time is minimized. Find the optimal solution which job will be left unassigned?

b) Give different application of Dynanic programming in civil Engineering. **[4]**

Q5) a) Use Lagrange multiplier technique to **[8]**

Minimize $Z = 5x_1 + x_2 - (x_1 - x_2)^2$

Subject to $x_1 + x_2 = 4$

$x_1, x_2 \geq 0$

b) Max. $Z = 6x_1 - 2x_1^2 + 4x_2 - 2x_2^2 - 2x_1x_2$ with initial value (1, 1) using steepest gradient method. **[8]**

OR

Q6) a) Write algorithm of Newton's modified method. **[8]**

Minimize $f(x) = 2x_1^2 + 2x_1x_2 + 2x_2^2 - 4x_1 - 6x_2$

Taking $x^0 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$. Use Newton's modified method.

b) Use method of Lagrangian multiplier to solve the following : **[8]**

Minimize $Z = 3x_1^2 + 2x_2 + 3x_3^2 + 10x_1 + 9x_2 + 16x_3 - 50$

Subject to $2x_1 + x_2 + 2x_3 = 40$

$x_1, x_2, x_3 \geq 0$

Q7) a) Four jobs 1, 2, 3, 4 are to be processed on each of the five machines A, B, C, D and E in the order ABCDE. Find the total minimum elapsed time if no passing of job is permilted. **[8]**

Machine job	A	B	C	D	E
1	7	5	2	3	9
2	6	6	4	5	10
3	5	4	5	6	8
4	8	3	3	2	6

b) Explain the criteria for replecement? Explain various cost associated with replacement analysis. **[8]**

OR

Q8) a) Aeroplane arrives at airport at an average rate of 8 planes per week and their arrival pattern follows poison distribution. On an average 12 planes are loaded and unloaded with exponential distribution per week so determine. **[8]**

i) The chance that a plane will be directly taken for loading and unloading and the proportion of time required for this process.

ii) The average queue length and no. of planes in the system.

iii) Average time spent by the plane waiting in the queue and in the system.

iv) The probability that there are two planes in the queue.

Given : A = 8 planes per week

B = 12 planes per week

b) Explain Monte Carlo simulation. Give the advantages and limitations of simulation technique. Also state the different applications of simulation in Civil Engineering. **[8]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

PE-838

[Total No. of Pages : 2

[6585]-233

M.E. (Civil - Construction & Management)

ENVIRONMENT & ENERGY FOR SUSTAINABLE CONSTRUCTION

(2017 Pattern) (Semester - III) (601033)

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

Instructions to the candidates:

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

Q1) a) Discuss the environmental challenges in highway construction in ecologically sensitive areas. **[4]**

b) How can fiscal impact analysis be integrated with socio-economic assessments to create more sustainable infrastructure projects? **[5]**

OR

Q2) a) Discuss the importance of integrating community participation in socio-economic assessment processes. **[4]**

b) Describe the potential natural/physical environmental impacts of constructing a dam. **[5]**

Q3) a) Assess the impact of the Energy Conservation Act on industries in India. **[4]**

b) What are Prototype Carbon Funds (PCF), and how do they contribute to global climate change mitigation efforts? **[5]**

OR

Q4) a) What challenges have arisen in the implementation of the Electricity Act, particularly regarding rural electrification? **[5]**

b) Explain the role of the Conference of Parties (COP) in implementing the objectives of the UNFCCC. **[4]**

P.T.O.

Q5) a) How can life cycle cost analysis be applied to assess the long-term benefits of energy-efficient technologies? **[8]**

b) Explain the concept of deferred payment financing and its application in energy-efficient projects. **[8]**

OR

Q6) a) What is the significance of government policies and incentives in promoting ESCO-based projects? **[8]**

b) Explain the key components of an energy-efficient project in the context of industrial applications. **[8]**

Q7) a) Explain the methodology involved in designing a CDM project for energy conservation. **[8]**

b) How has the UNFCCC addressed criticisms of the CDM process in recent years? **[8]**

OR

Q8) a) What are the key eligibility criteria for a project to qualify as a CDM project? **[8]**

b) Analyze the challenges and opportunities for India in leveraging CDM for sustainable development. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-839

[Total No. of Pages : 2

[6585]-234

M.E. (Civil) (Construction Management)

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - III) (601034)

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

Instructions to the candidates:

1) ***Solve Q.No.1 or 2, 3 or 4, 5 or 6, 7 or 8.***
2) ***Figures to the right side indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if necessary, stating it clearly.***

Q1) a) Write down Characteristics of a good research problem. **[4]**

b) Describe Different funding agencies in brief. **[5]**

OR

Q2) a) Explain elements and objectives of literature survey. **[4]**

b) What do you mean by literature survey? Explain its need. **[5]**

Q3) a) Explain need of literature survey in detail. **[4]**

b) Write down different methods of Errors in selecting a research problem. **[5]**

OR

Q4) a) Explain the criteria of goodness of a measurement scale **[4]**

b) What is a hypothesis? Explain basic concepts concerning testing of hypothesis. **[5]**

Q5) a) Explain approaches to qualitative and quantitative data analysis **[8]**

b) Explain various methods of factor analysis in brief. What is the difference between cluster analysis and factor analysis? **[8]**

OR

P.T.O.

Q6) a) What is the meaning of discrimination between groups? Compare regression analysis with discriminant analysis. **[8]**

b) What is the main objective of factor analysis? What is the difference between discriminant analysis and cluster analysis **[8]**

Q7) a) Write a short note on Documentation in the context of a research report. Explain the significance of a research report. **[8]**

b) Explain in detail methods of Testing of hypothesis in project writing. **[8]**

OR

Q8) a) Describe in brief, the structure of report. What do you mean by plagiarism? **[8]**

b) Mention the different types of report. Differentiate technical report and popular report. **[8]**



Total No. of Questions : 10]

SEAT No. :

PE-840

[Total No. of Pages : 2

[6585]-235

M.E. Civil (Environmental)

ENVIRONMENTAL LEGISLATION AND MANAGEMENT SYSTEMS

(2017 Pattern) (Semester - I) (501061)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Question 09 and question 10 are compulsory.***

Q1) Explain the concept of "Absolute Liability" with relevant case laws in environmental jurisprudence. **[5]**

OR

Q2) Describe the functions and constitutional framework of the State Pollution Control Board (SPCB) and Central Pollution Control Board (CPCB) **[5]**

Q3) Evaluate the legal and procedural aspects of sampling and the role of appellate authorities under the Water and Air Acts. **[5]**

OR

Q4) Examine the importance of Coastal Zone Regulation in the context of environmental sustainability. **[5]**

Q5) Write a detailed note on: Environment (Protection) Act 1986: Genesis of the Act. **[5]**

OR

Q6) Discuss the role of NGOs in raising international and national concerns for environmental protection. **[5]**

P.T.O.

Q7) Discuss the key powers and functions of the Maharashtra Pollution Control Board (MPCB) under the Water and Air Acts. **[5]**

OR

Q8) Write a detailed note on: Public Interest Litigation. Support your answer with suitable example. **[5]**

Q9) a) Differentiate between fossil fuel and renewable energy? Support your answer with suitable example. **[8]**

b) Explain in detail: Role of SPCB in implementation of various notifications issued by Central Govt. under Environmental (Protection) Act, 1986. **[7]**

Q10) a) Explain in detail: Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier. **[8]**

b) Explain in detail, concept of cradle to grave management for hazardous waste management. **[7]**



Total No. of Questions : 12]

SEAT No. :

PE-841

[Total No. of Pages : 2

[6585]-236

M.E. (Civil - Environmental Engineering)

ENVIRONMENTAL CHEMISTRY & MICRO-BIOLOGY

(2017 Pattern) (Semester - I) (501062)

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Figures to the right indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator and steam table is allowed.***

Q1) Explain hydrocarbons and categorize them with relevant examples. **[5]**

OR

Q2) Describe the law of conservation of mass with a suitable example. **[5]**

Q3) How does solar radiation affect the acidic nature of sulfur dioxide (SO_2) and nitrogen oxides (NO_x)? **[5]**

OR

Q4) Explain the influence of gravitational force on the settling behavior of particulate pollutants. **[5]**

Q5) Discuss the environmental pollution caused by pesticides, citing an example. **[5]**

OR

Q6) Explain the chemical processes involved in the degradation of hydrocarbons in the environment. **[5]**

P.T.O.

Q7) What are the symptoms of acute aflatoxin poisoning? Elaborate. **[5]**

OR

Q8) Define photosensitizer additives and explain their mechanism of action. **[5]**

Q9) a) Identify the key research areas in environmental microbiology and provide examples of their practical applications. **[7]**

b) What are enzymes? Explain their role in metabolic reactions and environmental biodegradation. **[7]**

OR

Q10) a) Provide a detailed comparison between autotrophic and heterotrophic microorganisms. **[7]**

b) Explain the significance of the cell wall in microorganisms with an appropriate sketch. **[7]**

Q11) a) Describe the industrial significance of *Saccharomyces cerevisiae* in microbiology. **[8]**

b) Compare aerobic and anaerobic biological treatment processes. Discuss the role of microorganisms in the activated sludge process. **[8]**

OR

Q12) a) What are the benefits of using microorganisms in antibiotic production? Discuss. **[8]**

b) Differentiate between selective and differential media, providing suitable examples. **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-842

[Total No. of Pages : 3

[6585]-237

M.E. (Civil- Environmental)

PHYSICO-CHEMICAL PROCESS FOR WATER AND WASTEWATER TREATMENT

(2017 Pattern) (Semester - I) (501063)

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

Instructions to the candidates:

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

Q1) a) Explain in detail, with suitable example the mass balance principle used in treatment processes. **[4]**

b) Discuss the followings **[5]**

i) Repulsive and Attractive Potentials

ii) Destabilization of Colloids

OR

Q2) a) Explain the process for determination of rate parameters in CMF reactors. **[5]**

b) Differentiate between orthokinetic and perikinetic flocculation. **[4]**

Q3) a) What do you mean by disinfection? Discuss the factor affecting efficiency of disinfection. **[4]**

b) Design of high rate single stage trickling filter for treating domestic sewage flow of 5 MLD using N.R.C. use following data. **[5]**

i) BOD_5 of raw sewage = 250mg/I

ii) BOD removed during primary treatment30%

iii) Organic loading rate = 0.8Kg/m^3/d

iv) Hydraulic loading rate =15m^3/m^2/d

v) Recirculation ratio = 2

Determine volume of filter media, Dimensions of trickling filter, Efficiency of trickling filter.

OR

P.T.O.

Q4) a) A filter unit of size 4m × 8m. After filtering 8000 m^3/day in 24 hours of period, the filter is backed washed at the rate of 10 lit/m^2/sec for 10 minutes. Compute the average filtration rate, quantity and percentage treated water used in washing and the rate of wash water flow in each trough. The unit has four troughs. **[5]**

b) Write note on mobile sewage treatment plants. **[4]**

Q5) a) Assuming suitable design criteria and following characteristics of domestic wastewater, design a UASB reactor system to treat an average 5.0 MLD flow of wastewater. Assume up flow velocity of 0.5m per hour. **[8]**

Given data

i) Influent BOD = 318 mg/I

ii) Influent COD = 840 mg/I

iii) Influent TSS = 400 mg/I

iv) Influent VSS = 300mg/I

v) Desired effluent BOD = 105mg/I or less

b) Enlist methods of sludge dewatering. Explain any one method in detail. **[8]**

OR

Q6) a) Design an aerobic digester to treat the waste sludge produced by the activated sludge treatment plant. Assume that the following conditions apply: **[8]**

i) Quantity of sludge to be digested = 2057 kg TSS/d

ii) Min Temp for Winter and Max Temp for summer operation =15°C and 25°C

iii) Volatile solid reduction in winter = 40%

iv) Minimum SRT for winter condition = 60 d

v) Waste sludge concentrated to 3%

vi) Specific gravity of Waste sludge =1.03

vii) Sludge Concentration in the digester =70%

viii) k_d at 15°C = $0.06d^{-1}$

ix) Volatile fraction of digester TSS= 0.80

x) Air temperature in diffused air system = 20°C

b) Enlist various methods of sludge disposal. Explain any one method in detail. **[8]**

Q7) a) Enlist and explain the factors influencing adsorption from aqueous solutions. **[8]**

b) What are the common pretreatment methods required before water enters an RO unit? Why are they necessary? **[8]**

OR

Q8) a) Explain the principle of ion exchange. What are the typical applications of cation and anion exchange in water treatment? **[8]**

b) Estimate quantity and quality of the waste stream and the total quantity of water that must be processed, from a reverse osmosis facility that is to produce 4000m^3/d of water to be used for industrial cooling operations. Assume that both the recovery and rejection rates are equal to 90% and that the concentration of bed stream is 400 g/m^3 **[8]**

❖❖❖

Total No. of Questions : 12]

SEAT No. :

PE-843

[Total No. of Pages : 2

[6585]-238

M.E. (Civil)(Environmental)

ENVIRONMENTAL SANITATION

(2017 Pattern) (Semester - I) (501064)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Your answers will be valued as a whole.***
3) ***Assume suitable data, if necessary.***

Q1) Define epidemiology and its significance in public health. **[5]**

OR

Q2) Discuss the classification and characteristics of microorganisms responsible for communicable diseases. **[5]**

Q3) What are the preventive measures for fly breeding in urban areas? **[5]**

OR

Q4) What are the key stages in the life cycle of mosquitoes? **[5]**

Q5) Define industrial sanitation and its importance in public buildings. **[5]**

OR

Q6) What are industrial poisons and how do they affect worker's health? **[5]**

Q7) What are the key features of low-cost excreta disposal systems? **[5]**

OR

Q8) What is emergency sanitation and why is it important during natural disasters? **[5]**

Q9) a) Compare and contrast domestic storage tanks and flushing storage tanks in terms of purpose, design and installation. **[7]**

b) What are the key considerations in selecting materials and equipment for the water supply system in a building? **[7]**

OR

P.T.O.

Q10) a) Explain the role of flushing storage tanks in building water supply systems. Discuss their design and operational requirements. **[7]**

b) Explain how water supply systems are integrated into the overall plumbing design of a building. **[7]**

Q11) a) Compare the single stack system and one-pipe system with their advantages and disadvantages. **[8]**

b) Discuss the various types of traps used in building drainage systems. Explain their function and importance in maintaining sanitary conditions. **[8]**

OR

Q12) a) Compare and contrast gully traps, intercepting traps and other types of traps commonly used in building drainage systems. Provide examples of where each type would be applicable. **[8]**

b) Describe the design principles for a wash basin or lavatory basin, highlighting the materials, size and installation requirements for an efficient plumbing system. **[8]**



Total No. of Questions : 12]

SEAT No. :

PE-844

[Total No. of Pages : 2

[6585]-239

M.E. (Civil - Environmental Engineering)

INDUSTRIAL WASTE WATER MANAGEMENT

(2017 Pattern) (Semester - II) (501067)

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, or Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.***
2) ***Figures to the right side indicate full Marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data if necessary.***
5) ***Use of electronic pocket calculator and steam table is allowed.***

Q1) Discuss the significance and mechanisms of neutralization, precipitation, and flotation in industrial wastewater treatment. **[5]**

OR

Q2) What are bioassay tests, and why are they important in toxicity analysis? **[5]**

Q3) How air stripping useful in removing Volatile Organic Compounds (VOCs) from wastewater. **[5]**

OR

Q4) What is the principle behind the membrane separation process? **[5]**

Q5) Compare the effluent composition and treatment methods in the food processing and dairy industries. **[5]**

OR

Q6) Discuss any two methods used for treating effluents in the sugar industry.**[5]**

Q7) Discuss any two toxic substances commonly found in pharmaceutical effluents. **[5]**

OR

Q8) What is the importance of oil-water separators in refineries? **[5]**

P.T.O.

Q9) a) How do CETPs handle variability in wastewater characteristics from different industries? Discuss the challenges in treating mixed effluents and the importance of pre-treatment at the source. **[7]**

b) How can CETPs incorporate zero discharge principles in their design and operation? **[7]**

OR

Q10) a) How do CETPs handle variability in wastewater characteristics from different industries? Discuss the challenges in treating mixed effluents and the importance of pre-treatment at the source. **[7]**

b) Discuss the economic implications of setting up and operating a CETP. How can financial models, such as public-private partnerships (PPP) support the sustainable functioning of CETPs? **[7]**

Q11) a) Discuss, why is flow equalization necessary in a wastewater treatment plant? **[8]**

b) Explain the principle and mechanism of adsorption as a treatment method. **[8]**

OR

Q12) a) Enlist and discuss the factors effecting the efficiency of polymer coagulation in dye wastewater treatment. **[8]**

b) Discuss in details about the limitations of the adsorption method in dye wastewater treatment. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-845

[Total No. of Pages : 2

[6585]-240

M.E. Civil (Environmental)

AIR POLLUTION AND CONTROL

(2017 Pattern) (Semester - II) (501068)

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

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat figures wherever necessary.***
4) ***Assume necessary data.***
5) ***Use of scientjfic calculators is allowed.***

Q1) a) What are the limitations of deterministic air quality models? **[4]**

b) A stack in an urban area is emitting 80 g/s of NO. It has an effective stack height of 100 m. The wind speed at stack height is 5.65 m/s. It is a clear summer day with the sun nearly overhead (stability class B). **[5]**

$\sum_y$=290m, σ_z= 220 m.

Estimate the ground level concentration at:

i) 2 km downwind on the centreline and

ii) 2 km downwind, 0.1 km off the centreline

OR

Q2) a) What are the assumptions in Gaussian modelling for the estimation of pollutant concentrations? **[4]**

b) An industry utilizes 0.3 ML (million litres) of oil fuel per month. It has also been estimated that for every 1 ML fuel oil burnt in the factory, per year, the quantities of various pollutants emitted are given as: PM = 2.9 t/yr, SO_2 = 60 t/yr, NO_x = 8 t/yr, HC = 0.4 t/yr, CO = 0.5 t/yr. Calculate height of chimney required to be provided for safe dispersion of pollutants assuming 300 working days in a year. **[5]**

Q3) a) What is the difference between physical and chemical adsorption for gaseous contaminant control system? **[4]**

b) Calculate the minimum size of the particle that will be removed with 100% efficiency from gravitational settling chamber under the following conditions **[5]**

i) Air : Horizontal velocity - 1.2 m/s, temperature - 75°C

ii) Particle : SP. Gr. - 1.5

iii) Chamber : Length - 10 m, height - 1.5 m

iv) At 75°C, viscosity of air - 2.1×10^{-5} kg/ms.

OR

Q4) a) What are the requirements of electrostatic precipitation process? Also enlist the operational issues related to ESP. **[4]**

b) Find the collection efficiency of a horizontal flow, single stage electrostatic precipitator consisting of two sections formed by plates 4 m wide and 6 m high on 25 cm centers, handling a gas flow of 2.5 m^3/s. Assume that a migration velocity is 12 cm/s. **[5]**

Q5) a) Explain with a neat sketch location of sampling ports and traverse points. **[8]**

b) What is iso kinetic sampling? Explain with a neat sketch. Why is it required? **[8]**

OR

Q6) a) What are the recommended criteria for siting the monitoring stations? Write the current national ambient air quality standards for PM_{10}, $PM_{2.5}$, SO_2 and NO_2. **[8]**

b) Discuss basis and statistical considerations of sampling sites. **[8]**

Q7) a) Explain the sources and remedial measures to control odour. **[8]**

b) What are the causes of indoor air pollution? Explain the method of mechanical ventilation system used for control of indoor air pollution. **[8]**

OR

Q8) a) List and explain the factors affecting indoor air quality. **[8]**

b) What are the various sources of odour? How the measurement of odour can be carried out? **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PE-846

[Total No. of Pages : 2

[6585]-241

M.E. (Civil - Environmental Engineering)

SOLIDWASTE AND HAZARDOUS WASTE MANAGEMENT

(2017 Pattern) (Semester - II) (501069)

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

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Each question carries equal marks.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Write note on Proximate and Ultimate analysis of MSW. **[4]**

b) Discuss Hauled container collection system. **[5]**

OR

Q2) a) Explain the direct load and discharge load Transfer station. **[4]**

b) Explain the functional elements of Solid Waste Management. **[5]**

Q3) a) Explain the types of composting **[4]**

b) Determine the area required for a new landfill site with a projected life of 20 years for a population of 150000 generating 25 kg per household per week. Assume the density of waste is 500kg/m3. A planning restriction limits the height of the landfill to 10m. Assume 3.5 persons per household.**[5]**

OR

Q4) a) Explain in detail the economical aspect of solid waste management. **[4]**

b) Explain in details the Pyrolysis and Incineration. **[5]**

P.T.O.

Q5) a) What are the different techniques involved in resource recovery? Explain in details. **[8]**

b) Explain in detail the potential health and environmental risks associated with improper biomedical waste management. **[8]**

OR

Q6) a) Explain the various methods for disposal of Nuclear and Radioactive waste. **[8]**

b) What are the different methods used for separating the solid waste? **[8]**

Q7) a) Explain in details Electronics waste management. **[8]**

b) Explain the characteristics of Hazardous waste management. **[8]**

OR

Q8) a) Write a detail note on TCLP test. **[8]**

b) Explain the Stabilization and solidification of Hazardous waste management. **[8]**



Total No. of Questions : 12]

SEAT No. :

PE-847

[Total No. of Pages : 2

[6585]-242
M.E. (Civil - Environmental Engineering)
ENVIRONMENTAL IMPACT ASSESSMENT
(2017 Pattern) (Semester - III) (601073)

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12***
2) ***Figures to the right indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator and steam table is allowed.***

Q1) What is the role of public participation in EIA? **[5]**

OR

Q2) What are project thresholds in the context of EIA? **[5]**

Q3) Discuss about interaction matrix methodologies **[5]**

OR

Q4) Differentiate between environmental indices and environmental indicators. **[5]**

Q5) How is the type and quantity of air pollutants identified during an environmental impact assessment? **[5]**

OR

Q6) Discuss any two methods used for predicting noise levels in an environment. **[5]**

Q7) What are the steps involved in assessing the impact of a project on groundwater quality? **[5]**

OR

Q8) What role does mitigation play in environmental impact assessment? **[5]**

P.T.O.

Q9) a) Explain how stakeholder engagement contributes to the evaluation of alternatives in the EIA process. **[7]**

b) What are the key principles of resettlement and rehabilitation in the context of large-scale development projects? **[7]**

OR

Q10)a) Explain the methods used to predict and assess the impact of developmental projects on cultural resources. **[7]**

b) How are the impacts on the socioeconomic environment predicted and assessed during an EIA process? **[7]**

Q11)a) Enlist and discuss the steps involved in obtaining environmental clearance for construction projects. **[8]**

b) Discuss the followings- **[8]**

i) Rapid EIA

ii) Comprehensive EIA

iii) Environmental Management Plan (EMP)

iv) Post-environmental monitoring

OR

Q12)a) Explain the procedure for conducting a public hearing as part of the EIA process, and discuss its importance for stakeholder engagement. **[8]**

b) Discuss the key components of an Environmental Management Plan (EMP) and their importance in project implementation. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-848

[Total No. of Pages : 2

[6585]-243

M.E. Civil (Environmental)

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - III) (601074)

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

Instructions to the candidates:

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

Q1) a) What is a research hypothesis? Why is it important? **[4]**

b) How does a literature survey help in identifying research gaps? **[5]**

OR

Q2) a) Outline the major steps involved in the research process **[5]**

b) What are the key elements that should be included in a comprehensive literature survey? **[4]**

Q3) a) How is data classified in research? Explain with examples. **[4]**

b) Differentiate between the null hypothesis and the alternative hypothesis with examples. **[5]**

OR

Q4) a) What are the key criteria of good measurement in research? **[5]**

b) What are the key steps involved in qualitative data analysis? **[4]**

P.T.O.

Q5) a) What do you mean by multivariate analysis? Explain how it differs from bivariate analysis. **[8]**

b) Why discriminate use of average is very essential for sound statistical analysis? Explain in details. **[8]**

OR

Q6) a) What are different types of analysis of data? Give the significance of each. **[8]**

b) How many discriminant functions would you obtain in a 4 group discriminant analysis and why? What do you mean by misclassification in discriminant analysis? **[8]**

Q7) a) Describe, in brief, the layout of a research report, covering all relevant points. **[8]**

b) Enlist different factors to be considered for effective presentation with an example. **[8]**

OR

Q8) a) What are different types of reports? Describe the formulation of report. **[8]**

b) What is Plagiarism? What are the different tools available to check plagiarism? **[8]**



Total No. of Questions : 12]

SEAT No. :

PE-849

[Total No. of Pages : 3

[6585]-244
M.E. (Civil)
(Geotechnical Engineering)
ADVANCE SOIL MECHANICS
(2017 Pattern) (Semester - I) (501121)

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

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and mention it clearly.***
5) ***Use of non-programmable calculator is allowed.***

Q1) Write a short note on Mohr's circle construction. **[4]**

OR

Q2) What is stress-strain relationship in soil? **[4]**

Q3) What is stress path? Explain stress path for the cases **[4]**

i) Effective stress path ii) Total stress path

OR

Q4) Explain the concept of limiting equilibrium and factor of safety for slope stability analysis. Also explain the general procedure for locating the critical failure plane. **[4]**

P.T.O.

Q5) Using Rankine's theory of earth pressure, draw the active earth pressure diagrams for the following cases of Cohesionless Soil: **[4]**

a) Dry horizontal backfill

b) Backfill with uniform surcharge

c) Submerged backfill

d) Inclined backfill

OR

Q6) Describe stability of retaining wall against overturning, sliding and bearing capacity failure. **[4]**

Q7) State the 3-D consolidation equation and mention the assumptions made for 3-D consolidation. **[4]**

OR

Q8) Enlist the effects of smear zone on radial consolidation. **[4]**

Q9) a) Explain an elastic-soil-spring method of vibration for analysis of foundations. Also, state the assumptions made in the theory. **[6]**

b) What is the effect of footing shape on vibration response? **[6]**

c) Explain the terms: **[4]**

i) Frequency ii) Resonance

OR

Q10) a) Explain linear elastic weightless spring method. **[6]**

b) state and explain the dynamic response of embedded block foundation. **[6]**

c) How do you determine mass spring constant and damping factor for a vibrating system. **[4]**

Q11) a) Describe the design criterias for foundation of rotary machine. **[6]**

b) Write a short note on: **[6]**

Construction details of machine foundations.

c) How would you determine the natural frequency of a machine foundation system. **[6]**

OR

Q12) a) Explain "use of isolators method" in vibration isolation with neat sketches. **[6]**

b) Describe the following methods of vibration isolation: construction of open or slurry filled trenches, sheet pile and concrete walls. **[6]**

c) Describe the need of vibration isolation in machine foundations. **[6]**

Total No. of Questions : 8]

SEAT No. :

PE-850

[Total No. of Pages : 2

[6585]-245

M.E. Civil (Geotechnical Engg.)

GROUND IMPROVEMENT TECHNIQUES

(2017 Pattern) (Semester - I) (501122)

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

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks..***

Q1) a) Which are the different clay minerals? Explain characteristics of any one. **[5]**

b) Write a short note on electrical effects in clay minerals. **[4]**

OR

Q2) a) State the different methods of soil stabilization and explain any one. **[5]**

b) Describe the behaviour of chemically stabilized soils. **[4]**

Q3) a) Explain electro-osmosis. **[5]**

b) Describe process of dynamic consolidation. **[4]**

OR

Q4) a) Write a short note on stone column. **[5]**

b) Write a note on mechanism of bituminous stabilization. **[4]**

Q5) a) Discuss granular trench stabilization. **[8]**

b) Discuss the design consideration of sand drains. **[8]**

OR

P.T.O.

Q6) a) Discuss the importance of total and differential settlement giving examples. **[8]**

b) Explain Design consideration of sand drains. **[8]**

Q7) a) Explain Permeation Grouting and Jet Grouting. **[8]**

b) State and explain various types of grout. **[8]**

OR

Q8) a) Explain hydro-fracture grouting and compaction grouting. **[8]**

b) Draw and explain the grouting equipments. **[8]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

PE-851

[Total No. of Page : 1

[6585]-246
M.E. (Civil) (Geotechnical Engineering)
ROCK MECHANICS
(2017 Pattern) (Semester - I) (501123)

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

Instructions to the candidates:

1) ***Attempt any 5 questions from the 8 questions.***
2) ***Figure to the right indicates full marks.***
3) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Neat diagram must be drawn wherever necessary.***

Q1) a) Explain Flat Jack method of rock stress determination. **[4]**

b) What are the different index properties of rock mechanics? Explain any one in detail. **[6]**

Q2) a) Discuss Modes of failure of rocks. **[5]**

b) What is creep in rock? Explain the influence of time on rock deformation. **[5]**

Q3) a) Explain Factors affecting Rupture behavior of rock. **[5]**

b) Explain Rock failure in compression. **[5]**

Q4) a) Explain Failure propagation in rock masses. **[5]**

b) Write a note on structural discontinuities in rock masses. **[5]**

Q5) a) Explain foundation anchoring. **[4]**

b) Explain principal of limit equilibrium method for the analysis of rock structure. **[6]**

Q6) a) Explain approximate methods for two dimensional limit equilibrium analysis. **[5]**

b) Write a note on stress and deflection in rock under footing. **[5]**

Q7) a) Explain plastic behavior around tunnels. **[6]**

b) Write a note on rock slopes. **[4]**

Q8) a) Explain the kinematic analysis of rock mechanics. **[6]**

b) Write a note on shotcreting. **[4]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-852

[Total No. of Pages : 2

[6585]-247

M.E. Civil (Geotechnical Engg.)

GEO-ENVIRONMENTAL ENGINEERING

(2017 Pattern) (Semester - I) (501125)

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

Instructions to the candidates :

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

Q1) a) State the different characteristics of solid waste? Explain any one. **[4]**

b) Discuss on field evolution of permeability. **[5]**

OR

Q2) a) Explain the process of solid waste determination. **[4]**

b) Discuss in brief sources and effect of sub-surface contamination. **[5]**

Q3) a) What aspects are being considered for planning and design in waste disposal in land fill? **[5]**

b) State the various disposal methods and explain any one. **[4]**

OR

Q4) a) State types of barrier materials used in land fill and explain any one. **[4]**

b) Describe Ash pond and Trailing ponds in brief. **[5]**

P.T.O.

Q5) a) State any four advantages and disadvantages of landfill method. **[8]**

b) Discuss properties and Geotechnical reuse of waste. **[8]**

OR

Q6) a) Explain the different engineering properties of solid waste. **[8]**

b) Discuss the process of reclamation of old waste dump. **[8]**

Q7) a) Discuss in detail single and double lined landfill. **[8]**

b) Describe “land fill construction”. **[8]**

OR

Q8) a) Describe application of Geo-synthetics in waste disposal design. **[8]**

b) State the different types and application of clay liners. **[8]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. : ____

PE-853

[Total No. of Pages : 2

[6585]-248

M.E. (Civil - Geotechnical Engg)

ADVANCE FOUNDATION ENGINEERING

(2017 Pattern) (Semester - II) (501127)

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

Instructions to the candidates:

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

Q1) a) Discuss the modes of shear failure. **[4]**

b) A sampling tube of 98 mm diameter and 2 mm thick. It is fitted with cutting edge. The inside diameter of cutting edge is flushed with sampling tube. The cutting edge is 3 mm thick. Compute inside clearance, outside clearance, and area ratio. Comment on sample collected by tube. **[5]**

OR

Q2) a) A square footing is founded on clay deposit. The depth of the foundation is 2 m, and the width is 3 m. The unconfined compressive strength of the clay is 95 kPa, $\gamma b = 16.28\ kN/m^3$. What is the gross safe bearing capacity of the foundation? FOS = 3. Use Skempton's analysis. **[5]**

b) Explain the significant depth for foundation. **[4]**

Q3) a) Briefly describe cantilever sheet pile. **[4]**

b) Explain design steps of raft foundation by conventional (rigid) method. **[5]**

OR

Q4) a) Enlist the different types of sheet pile walls with sketches. **[5]**

b) State in which conditions the raft foundation is preferred. **[4]**

P.T.O.

Q5) a) Explain Feld's rule for group efficiency of piles. Determine the efficiency of group of nine piles (3×3) by Feld's rule. **[8]**

b) A 3 × 3 pile group with pile diameter and pile length of 300 mm and 10m respectively is embedded in soft clay with Cohesion of 70 kN/m^2. The spacing between the piles (both ways) is 90 cm and adhesion factor is 0.6. Calculate the capacity of the pile group. Take factor of safety = 2.5. Bearing resistance neglected for the piles. **[8]**

OR

Q6) a) Discuss the cyclic pile load test. **[8]**

b) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of piles were 30 cm and 9 m respectively. If the unconfined compression strength of the clay is 90 kN/m^2, and the pile spacing is 90 cm centre to centre, what is the capacity of the group? Assume the factor of safety of 2.5 and adhesion factor of 0.75. **[8]**

Q7) a) Enlist the types of coffer dams and explain any one type coffer dam. **[8]**

b) Describe the methods to correct tilts and shifts during well sinking. **[8]**

OR

Q8) a) Discuss about design analysis of well foundation. **[8]**

b) Discuss the well sinking operation with sketches. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. : ____

PE-854

[Total No. of Pages : 2

[6585]-249

M.E. (Civil) (Geotechnical Engineering)

CONSTRUCTION METHODS IN GEOTECHNICAL ENGINEERING

(2017 Pattern) (Semester - II) (501128)

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

Instructions to the candidates:

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

Q1) a) Describe the term "micro piling". **[4]**

b) Explain in detail circular cofferdam. **[5]**

OR

Q2) a) Write a note on "Construction of Precast and Cast-in-situ piles. **[4]**

b) Describe the procedure of setting and driving of sheet piles. **[5]**

Q3) a) Discuss, how Cofferdam will be destroyed by surge. **[4]**

b) Explain in detail Site and foundation preparation of Caissons. **[5]**

OR

Q4) a) Explain in brief Bucket method and Tremic method for construction of seal of cofferdam. **[4]**

b) Describe the procedure of construction of pneumatic caisson with sketch. **[5]**

Q5) a) Write notes on over brake control and pre-splitting. **[8]**

b) Discuss blast hole design and factors affecting on it. **[8]**

P.T.O.

OR

Q6) a) Enlist various drilling equipment and explain any one in detail. **[8]**

b) Write down the selection criteria of explosives for rock excavations. **[8]**

Q7) a) Explain tunneling by TBM and its types. **[8]**

b) Write notes on shield tunneling and sinking caisson method. **[8]**

OR

Q8) a) Explain Single stage and Multistage method of tunneling. **[8]**

b) Explain how is tunneling in moderately firm rocks and ground carried out? **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-855

[Total No. of Pages : 2

[6585]-250

M.E. (Civil) (Geotechnical Engineering)

STABILITY OF SLOPES AND EARTH DAMS

(2017 Pattern) (Semester - II) (501129)

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

Instructions to the candidates:

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

Q1) a) Compare the Bishop's and Swedish slip circle method for slope stability. **[4]**

b) Explain in detail Failure of Earthen Dams. **[5]**

OR

Q2) a) Discuss the Earthen Dam in detail and explain factors affecting its design. **[4]**

b) Explain in detail Limit Equilibrium Methods of slope Stability. **[5]**

Q3) a) Draw a neat sketch of Earthen dam indicating all its component Parts. **[5]**

b) Explain in Detail forces acting on Earthen Dam. **[4]**

OR

Q4) a) Explain how to determine Seepage Discharge in Earthen Dam and also explain methods to reduce the pore pressure in earth dams. **[4]**

b) Explain in Detail Earthquake effects on stability of Earthen Dam. **[5]**

Q5) a) Write Short Note on Earthen Dam Instrumentation. **[8]**

b) Explain with neat sketches various types of piezometers used in Earthen Dam Instrumentation. **[8]**

P.T.O.

OR

Q6) a) Discuss "Distributed fiber optics temperature tools and vibrating wire settlement cells used in Earthen Dam Instrumentation" **[8]**

b) Write Working principle of Inclinometers and Vibrating Wire Pressure Cell used in Earthen Dam Instrumentation. **[8]**

Q7) a) Write Short Note on "Reinforced Earth Steep Slopes & process of Soil Nailing" **[8]**

b) Discuss in Detail "Landslides - Causes and Remedial Measures" **[8]**

OR

Q8) a) Write Short Note measures taken for stabilization of unstable slopes. **[8]**

b) Explain in Detail Use of Geo-synthetics for railway embankment for High Speed Trains. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. : ____

PE-856

[Total No. of Pages : 2

[6585]-251

M.E. (Civil) (Geotechnical Engineering)

GEOTECHNICAL EARTHQUAKE ENGINEERING

(2017 Pattern) (Semester - III) (601133)

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

Instructions to the candidates:

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

Q1) a) Discuss 'Elastic Rebound Theory'. **[4]**

b) What is soil-structure interaction? Why is it important in geotechnical engineering? **[5]**

OR

Q2) a) Explain the steps for strong motion recording with the help of seismographs. **[4]**

b) Distinguish between 2-d and 3-d ground response analysis methods. **[5]**

Q3) a) Discuss 'Development of design parameters' for ground motion. **[4]**

b) What is liquefaction? Describe the phenomenon and the conditions under which it occurs in soils. **[5]**

OR

Q4) a) Explain 'Seismic Reflection Test'. **[4]**

b) Explain evaluation of liquefaction hazards. **[5]**

Q5) a) Discuss Ground Response Analysis. **[8]**

b) Write a note on "stability of earthen dam during earthquake". **[8]**

OR

P.T.O.

Q6) a) Explain Development of deformation analysis by Goodman. **[8]**

b) What are the factors affecting stability of the dam? **[8]**

Q7) a) Explain in detail about 'EQ induced settlement'. **[8]**

b) Discuss 'Seismic Design of Retaining wall'. **[8]**

OR

Q8) a) Explain the factors that influence the dynamic response of retaining walls under seismic loading. **[8]**

b) Discuss different soil reinforcing techniques. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-857

[Total No. of Pages : 2

[6585]-252

M.E. (Civil) (Geotechnical Engineering)

RESEARCH METHODOLOGY

(2017 Pattern) (Semester - III) (601134)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and mention it clearly.***

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

b) Explain the importance of a good literature review. **[4]**

OR

Q2) a) Write short notes on styles of literature survey and strategies of literature survey. **[5]**

b) Explain clearly with examples the difference between applied and fundamental research. **[4]**

Q3) a) Write a note on "Rating scales as a Sampling technique" with examples. **[5]**

b) What are the methods of data collection? Explain. **[4]**

OR

Q4) a) Explain in brief various sampling techniques. **[5]**

b) What do you mean by testing of hypothesis? **[4]**

Q5) a) Explain with an example Correlation and regression analysis. **[8]**

b) Discuss factor analysis and discriminant analysis. **[8]**

OR

P.T.O.

Q6) a) Explain "Descriptive Statistics: Measures of Central Tendency, Measures of Dispersions, Measures of Skewness and Measures of Relationships". **[8]**

b) Explain the centroid method of factor analysis. **[8]**

Q7) a) Write down the characteristics of good Abstract, Introduction, Research Methods and Research Methodology. **[8]**

b) Discuss - Report writing is more an art that hinges upon practice and experience. Write a short note on Documentation in the context of a research report. **[8]**

OR

Q8) a) Write a research proposal for a suitable research problem (related to Geotechnical Engg.) to a funding agency with reference to the following terms- "Title, Introduction, origin of the problem, expected outcome, literature review, significance of study in context of current status, objectives, methodology year wise plan. **[8]**

b) Discuss the important points to be considered during presenting a research idea. Also write a note on patenting a research idea. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-858

[Total No. of Pages : 3

[6585]-257
M.E. Civil (Hydraulics)
OPEN CHANNEL HYDRAULICS
(2017 Pattern) (Semester - II) (501047)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***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 : **[5]**

i) Specific energy

ii) Critical flow and conditions

b) Derive equation for hydraulic jump in slopping rectangular channel. **[4]**

OR

Q2) a) For a constant specific energy of 2.1 N.m/N, calculate the maximum discharge that may occur in a rectangular channel 5 m wide. **[4]**

b) Discuss classification of hydraulic jump based on tail water depth. **[5]**

Q3) a) Draw M3, S1 and S2 profiles and discuss them in detail. **[5]**

b) State assumptions and derive spatially varied flow with decreasing discharge. **[4]**

OR

Q4) a) Explain in detail standard step method in gradually varied flow analysis. **[4]**

b) A mountainous stream carries a discharge of 8 m^3/s. At a location where the cross-section is rectangular with a depth of 0.2 m and width of 14 m, a Trench weir type intake is proposed to divert the flow. The rack is made of circular bars with diameter to spacing ratio of 1.04 giving an opening ratio of 0.49. The rack is of longitudinal parallel-bar-rack type. Estimate the minimum length of the rack required to completely divert the flow. A blockage by debris to an extent of 50% of rack opening can be assumed. **[5]**

P.T.O.

Q5) a) Explain in detail concept of uniformly progressive wave. **[8]**

b) A negative wave of height 0.75 m is produced in a rectangular channel due to the sudden lifting up of a gate. The initial dept upstream of the gate is 3.0 m. (i) Determine the discharge per unit width through the gate and the profile of the negative wave at 4.0 s after the gate is opened. (ii) What will be the discharge if the gate is lifted up by 2.0 m? **[8]**

OR

Q6) a) A sluice gate in a rectangular channel of width B is suddenly raised from a closed position. A negative wave produced by this action travels upstream. If h_0 = drawdown at the gate and y_1 = initial depth upstream of the gate, show that the discharge Q_0 through the gate is given by:**[9]**

$$\frac{Q_0}{B\sqrt{gy^3}} = 2\left[1 - \frac{h_0}{y_1}\right]\left(1 - \sqrt{1 - \frac{h_0}{y_1}}\right)$$

b) A rectangular channel carries a discharge of 1.5 m^3/s per mere width at a depth of 0.75 m. If the sudden operation of a sluice gate at an upstream section causes the discharge to increase by 33 per cent, estimate the height and absolute velocity of the positive surge in the channel. **[7]**

Q7) a) Define the problem of level pool routing. Describe a commonly used method of reservoir routing. **[8]**

b) Route the following flood hydrograph through a river reach for which Muskingum coefficients K = 8h and x = 0.25. **[8]**

Time(h)	0	4	8	12	16	20	24	28
Inflow(m^3/s)	8	16	30	30	25	20	15	10

OR

Q8) a) Explain briefly - i) Isochrone, ii) time of concentration, iii) linear reservoir, iv) linear channel. **[7]**

b) A small reservoir has the following storage elevation relationship. **[9]**

Elevation (m)	55	58	60	61	62	63
Storage($10^3 m^3$)	250	650	1000	1250	1500	1800

A spillway provided with its crest at elevation 60.00 m has the discharge relationship $Q = 15H^{3/2}$, where H = head of water over the spillway crest. When the reservoir elevation is at 58.00 m a flood as given below enters the reservoir. Route the flood and determine the maximum reservoir elevation, peak outflow and attenuation of the flood peak.

Time(hr)	0	6	12	15	18	24	30	36	42
Inflow (m^3/s)	5	20	40	60	50	32	22	15	10

Total No. of Questions : 8]

SEAT No. : ____

PE-859

[Total No. of Pages : 2

[6585]-262
M.E. (Civil Structures)
THEORY OF ELASTICITY AND PLASTICITY
(2017 Pattern) (Semester - I) (501001)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagram must be drawn whereever necessary.***
3) ***Figures to the right bracket indicate full marks.***
4) ***Assume suitable data, if necessary and clearly state.***

Q1) a) The state of stress at a particular point relative to the XYZ coordinates system is given by the stress matrix. **[5]**

$$\begin{bmatrix} 15 & 10 & -10 \\ 10 & 10 & 0 \\ -10 & 0 & 40 \end{bmatrix}$$

Determine the normal stress and magnitude of the shear stress on a surface intersecting the point and parallel to the plane given by the equation as

$$2x - y + 3z = 9$$

b) Derive the equilibrium equation in polar coordinate system. **[4]**

OR

Q2) a) Show that stress tensor is symmetrical. **[5]**

b) Write down the Airy's stress function for fourth degree polynomial from Pascal's triangle. **[4]**

Q3) a) Derive the stress equation of equilibrium without body forces for plane stress situation, if the cylinder ends are free to expand $\sigma_z = 0$ and uniform radial deformation. **[5]**

b) Obtain the expression of torsion for circular cross section as per classical Prandtl's theory. **[4]**

P.T.O.

OR

Q4) a) A spherical container of inner radius 'a' and outer radius 'b' subjected to internal pressure P1 and external pressure Po. Determine radial stress component and hoop stress component at a point. **[5]**

b) Derive the torsion equation of prismatic non circular bar subjected to torque 'T' according to St. Venant's theory. **[4]**

Q5) a) Derive the expression showing plastic stress strain relationship. **[8]**

b) Explain in brief Tresca's failure criteria with suitable example. **[8]**

OR

Q6) a) Define hardening rule. Also state the various factor affecting the plastic deformation. **[8]**

b) State the significance of theories of failures in structural engineering, and discuss Octahedral shear stress theory and Distortion energy theorem in details. **[8]**

Q7) a) Explain the elastic-plastic analysis of thick spherical shell due to internal pressure. **[8]**

b) Explain in brief plastic torsion and Nadia's Sand Heap analogy. **[8]**

OR

Q8) Derive the equation of thick cylindrical tubes in elastic-plastic analysis due to internal pressure and a longitudinal force 'P'. **[16]**

Total No. of Questions : 8]

SEAT No. :

PE-860

[Total No. of Pages : 3

[6585]-263
M.E. (Civil) (Structural Engineering)
STRUCTURAL DYNAMICS
(2017 Pattern) (Semester - I) (501002)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6; and Q.7 or Q.8.***
2) ***Figures in bold to the right, indicate full marks.***
3) ***Neat diagrams should be drawn whereever necessary.***

Q1) a) Find the equivalent stiffness for the structure shown in Fig.1. **[4]**

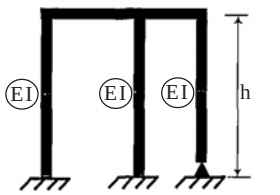


Fig. 1

b) What is logarithmic decrement? Derive its expression. **[5]**

OR

Q2) a) Derive the expression for the dynamic magnification factor. **[5]**

b) A body of mass 11.34 kg is suspended from a spring with stiffness 2333.76 N/m. At time t = 0, it has a downward velocity of 0.6096 m/s as it passes through the position of static equilibrium. Determine:

i) The displacement $x(t)$ as a function of time, measured from the position of static equilibrium

ii) The maximum velocity V_{max} attained by the mass

iii) The maximum acceleration a_{max} attained by the mass **[4]**

Q3) Find the steady state response of an undamped single degree of freedom system subjected to a ramp impulse as shown in Fig. 2 **[9]**

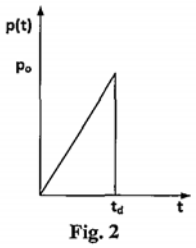


Fig. 2

P.T.O.

OR

Q4) Derive the expression for Duhamel integral. **[9]**

Q5) a) The plan of a building is shown in Fig. 3. The details are as follows:**[10]**

i) No. of storey – 2

ii) Floor to floor height – 3.2 m

iii) Size of columns – (230 × 450) mm

iv) Total load on each floor – 6 kN/m^2

v) Assume E = 25 GPa

Calculate the natural frequencies and plot the mode shapes.

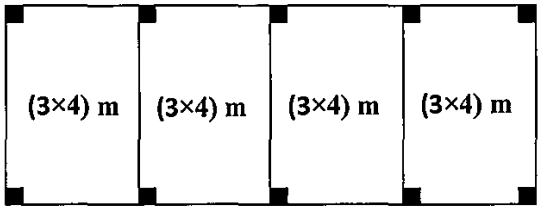


Fig. 3

b) Explain mass coupling, velocity coupling and, elastic coupling with suitable examples. **[6]**

OR

Q6) a) Calculate the Eigen values and Eigen vectors for the system shown in Fig.4. Consider m_1 = 100 kg, m_2 = 150 kg, m_3 = 400 kg and $k_1 = k_4$ 1000 N/m and $k_2 = k_3$ = 800 N/m. **[10]**

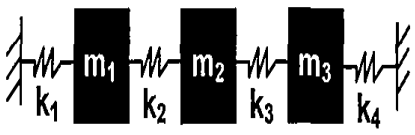


Fig. 4

b) Explain with an example why are the mass, damping, and stiffness matrices are symmetrical. **[6]**

Q7) a) For a uniform Euler-Bernoulli beam, derive the expression for natural frequencies for a simply supported beam. **[8]**

b) Using the Rayleigh method, estimate the fundamental frequency of a cantilever beam. Assume a suitable mode shape and show all steps in the calculation. **[8]**

OR

Q8) a) Explain how the boundary conditions influence both natural frequencies and mode shapes of a beam. Provide comparisons between simply supported, cantilever, and fixed-fixed beams. **[8]**

b) Describe the procedure to perform free vibration analysis of a cantilever beam using the Finite Element Method. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-861

[Total No. of Pages : 2

[6585]-264
M.E. (Civil Structural Engineering)
ADVANCED DESIGN OF STEEL STRUCTURES
(2017 Pattern) (Semester - I) (501003)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***The figures on right side indicates the marks.***
5) ***Use of Electronic pocket calculators is allowed.***
6) ***Use IS: 800-2007, IS: 800-1984, IS:801, IS:802, IS:811, SP-34 are allowed.***

Q1) Design a castellated beam using an ISMB 450 rolled steel section for an effective span of 10 m subjected to a uniform factored load of 40 kN/m. Include checks for web buckling and shear. **[9]**

OR

Q2) Design a tubular cantilever arm of a microwave tower projecting .1.5 m, carrying a load of 3 kN at its end. Use circular tubes and check for bending and deflection. **[9]**

Q3) a) Explain the structural configuration and functions of each component of a transmission tower. **[4]**

b) Describe different types of stiffened, un-stiffened and multiple stiffened elements with neat sketches. **[5]**

OR

Q4) Design a cold-formed steel compression member of length 2.5 m using a stiffened channel section. Include checks for overall buckling and local element buckling. **[9]**

Q5) a) State and explain different type of steel chimney with sketches. **[8]**

b) Explain the role of lining and joints in steel chimneys. What are the practical challenges in their design? **[8]**

P.T.O.

OR

Q6) a) Design the thickness and stiffeners for a 40 m tall cylindrical chimney with lining and insulation, subjected to wind load. **[10]**

b) State and explain design criterion of anchor bolt in steel chimney. **[6]**

Q7) a) State and explain different design forces for the chimney. **[8]**

b) A steel chimney carries wind load moment 15090 kNm and dead load, 920 kN rest on M20 grade of concrete. Design the foundation for the chimney. **[8]**

OR

Q8) A self supporting steel stack is 60 m high and its top diameter is 3m is to be designed for Pune. Design the plates of stack, base plate of stack and anchor bolt. **[16]**

Total No. of Questions : 8]

SEAT No. : ____

PE-862

[Total No. of Pages : 2

[6585]-265

M.E. (Civil) (Structures Engineering)

NUMERICAL METHODS IN STRUCTURAL ENGINEERING

(2017 Pattern) (Semester - I) (501004)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Figure to the right indicates full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) a) Enumerate the properties of a typical stiffness matrix with suitable example. **[4]**

b) Solve the linear system step by step by Gauss Jorden Method. **[5]**

$x + y + z = 5 \quad 2x + 3y + 5z = 8 \quad 4x + 5z = 2$

OR

Q2) a) Explain the importance and use of a transformation matrix. Derive the transformation matrix for a grid member. **[5]**

b) Explain the differences in Gauss Seidal and Gauss Jordan method for the solution of linear equations. Explain the convergence criteria and diagonal dominance with reference to above methods. **[4]**

Q3) a) Write a short note Gauss Quadrature method for numerical integration, Explain with illustration. **[4]**

b) Given $dy/dx = x^2 - y + 2$ At $x = 0$, $y = 1$. Calculate the value of y at $x = 0.1$ and 0.2 using an interval of 0.1. Use- Euler method. **[5]**

OR

Q4) a) Derive the 1 point and 2 point Gauss Quadrature formula and hence evaluate the integral and compare with exact value $\int_0^{0.8} \frac{\sinh x}{x} dx$ **[5]**

P.T.O.

b) When the values of y at values of x at uniform intervals are known, state how the area under the curve is to be calculated using Simpson's rule and Gauss Quadrature. **[4]**

Q5) a) Estimate the lowest buckling load of a uniform pin ended column of length L and flexural rigidity EI using three subintervals. Compare the approximate value obtained with the exact value given by Euler's critical load theory. **[8]**

b) A propped cantilever beam of 6m span is subjected to an uniformly distributed load of 10kN/m. Applying central difference formula dividing the beam in four equal parts, find the deflection at the nodal points, rotation at the simply supported end and moment at its fixed end. **[8]**

OR

Q6) a) Derive the biharmonic finite difference net for a plate simply supported at its edges. Explain how boundary conditions are incorporated. How are the shear forces and bending moments calculated? **[8]**

b) A simply supported uniform square plate of length 1.5 m supports a central point load of 12 kN along with uniformly distributed load 3 kN/m^2 over the entire plate.

Using finite difference method, estimate the deflection at the nodal points of the grid, dividing the plate into nine parts. **[8]**

Q7) a) Find a quadratic polynomial that fits the following data **[8]**

X	-3	-1	0	1	3
y = f(x)	2	1.5	1.4	1.5	2

b) What is spline interpolation function? How are they different from Lagrange's interpolation function? **[8]**

OR

Q8) a) Explain regression analysis with suitable example. **[8]**

b) Find the cubic spline for the following table of values, Hence evaluate $y(1.5)$ and $y(3)$. **[8]**

X	1	2	3	4
Y	1	4	12	6

Total No. of Questions : 8]

SEAT No. : ____

PE-863

[Total No. of Pages : 2

[6585]-266
M.E. (Civil-Structures)
FINITE ELEMENT METHOD
(2017 Pattern) (Semester - II) (501007)

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

Instructions to the candidates :

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

Q1) a) Define node in finite element analysis. What are the types of nodes? **[5]**

b) Write difference between finite element method and finite difference method. **[4]**

OR

Q2) a) Give any two examples of finite element modeling. **[4]**

b) Derive the element stiffness matrix for truss element by using potential energy approach. **[5]**

Q3) a) Explain concept of isoparametric elements with example. **[4]**

b) Write the properties of shape functions. **[5]**

OR

Q4) a) List the general steps of the finite element method. **[5]**

b) For a plane elasticity problem, derive the strain displacement matrix for the rectangular 2D-6 noded serendipity element. **[4]**

P.T.O.

Q5) a) Sate the salient features shear deformation theory with reference to finite element analysis. Explain shear locking phenomenon. **[8]**

b) Explain the Mindlin's plate element and briefly explain the formulation of stiffness matrix. **[8]**

OR

Q6) a) Explain the convergence requirements of displacement functions. Write a note on conforming and non-conforming elements with reference to plate elements. **[8]**

b) Derive the stiffness matrix for BFS. **[8]**

Q7) a) For axisymmetric element, write constitutive relations and hence obtain the element stiffness matrix for a typical triangular element for its application in solving a problem of cylinder subjected to internal pressure. **[8]**

b) How will you differentiate shell element in comparison with plate element. Write the strain displacement matrix for the curved shaped element. **[8]**

OR

Q8) a) Explain how axi-symmetric problems can be analyzed using axi-symmetric elements in Finite element method. **[8]**

b) i) Explain in detail 'Flat elements' in Finite element analysis.

ii) Write the displacement field for 4 noded degenerated shell elements. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-864

[Total No. of Pages : 2

[6585]-267
M.E. Civil (Structural Engg.)
THEORY OF PLATES AND SHELLS
(2017 Pattern) (Semester - II) (501008)

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

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q.5 or Q. 6 and Q. 7 or Q. 8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and clearly state.***

Q1) a) What are the assumptions made in pure bending of thin plates. **[5]**

b) Find the deflection equation for a plate subjected to hydrostatic pressure use Levy's basic equation for calculating deflection. **[4]**

OR

Q2) a) Derive the moment curvature in the case of pure bending of plates. **[5]**

b) Using Levy's method, obtain expression for lateral displacement 'w' of the plate a x b subjected to moments at the edges. Take origin at the center of the left edge find the central deflection. **[4]**

Q3) a) Obtain the expression for deflection in case of uniformly loaded circular plates with clamped edges. **[5]**

b) Differentiate between long shells and short shells. **[4]**

OR

Q4) a) A circular plate of radius 'a' is clamped at edges. The plate carries a load of intensity 'q' uniformly distributed over the entire surface of the plate. The thickness of the plate is 'h'. Analyze the plate from the basic principles and obtain the expression for bending moments at the center of the plate. **[5]**

b) Explain the following terminology of shell **[4]**

i) Membrane behavior

ii) Membrane equation

P.T.O.

Q5) a) Derive equilibrium equation for circular cylindrical shell using membrane and bending theory. **[8]**

b) What is intrinsic equation for parabolic shell, derive the general membrane solution for this type of parabolic shells subjected to self weight only.**[8]**

OR

Q6) a) State the application of membrane theory to pipe and hence derive an expression for N_x N_ϕ + and $N_{x\phi}$. **[8]**

b) A long circular pipe is subjected to edge moment M_0 and edge shear Q_o per unit circumferential length. Determine the expression for displacement. **[8]**

Q7) a) Enumerate the basic assumptions made in the analysis of cylindrical shells in the Schorer' s Theory. **[8]**

b) Derive the six equations of equilibrium of a shell element subject to bending. **[8]**

OR

Q8) a) Enumerate the basic assumptions made in the analysis of cylindrical shells in the D. K. J. Theory. **[8]**

b) Explain in details arch analysis for cylindrical shells. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. : ____

PE-865

[Total No. of Pages : 3

[6585]-268

M.E. Civil (Structural Engineering)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2017 Pattern) (Semester - II) (501009)

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

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Use of IS 456-2000, IS 1343, IS 1893, IS 3370 and Non-programmable calculator is allowed***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Mere reproduction from IS Code as answer, will not be given full credit.***
6) ***Assume any other data, if necessary.***

Q1) a) Explain Assumptions in Yield line Theory **[4]**

b) Design a grid slab for a floor of community hall 12 m×l4 m having a square grid of 2m. Use M25 and Fe 500 steel. **[5]**

OR

Q2) a) Draw yield lines for Right angled triangular slab, fixed at two sides making right angle, unsupported at third side. **[4]**

b) Design a grid slab for a floor of community hall 15m×18m having square grid of 1.5m. Take live load 4.5kN/m^2 and floor finish load l.5kN/m^2 Use M20 and Fe415. **[5]**

Q3) a) Explain with sketch why drop panel is provided in flat slab. **[4]**

b) An open square tank 6m×6m×4m deep and supported 8m above the ground level on beams and columns. Design the beam and column of a tank. Use M25 and Fe 500 steel. **[5]**

P.T.O.

OR

Q4) a) Design an interior panel of flat slab for flexure take live load of 5 kN/m^2 and floor finish load of 1.25 kN/m^2. The panels are 6m×6m in dimensions. Use M20 and Fe 500. **[5]**

b) Explain in detail wind load analysis of column for a water tank supported on four identical columns with their lower end fixed to the base and braced at intermediate levels. **[4]**

Q5) a) Design a circular bunker to store 300 tons of coal for the following. Density of coal = 9 kN/m^3, angle of repose is 28°. Use M25 and Fe500 steel. Draw the details of reinforcement in the side wall and hopper **[8]**

b) Design a square bunker to store 250 kN furnace slag. Unit weight of slag is 8000N/m^2. Angle of repose is 24°. Use M25 and Fe500. Draw reinforcement details. **[8]**

OR

Q6) a) Design a circular bunker to store 100 kN of coal take density of coal as 8.5kN/m^3 , angle of repose is 25°. Use M25 and Fe500 steel. Draw the details of reinforcement in side wall and hopper. **[8]**

b) A concrete silo of diameter 8m, with height of cylindrical portion of 18 m and contains and contains cement weighing 15 .2kN/m^3. The coefficient of friction between grain and grain is 0.31, the coefficient of friction between grain and concrete is 0.45 and angle of repose is 17.5°. Determine the lateral pressure at 6m interval on the walls of silo, **[8]**

Q7) a) A group of 20 piles are arranged in 4 rows and 5 in each row. The piles are 350mm in diameter and spaced 1m center to center. Each pile can carry 150kN load if it can act independently. Determine the carrying capacity of the pile group. **[8]**

b) Design a formwork for a slab of 4m×4m having thickness of 180mm. It is proposed to deposit concrete in one stage. **[8]**

OR

Q8) a) In a group of 25 piles of diameter 450mm and center to center spacing of pile being 1.2 m. The piles are arranged in square area. Each pile is 10m long and taking m = 0.7 and c=50kN/m^2. Ascertain whether the failure will occur with the piles acting individually or as a group. Also specify the failure load. **[8]**

b) Design a raft foundation for the following center to center distance of colunm in both directions is 2.8m. Taking column size as 350mm×350mm, working load on each column is 650kN. The depth of strata is 1.8m. Use M25 and Fe 500, SBC 100kN/m^2. Draw reinforcement details. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-866

[Total No. of Pages : 2

[6585]-269
M.E. (Civil) (Structural Engineering)
RESEARCH METHODOLOGY
(2017 Pattern) (Semester - III) (601013)

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

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q.5 or Q. 6 and Q. 7 or Q. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to the right side indicates full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write a note on "Types and Importance of Research Design". **[4]**

b) What is research design? Explain the different types of research designs and formulate a research design for your research problem. **[5]**

OR

Q2) a) What do you mean by research? Explain its significance in modern times. **[4]**

b) Describe the research problem. Describe the key points that the researcher should focus on while creating the research problem with suitable example. **[5]**

Q3) a) Explain the importance of good literature review. **[4]**

b) Explain the purpose of literature survey. Explain with example the purpose and use of three different literature sources. **[5]**

OR

Q4) a) Which method of primary data, do you think, is the best and why? **[4]**

b) How to write literature review to develop conceptual framework for research? **[5]**

P.T.O.

Q5) a) What do you mean by hypothesis testing? What is null hypothesis? **[8]**

b) Write a short note on: **[8]**

i) Factor analysis

ii) Cluster analysis

iii) Discriminant analysis

iv) Uncertainty analysis.

OR

Q6) a) What do you mean by regression? Explain linear and non-linear regression in detail with suitable examples. **[8]**

b) Enlist the important parametric tests for Hypothesis testing. Explain anyone. **[8]**

Q7) a) Write a research proposal for a suitable research problem (Any problem related to Civil Engineering can be considered) to a funding agency with reference to the following terms: Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. **[8]**

b) Describe in brief, the structure of report. What do you mean by plagiarism? **[8]**

OR

Q8) a) Explain in brief the following terms used in research. **[8]**

i) Research synopsis and

ii) Research report

b) Write a research proposal for a suitable research problem (Any problem related to Structural Engineering can be considered) to a funding agency with reference to the following terms: Title, Introduction, origin of the problem, expected outcome, literature review. Significance of the study in the context of current status, objectives, methodology, year wise plan. **[8]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-867

[Total No. of Pages : 2

[6585]-270

M.E. (Civil Structures)

ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

(2017 Pattern) (Semester - III) (601014)

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

Instructions to the candidates:

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

Q1) a) Explain the lessons learnt from the past earthquakes. **[5]**

b) Explain the various terms used for measurement of an earthquake. Also explain the seismic waves occurring during an earthquake and explain their salient parameters. **[4]**

OR

Q2) a) Explain in detail about any eight recent earthquakes occurred in India. Also explain the damages due to them. **[5]**

b) Explain the behavior of soil under seismic loading? What is the effect of soil - structure interaction in the design of important structures? **[4]**

Q3) a) Explain in brief the strength and stiffness irregularity in multistory RC buildings. **[5]**

b) Explain the capacity design concept for multistoried RC earthquake resistant building. **[4]**

OR

Q4) a) How unreinforced masonry infill wall panels in RC frame building affect the behavior of the building when subjected to earthquake load? **[5]**

b) Explain the member and structure ductility with respect to multi-storey RC building. **[4]**

P.T.O.

Q5) a) What is response spectrum? Differentiate between design spectrum and response spectrum. **[8]**

b) Give four virtue of good earthquake resistant design. Explain Strong column - Weak beam design concept. **[8]**

OR

Q6) a) Explain in detail in detail about the various codal provisions to be followed in the earthquake resistant design of buildings. **[12]**

b) Write short note on Push over analysis with suitable example. **[4]**

Q7) a) Explain about the design procedure of elevated water tank in detail. **[8]**

b) Explain the different types of shear wall with neat sketch. **[8]**

OR

Q8) a) Calculate time period of water tank whose mass is 300000 kg and stiffness is 2.5×10^8N/m. **[8]**

b) Explain about the design procedure of shear wall in detail. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-868

[Total No. of Pages : 2

[6585]-275

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

HYDROLOGY

(2017 Pattern) (Semester - II) (501087)

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

Instructions to the candidates:

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

Q1) a) Write a note on Synthetic Hydrograph. **[5]**

b) Explain Stanford Watershed Model. **[4]**

OR

Q2) a) Draw a flow chart for mathematical methods in hydrology and explain stochastic hydrology applications. **[6]**

b) Explain normal distribution (statistical) **[3]**

Q3) a) What is design flood? How it is finalized while designing hydraulic structure. **[4]**

b) Explain Pearson Type-II method **[5]**

OR

Q4) a) Write note on method of images for ground water management. **[5]**

b) Explain the Goodrich method of flood routing. **[4]**

Q5) a) Explain step by step design of tube well & also explain types and construction methods for tube wells. **[8]**

b) What are causes of ground water pollution? State effects of ground water pollution. What are the methods to treat polluted ground water.**[8]**

OR

P.T.O.

Q6) a) What affects the quality of ground water in India. **[8]**

b) Explain porous media models. **[8]**

Q7) a) Explain any one widely used method of ground water recharge. **[8]**

b) State various methods to conserve ground water and explain any two and also explain how it helps in management of water resources. **[8]**

OR

Q8) a) Explain sand tank model and transparent model for ground water modeling with neat sketches. **[8]**

b) Explain electric analog model for ground water modeling with neat sketches. **[8]**



Total No. of Questions : 12]

SEAT No. :

PE-870

[Total No. of Page : 1

[6585]-280
M.E. (Artificial Intelligence)
DATA PREPARATION AND ANALYSIS
(2017 Pattern) (Semester - I) (510502F)

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

Instructions to the candidates:

1) ***1. Attempt Q.1 or Q.2, Q.3 or 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 whenever necessary.***
3) ***Assume suitable data jf necessary.***

Q1) What are different potential sources of data ? How data is gathered? **[8]**

OR

Q2) Write a note on Data Discovery. **[8]**

Q3) Explain with suitable diagram Data Preparation Basic Models. **[8]**

OR

Q4) What is Data Normalization? Explain types of data normalization with suitable example. **[8]**

Q5) Why data transformation is required ? Explain Linear and Quadratic data transformation in detail. **[8]**

OR

Q6) Explain Transformations via Data Reduction in detail. **[8]**

Q7) What is Data exploration ? How it is done through summary statistics and plots. **[9]**

OR

Q8) What is Feature Engineering ? Explain in detail how feature selection and transformation is done. **[9]**

Q9) What is data Visualization ? What are different visualization techniques? **[8]**

OR

Q10)What are time series and Geo-located data ? Explain in detail. **[8]**

Q11)What is web scrapping ? How it can be handled? **[9]**

OR

Q12)What are open source tools for data preparation ? Explain any one tool in detail. **[9]**

❖❖❖

Total No. of Questions : 12]

SEAT No. :

PE-869

[Total No. of Pages : 2

[6585]-281

M.E. (Artificial Intelligence)

DATA MODELING AND VISUALIZATION

(2017 Pattern) (Semester - I) (510501)

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

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, Q.No.11or Q.12***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) What are the different stages of data visualization? Explain with an example. **[8]**

OR

Q2) Explain Fitt's Law and its importance in human visual perception. **[8]**

Q3) Differentiate between basic and advanced visualization techniques.When should one use advanced techniques like statistical measures over simple charts? **[8]**

OR

Q4) Explain the concept of scatter plots and histograms with suitable examples. **[8]**

Q5) How can networks and hierarchies be represented using visualization techniques? **[9]**

OR

Q6) Explain the concept of treemaps and shaded maps with real-world applications. **[9]**

P.T.O.

Q7) Explain the use of Google Chart API in high-dimensional data visualization **[8]**

OR

Q8) How does clustering aid in high-dimensional data visualization? Explain with a suitable technique and its advantages. **[8]**

Q9) Explain the perception of transparency and overlapping data with examples. **[8]**

OR

Q10) Explain the impact of Gestalt laws on data visualization. How does improper use of these laws lead to misleading insights? **[8]**

Q11) Discuss the role of Tableau in data visualization. Discuss the workspace and features of Tableau Desktop. **[9]**

OR

Q12) What are the different methods for evaluating the effectiveness of Visualization techniques? Discuss the criteria for evaluating the effectiveness of a visualization tool. **[9]**



Total No. of Questions : 8]

SEAT No. :

PE-871

[Total No. of Pages : 2

[6585]-282

M.E. (Artificial Intelligence/Computer Engg. & Computer AIDS)

BIO-INSPIRED OPTIMIZATION ALGORITHM

(2017 Pattern) (Semester - II) (510102)

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

Instructions to the candidates:

1) ***Answer ANY FIVE questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary***

Q1) a) What is the philosophy behind natural computing? **[4]**

b) Explain simulated annealing algorithm & it's typical implementation algorithm. **[4]**

c) What is natural computing? **[2]**

Q2) a) Explain Evolutionary strategies. **[4]**

b) Discuss Evolutionary programming. **[4]**

c) What is evolutionary computing? Write advantages of evolutionary computing. **[2]**

Q3) a) Write Ant colony optimization & write basic features of ACO Algorithm **[4]**

b) Explain Particle swarm optimization. **[4]**

c) Define swarm intelligence, write principles of swarm Intelligence. **[2]**

Q4) a) Discuss Cuckoo search algorithm & write rules of cuckoo search algorithm. **[4]**

b) Explain flower pollination. Write pseudo code of flower pollination. **[4]**

c) Explain self-tuning framework. **[2]**

P.T.O.

Q5) a) Explain in brief Artificial immune systems. **[4]**

b) Explain any TWO: **[4]**

i) Bone marrow

ii) Negative selection

iii) Clonal selection

c) Define continuous Immune network model. **[2]**

Q6) a) Discuss current trends &open problem of Artificial life. **[4]**

b) Explain Framstick architecture **[4]**

c) What is Artificial Life & Discuss scope of Artificial Life. **[2]**

Q7) a) Explain Genetic Algorithm. **[5]**

b) Explain Bat algorithm & discuss rules of Bat algorithm. **[5]**

Q8) a) Explain in brief Ant clustering Algorithm. **[5]**

b) Explain aiNet learning algorithm **[5]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-872

[Total No. of Pages : 2

[6585]-284

M.E. (Electronics & Communication) (VLSI Design)

DIGITAL IC DESIGN

(2017 Pattern) (Semester - I) (504702)

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

Instructions to the candidates :

1) ***Answer any five questions.***
2) ***Assume suitable data if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of nonprogrammable calculator is allowed.***

Q1) a) Implement SRAM, DRAM structure. **[5]**

b) Explain the concept of Setup time and hold time static with examples. **[5]**

Q2) a) List out the layout design rules and explain the concepts of stick diagram. **[5]**

b) Explain the fabrication process in CMOS n-Well process. **[5]**

Q3) a) Draw and explain inverter with n-type MOSFET load. **[5]**

b) Brief: Network-on Chip (NoC) concept. **[5]**

Q4) a) Explain VLSI design flow. **[5]**

b) Explain VLSI design styles, design quality, packaging technology in detail. **[5]**

P.T.O.

Q5) a) Brief about Long channel

1) I-V characteristics 2) non-linear I-V effects **[5]**

b) Explain the concept of regularity, modularity and locality. **[5]**

Q6) a) Explain the ASIC Design Flow. **[5]**

b) Compare ASIC and SoC. **[5]**

Q7) a) How to calculate interconnect delay. **[5]**

b) Explain any two MOS Inverters (Switching Characteristics) **[5]**

Q8) a) With the help of schematic, explain the concept of ratioed circuits. **[5]**

b) Explain CMOS transmission gates (pass gates) **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-873

[Total No. of Pages : 2

[6585]-285

M.E. (E & TC - VLSI Design)

ANALOG IC DESIGN

(2017 Pattern) (Semester - I) (504703)

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

Instructions to the candidates :

1) ***Answer any five questions from questions (Q.1. to Q.8.)***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data wherever necessary.***

Q1) a) Explain the I-V characteristics of an n-channel MOSFET and describe how these characteristics change with different regions of operation. **[6]**

b) Describe the design and working of a Widlar current mirror. What advantage does it offer over the basic current mirror? **[4]**

Q2) a) What is Drain-Induced Barrier Lowering (DIBL)? Explain its cause and impact on MOSFET operation, especially in short-channel devices. **[6]**

b) What is a current conveyor? Describe its structure and working principle. Give one practical application of a current conveyor. **[4]**

Q3) a) Discuss the advantages and limitations of using a diode-connected load in a CS amplifier. How does it affect the gain and linearity of the amplifier? **[6]**

b) What is a folded cascode amplifier? How does it differ from a regular cascode amplifier and what advantages does it offer in analog design? **[4]**

P.T.O.

Q4) a) Compare the performance of CS amplifiers with resistive, diode-connected and triode region loads in terms of gain, swing and power consumption. **[6]**

b) Describe the cascode amplifier structure. How does it enhance gain and bandwidth compared to a basic common source amplifier? **[4]**

Q5) a) Explain the operation of a quasi-differential amplifier. How does it differ from a fully differential amplifier in terms of performance and design complexity? **[6]**

b) Explain how device capacitances affect the frequency response of a cascode amplifier. Why is a cascode preferred for high-frequency applications? **[4]**

Q6) a) Discuss the role of the tail current source in a differential amplifier. What advantages does it offer in terms of common-mode rejection? **[6]**

b) Analyze the frequency response of a differential amplifier. What factors influence its bandwidth and gain at high frequencies? **[4]**

Q7) a) Explain the concept of feedback in amplifiers. Distinguish between negative and positive feedback with examples. **[6]**

b) Describe the common-centroid layout technique. With a sketch, explain how it improves matching and is applied in differential pair design. **[4]**

Q8) a) Compare voltage-series, voltage-shunt, current-series and current-shunt feedback configurations in terms of input/output impedance and gain behavior. **[6]**

b) Discuss the phenomenon of electromigration in VLSI layout. What design rules or precautions are taken to prevent it? **[4]**

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

PE-874

[Total No. of Pages : 2

[6585]-286
M.E. (E & TC) (VLSI Design)
RESEARCH METHODOLOGY
(2017 Pattern) (Semester - I) (504704)

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

Instructions to the candidates:

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

Q1) a) Define a research problem. What are the major sources of research problems? **[5]**

b) Explain static and dynamic characteristics of instruments with suitable examples. **[5]**

Q2) a) List and explain any five characteristics of a good research problem. **[5]**

b) What are common errors encountered when selecting a research problem? Give examples. **[5]**

Q3) a) Explain the steps involved in performing regression analysis. Give an example. **[5]**

b) What is Principal Component Analysis (PCA)? How is it useful in data analysis? **[5]**

Q4) a) Discuss the role of state vector machines in statistical analysis. **[5]**

b) What are moments in statistics? Explain the method of moments with an example. **[5]**

Q5) a) Describe how to set up a computing model to predict the performance of an experimental system. **[5]**

b) What is multi-scale modelling? Give an example of its application. **[5]**

Q6) a) How can sensitivity theory be applied in performance prediction? Illustrate with an example. **[5]**

b) What is nonlinear analysis of systems? How is it different from linear analysis? **[5]**

P.T.O.

Q7) a) What are the essential components of a well-structured research proposal? **[5]**

b) Explain the importance of presenting a research proposal to a review committee. **[5]**

Q8) a) Describe the role of guide and external expert in proposal evaluation. **[5]**

b) Describe the different measurement scale used in process system. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-875

[Total No. of Pages : 2

[6585]-287
M.E.(E&TC)(VLSI Design)
SYSTEM ON PROGRAMMABLE CHIP DESIGN
(2017 Pattern) (Semester - II) (504707)

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

Instructions to the candidates :

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

Q1) a) Explain in brief the Besign flow of SoC. **[5]**

b) What are the key driving forces behind the development and adoption of System- on-Chip (SoC) technology, and how do they contribute to its evolution? **[5]**

Q2) a) Enlist 5 important Design Trade-offs in SoC Design. **[5]**

b) Explain the Architecture of Vector Processor in brief. **[5]**

Q3) a) Explain the role of arbitration mechanisms in on-chip bus communication. How do centralized, distributed, and dynamic arbitration methods differ in handling bus access conflicts? **[5]**

b) What is Network On Chip ? Enlist its Merits & Demerits. **[5]**

Q4) a) Compare and contrast Shared Bus & Ring Topology in terms of scalability, latency, and power consumption. **[5]**

b) Enlist Quality of Service (QoS) configurability. **[5]**

P.T.O.

Q5) a) Explain the stages of the IP life cycle, from creation to maintenance. Which stage do you think is the most critical and why? **[5]**

b) What performance metrics are commonly evaluated in FPGA-based IP testing? **[5]**

Q6) a) What are the types of IP? Provide examples of each and explain their roles in design processes. **[5]**

b) Why is FPGA prototyping essential in IP evaluation? Discuss how it helps validate the functionality and performance of the IP. **[5]**

Q7) a) How does a Real-Time Operating System (RTOS) enhance peripheral interface and support real-time embedded applications? **[5]**

b) Which are Industry standard High Density FPGAs used in commercial market. **[5]**

Q8) a) What is SoC Test Automation (STAT), and how does it streamline the testing of complex SoC designs? **[5]**

b) Explain in brief Memory IPs. **[5]**

Total No. of Questions : 8]

SEAT No. :

PE-876

[Total No. of Pages : 2

[6585]-288
M.E. (E&C)(VLSI Design)
MIXED SIGNAL IC DESIGN
(2017 Pattern) (Semester - II) (Elective - II) (504708)

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

Instructions to the candidates :

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

Q1) a) Why CMOS Technologies is preferred over other fabrication technologies for Analog-Mix Signal Integrated Circuits? **[5]**

b) What are the specifications of a DAC? Explain any one in detail. **[5]**

Q2) a) Explain the operation of a time interleaved ADC. **[5]**

b) Explain the static and dynamic characteristics of ADCs. **[5]**

Q3) a) Draw the circuit diagram of a R-2R DAC and explain its operation. **[5]**

b) Explain ADC Architecture. With neat diagram. **[5]**

Q4) a) What is Pipeline and its Benefits. **[5]**

b) Explain Dual-Slope & its Advantages. **[5]**

P.T.O.

Q5) a) With neat diagram, explain the working of a sample and hold circuit. **[5]**

b) Explain the sampling rate below the Nyquist rate in terms of reconstruction? **[5]**

Q6) a) Explain the Steps calculating RMS quantization noise voltage from a spectrum. **[5]**

b) What is Quantization noise? Give its Advantages & Disadvantages. **[5]**

Q7) a) Explain Clock jitter & mention its type. **[5]**

b) Explain AAF ? Why Relaxed AAF Required? **[5]**

Q8) a) Explain First order noise shaping. **[5]**

b) Compare Noise Shaping Topologies. **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-877

[Total No. of Pages : 2

[6585]-289

M.E. (E & C) (VLSI Design)

DESIGN OF ASICs

(2017 Pattern) (Semester - II) (504709)

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

Instructions to the candidates:

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

Q1) a) Describe the importance of timing closure in placement and routing. How do Clock Tree Synthesis (CTS) and signal integrity affect timing? **[5]**

b) What are the different power dissipation components in an ASIC and what techniques are used for power optimization? **[5]**

Q2) a) Explain the key stages of the ASIC design flow and their significance. **[5]**

b) What is logic synthesis and how does it contribute to ASIC development? **[5]**

Q3) a) What is Automatic Test Pattern Generation (ATPG) used for in ASIC testing? **[5]**

b) What is the main challenge when designing mixed analog-digital circuits? **[5]**

Q4) a) What are signal integrity (SI) issues and how do they impact ASIC design? **[5]**

b) What factors affect delay estimation in ASIC circuits? **[5]**

Q5) a) How does system partitioning impact ASIC performance, power consumption and design complexity? **[5]**

b) What are the major floor planning strategies used in ASIC design and how do they optimize area and power distribution? **[5]**

P.T.O.

Q6) a) Why are timing constraints important in ASIC design? **[5]**

b) What is a false path in timing analysis and why should it be detected? **[5]**

Q7) a) How does an HDL-based test bench help in verifying an ASIC design? **[5]**

b) What are some commonly used EDA tools for ASIC design and what are their roles? **[5]**

Q8) a) How does the Scan Test method improve fault detection in digital circuits? **[5]**

b) What is the function of JTAG in ASIC testing? **[5]**



Total No. of Questions : 8]

SEAT No. :

PE-878

[Total No. of Pages : 1

[6585]-290

M.E. (Electronics & Communication Engineering)

(VLSI Design)

TESTING AND VERIFICATION OF VLSI CIRCUITS

(2017 Pattern) (Semester - III) (604701)

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

Instructions to the candidates:

1) ***Answer any five questions. Each question carries 10 marks.***
2) ***Neat Diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and clearly state.***

Q1) a) Differentiate between VLSI verification and VLSI testing. **[5]**

b) State any four fault models and explain any two in brief. **[5]**

Q2) a) Write a short note on "SoC Testing" **[5]**

b) Write a short note on: A.T.P.G. **[5]**

Q3) a) What is the need of fault Simulation? Contrast fault simulation and logic simulation? **[5]**

b) How is combinational circuit test generation different from sequential circuit test generation? **[5]**

Q4) a) Explain different test pattern generation methods for BIST. **[5]**

b) Differentiate between Analog Testing and Digital Testing. **[5]**

Q5) a) Write a short note on: Hardware Emulation. **[5]**

b) Explain in brief: Equivalence checking and model checking. **[5]**

Q6) a) Write a Short Note on "Analog Fault Models". **[5]**

b) Explain in brief the types of Boundary Scan Architectures. **[5]**

Q7) a) Explain briefly Observability and Controllability. **[5]**

b) Explain in brief the various aspects of Memory Testing. **[5]**

Q8) a) Explain VLSI Test economics & product quality indicators. **[5]**

b) What is Fault modeling? Explain Stuck-At faults. **[5]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE-2753

[Total No. of Pages : 2

[6585]-291

ME (E&TC) (VLSI Design)

ASIC DESIGN

(2017 Pattern) (Semester - III) (604702)

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

Instructions to the candidates:

1) ***Answer any five questions. Each question carries 10 marks.***
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 neat labeled diagram describe different types of ASIC. **[5]**

b) What is test bench explain with one example. **[5]**

Q2) a) Write VHDL code and test bench code for 8 bit counter **[5]**

b) With neat flow chart explain in detail ASIC Design Flow **[5]**

Q3) a) Write short note on gate level mixed mode testing. **[5]**

b) What is placement in ASIC Design? Write its goals and objectives. **[5]**

Q4) a) With neat labeled diagram explain clock distribution technique in ASIC **[5]**

b) How to reuse any ASIC design? Give one example. **[5]**

Q5) a) Write short note on static timing analysis. **[5]**

b) What is the need of time optimization? Give one example which describes time optimization in ASIC. **[5]**

P.T.O.

Q6) a) Draw and explain linear feedback shift register in detail **[5]**

b) What are the time related constraints? Explain with one example **[5]**

Q7) a) Write short note on mixed mode design in ASIC. **[5]**

b) What is functional simulation? Where it is required? Give one example **[5]**

Q8) a) Write short note on memory testing. **[5]**

b) Describe how memory testing is carried out in ASIC design. **[5]**



Total No. of Questions : 6]

SEAT No. :

PE-879

[Total No. of Pages : 2

[6585]-301

M.E. (Electrical) (Power Electronics and Drives)

POWER SYSTEM MODELLING

(2017 Pattern) (Semester - I) (503401)

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

Instructions to the candidates:

1) ***Attempt Q1.or Q.2, Q3 or Q4 Q5 and Q6.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the need for modeling in power systems. Discuss different models used for power system analysis, with their applications. **[8]**

b) Develop the simplified model for a steam turbine-governor system. Explain the modeling of non-electrical components like a boiler, steam turbine, and governor system in power system analysis. **[10]**

OR

Q2) a) Discuss the transformer modeling used in power system analysis. Explain the modeling of tap-changing and phase-shifting transformers. **[8]**

b) Describe the modeling of hydro-turbine and governor systems in power systems. Illustrate how these models are used for stability studies. **[10]**

Q3) a) Explain the steady-state model of a synchronous machine.Derive the model for dynamic studies, using Park's transformation, and explain its significance in power system simulation. **[8]**

b) Discuss the current and flux linkage models of synchronous machines.Explain how these models are simulated as linear models for analysis. **[8]**

OR

P.T.O.

Q4) a) A synchronous machine is connected to an infinite bus. Develop its simulation for steady-state conditions. Discuss the method to analyze transient conditions for this setup. **[8]**

b) Explain the voltage response ratio and exciter voltage ratings.Discuss the simplified view of excitation control and its role in power system stability. **[8]**

Q5) a) Explain the modeling of a transmission line using Clark's and Kron's transformations. Discuss their importance in the stability and analysis of a power system. **[8]**

b) Define the concept of Static VAR Compensators (SVC). Explain their role in enhancing the stability of a power system, focusing on voltage regulation and dynamic stability. **[8]**

OR

Q6) a) Explain the static load modeling in power systems. Discuss the types of static load models and their role in steady-state power system analysis.**[8]**

b) Discuss the modeling of induction motors using the synchronous machine model. Explain their importance in power system stability and transient analysis. **[8]**



Total No. of Questions : 6]

SEAT No. :

PE-880

[Total No. of Pages : 2

[6585]-302

M.E. Electrical (Electrical Engineering)

ADVANCED POWER ELECTRONICS

(2017 Pattern) (2024 Course) (Semester - I) (503402)

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

Instructions to the candidates :

1) ***Attempt Ql or Q2, Q3 or Q4, Q5 or Q6***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain about principle of operation of 3 level voltage source converters with neat circuit diagrams and wave forms. **[10]**

b) Explain about principle of operation of 3 x 3 matrix converter with neat circuit diagrams. **[8]**

OR

Q2) a) Explain with neat diagram the Flywheel energy storage system and Superconducting Magnetic energy storage system. **[10]**

b) Explain about Basic concepts of CSC converters with self-commutating devices. **[8]**

Q3) a) With neat circuit diagram explain about principle of operation of Series resonant Inverters with unidirectional & Bidirectional switches. **[8]**

b) Explain about Parallel resonant inverters with neat circuit diagrams and output waveforms **[8]**

OR

Q4) a) Explain the Series resonant inverters with unidirectional & Bidirectional switches. **[8]**

b) Explain the Analysis of half bridge converters and full bridge converters configurations. **[8]**

Q5) a) With a neat circuit diagram and relevant waveform explain about active and reactive powers in three phase circuits. **[8]**

b) Draw the 3-phase circuit with sinusoidal voltage source with non-linear loads derive the expression for output power. **[8]**

OR

Q6) a) Write a short note on the Akagi' s components and conventional active and reactive power application of p-q theory. **[8]**

b) Explain about the Akagi's instantaneous power (p-q) theory. **[8]**

♦ ♦ ♦

Total No. of Questions : 3]

SEAT No. :

PE-881

[Total No. of Pages : 2

[6585]-303
M.E. (Electrical Engineering)
COMPUTER APPLICATIONS IN POWER SYSTEM
(2024 Pattern) (Semester - I) (503403)

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

Instructions to the candidates :

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

Q1) **Attempt any three**

a) Derive equations of Newton Raphson load flow analysis in rectangular ordinates. **[6]**

b) What are the assumptions made in decupled and fast decoupled load flow method? **[6]**

c) What are the theorems used in optimizing multivariable functions? **[6]**

d) Draw surface constraint diagram showing behaviour and side constraints. Also indicate bounded and unbounded, acceptable and unacceptable points on surface constraint. **[6]**

Q2) Attempt any two

a) Explain solution of economic load dispatch problem using NR method. **[8]**

b) The incremental production costs of both the units are $\frac{dF_1}{dP_1} = 0.4P_1 + 40$ Rs/MWh and $\frac{dF_2}{dP_2} = 0.5P_2 + 30$ Rs/MWh Determine economical schedule for the sharing of 180MW demand considering generation limit on each unit as 25MW and 100MW. Determine the saving obtained by economical loading over equal load sharing. **[8]**

c) State economical dispatch problem **[8]**

i) Unconstrained without loss
ii) Constrained without loss
iii) Unconstrained with loss
iv) Constrained with loss

Q3) Attempt any two

a) Show that transmission loss formula is a function of generation and load. **[8]**

b) Derive general formula of fault current and fault voltage for LLG type fault. **[8]**

c) Explain economic load dispatch for active and reactive power balance. **[8]**

♦ ♦ ♦

Total No. of Questions : 6]

SEAT No. :

PE-882

[Total No. of Pages : 2

[6585]-304
M.E. (Electrical)
RESEARCH METHODOLOGY
(2024 Pattern) (Semester - I) (503404)

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

Instructions to the candidates:

1) ***Attempt any three questions from question 1 to 4.***
2) ***Questions 5 and 6 are compulsory.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table, slide rule and non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) What is the need of research and write different components of research paper. **[6]**

Q2) Explain the structure of a research proposal and what care must be taken in selecting the research problem. **[6]**

Q3) Explain the terms Copyright, royally and patent. **[6]**

Q4) Explain the Elimination method of solving linear simultaneous equations with example. **[6]**

Q5) Solve any two.

a) Describe the concept of finite difference approximations of partial derivatives with example **[8]**

b) Explain in detail the convex programming problem **[8]**

c) Explain basic approach of penalty function method. **[8]**

P.T.O.

Q6) Write short note on the following with applicable example in Electrical Engineering (Attempt any two)

a) Particle Swarm Optimization **[8]**

b) Linear and Multi regression **[8]**

c) Genetic Algorithm **[8]**

Total No. of Questions : 8]

SEAT No. :

PE-883

[Total No. of Pages : 1

[6585]-305

M.E. (Electrical)

AC / DC DRIVES

(2017 Pattern) (Semester - II) (503407)

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

Instructions to the candidates:

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

Q1) What are the key advantages of using electrical drives in industrial applications? **[10]**

OR

Q2) List and briefly explain the main elements of an electrical drive system. **[10]**

Q3) What is a two-quadrant DC drive? How does it differ from a single-quadrant drive? **[10]**

OR

Q4) Discuss the steady-state analysis of a three-phase converter controlled DC motor drive. **[10]**

Q5) What are the basic features of an electric drive system, and why is closed-loop control used? **[15]**

OR

Q6) Derive the transfer function for a basic closed-loop drive control system. **[15]**

Q7) Explain the principle of direct vector control of induction motors. **[15]**

OR

Q8) What is Direct Torque Control (DTC) of induction motors and how does it differ from vector control? **[15]**



Total No. of Questions : 3]

SEAT No. : ____

PE-884

[Total No. of Pages : 2

[6585]-306

M.E. (Electrical Engineering)

ADVANCE POWER SYSTEM PROTECTION

(2024 Pattern) (Semester - II) (503408)

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

Instructions to the candidates :

1) ***All Questions are compulsory.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figure to the right indicates full marks.***
4) ***Assume suitable data wherever necessary.***
5) ***Use of non-programmable scientific calculator is allowed.***

Attempt any three

Q1) a) Describe in detail Least Error Squared Techniques (LES) with equations. **[6]**

b) Classify faults of synchronous generator, Explain how earth fault protection is provided to synchronous generator. **[6]**

c) Elaborate on transient response of the CT. **[6]**

d) Assume that secondary burden of a 300:5 class 'C' CT is 5Ω. The relay setting is 2A and the CT ratio is 300/5, secondary resistance 0.15Ω & corresponding exciting current is 0.04A. Calculate the primary current required to operate the relay? **[6]**

e) Explain features of PC-based integrated software for short circuit studies. **[6]**

P.T.O.

Attempt any two :

Q2) a) With a neat block diagram explain the hardware design of digital protection of transmission line. **[8]**

b) Explain distance protection of transmission line using mho relay. **[8]**

c) Explain amplitude comparison travelling wave relay scheme; how it is useful for protection of forward as well as reverse faults in transmission line. **[8]**

Attempt any two :

Q3) a) Bring out salient features of three stepped distance protection scheme of transmission line. **[8]**

b) Elaborate on integrated operation of national power system. **[8]**

c) Explain importance of relay setting and Relay co-ordination in electrical power system. **[8]**

Total No. of Questions : 6]

SEAT No. :

PE-885

[Total No. of Pages : 1

[6585]-307
M.E. (Electrical Engineering)
POWER SYSTEM DYNAMICS
(2024 Pattern) (Semester - II) (503409)

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

Instructions to the candidates:

1) ***Solve Total Three questions. Answer 1 question from Q1 and Q2, Q3 or Q4, and Q5 or Q6 each.***
2) ***Assume suitable data if necessary.***
3) ***Write down all the assumptions made.***

Q1) Explain with the help of suitable example, the objectives islanding and any two methods of islanding. **[18]**

OR

Q2) Classify and discuss the various states of operations and the security of the system as per Dy Liacco and Fink and Carlson. **[18]**

Q3) Explain the SVC model and its inclusion in the dynamics of SMIB. **[16]**

OR

Q4) Draw the diagram representing synchronous generator by model 2.1 and derive stator voltage equations for it. **[16]**

Q5) Draw the block diagram of single machine system. Derive the characteristic equation for single machine system. **[16]**

OR

Q6) Derive the rotor mechanical equations for the small signal analysis of single machine model with field circuit only. Write down assumptions involve in it. **[16]**

❖❖❖

Total No. of Questions : 5]

SEAT No. :

PE-886

[Total No. of Pages : 2

[6585]-308
M.E. (Electrical)
POWER SYSTEM PLANNING AND RELIABILITY
(2024 Pattern) (Semester - III) (603401)

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

Instructions to the candidates:

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

Q1) **Solve any three of the following :** **[18]**

a) Discuss the importance of load research and load growth characteristics in system planning.

b) Compare and explain extrapolation and correlation techniques used for load forecasting.

c) Markov process used in reliability evaluation.

d) Write short notes on :

i) Random variables

ii) Mathematical expectation.

e) Explain LOLP and LOLE for reliability evaluation

f) Explain economic analysis models in generation Planning.

Q2) a) Discuss the analysis of transmission line failure and methods to improve reliability. **[8]**

b) Evaluation of system & load point indices in a transmission network. **[8]**

OR

Q3) a) Explain long term and short term planning of transmission system. **[8]**

b) Explain causes of failure of transmission line components used for reliability evaluation. **[8]**

P.T.O.

Q4) a) Describe different types of distribution systems and their characteristics from reliability point of view. **[8]**

b) Explain the role of Power system Protection devices in reliability assessment. **[8]**

OR

Q5) a) Discuss use of reconfiguration algorithm used for monitoring of distribution systems. **[8]**

b) Discuss the impact of weather on the performance of distribution systems. **[8]**

❖❖❖

Total No. of Questions : 5]

SEAT No. : ____

PE5109

[Total No. of Pages : 2

[6585]-309
S.Y. M.E. (Electrical) (Power Systems)
POWER QUALITY ASSESSMENT AND MITIGATION
(2024 Pattern) (Semester - III) (603402)

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

Instructions to the candidates:

1) ***Attempt Q1 is compulsory.***
2) ***Attempt any one from Q2 or Q3, Q4 or Q5.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable additional data, if necessary.***
6) ***Use of non - programmable calculator is allowed.***

Q1) Answer any THREE of the following.

a) Define transients and list their major types as per IEEE - 1159. **[6]**

b) Explain the causes and effects of short - term and long -term flicker. **[6]**

c) Describe the economic impact of voltage sags on industries. **[6]**

d) Explain harmonic distortion using Fourier analysis basics. **[6]**

e) Define and explain the difference between voltage sag and swell. **[6]**

f) Explain voltage versus current distortion and discuss AC quantities under non-sinusoidal conditions. **[6]**

Q2) a) Explain the concept of harmonic resonance and its consequences in power systems. **[8]**

b) Describe passive harmonic filters with diagrams and their advantages & limitations. **[8]**

OR

Q3) a) Explain the procedure for modifying the system frequency response to reduce harmonic impact. **[8]**

b) Discuss different computer tools used for harmonic analysis. **[8]**

P.T.O.

Q4) a) Explain the need for power quality monitoring in modern distribution networks. **[8]**

b) Discuss selection of transducers and monitoring locations for effective PQ monitoring. **[8]**

OR

Q5) a) Explain the process and challenges involved in transient monitoring. **[8]**

b) Describe power quality assessment and list important PQ indices used in monitoring reports. **[8]**



Total No. of Questions : 8]

SEAT No. :

PE-887

[Total No. of Pages : 2

[6585]-310
M.E. (IoT)
EDGE ARTIFICIAL INTELLIGENCE FOR IOT
(2024 Pattern) (Semester - II) (504816)

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

Instructions to the candidates:

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

Q1) a) What are the pros and cons of implementing machine learning in embedded systems? **[5]**

b) Recap the core concepts of machine learning. Distinguish between supervised, unsupervised and reinforcement learning. **[5]**

Q2) a) What is TinyML? Discuss its applications and constraints in resource-limited devices. **[5]**

b) What is TensorFlow Lite for Microcontrollers (TFLM)? Describe its key features and limitations. **[5]**

Q3) a) Discuss at least three important design considerations when developing an Edge AI application. **[5]**

b) Describe the key features and sensor capabilities of the Arduino Nano 33 BLE Sense board. How does it support 3V (Vision, Voice, Vibration) applications? **[5]**

Q4) a) What are some design considerations when selecting an Arduino platform for a multi-modal 3Vs application? **[5]**

b) Describe the Raspberry Pi (RP i) ecosystem, highlighting both hardware and software components. **[5]**

P.T.O.

Q5) a) Explain the hardware and software features of Raspberry Pi that make it suitable as Single Board Computer (SBC). **[5]**

b) Outline the typical machine learning and computer vision (ML and CV) toolchain used on Raspberry Pi. **[5]**

Q6) a) Using OpenCV with Python on Raspberry Pi, explain the steps involved in building a basic object classification application. **[5]**

b) Explain the role of STM32Cube.AI in deploying AI models on STM32 microcontrollers. **[5]**

Q7) a) Describe various techniques used to optimize AI models for deployment using STM32Cube.AI. **[5]**

b) Explain the AI development ecosystem around NVIDIA Jetson Nano. **[5]**

Q8) a) Design a sample application for person identification using Raspberry Pi, outlining the hardware and software setup. **[5]**

b) Discuss how real-time AI inference can be implemented on STM32H7 using both cores efficiently. **[5]**

❖❖❖

Total No. of Questions : 8]

SEAT No. :

PE3252

[Total No. of Pages : 2

[6585]-311
S.Y.M.E. (Internet of Things)
IOT SECURITY AND TRUST
(2024 Pattern) (Semester-III) (604809)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if neccessary.***
4) ***Use of scientific calculator is allowed.***

Q1) a) Define the Internet of Things (IoT) and explain its security challenges. **[5]**

b) What are the main layers of IoT architecture and their security implications? **[5]**

OR

Q2) While designing a smart home system with sensors, cameras, and a Mobile control application, which IoT security requirements to ensure data confidentiality, authentication, and access control in your design.**[10]**

Q3) a) Explain the role of cryptographic primitives in securing IoT systems.**[5]**

b) Discuss how encryption, decryption, hash functions, and digital signatures contribute to ensuring confidentiality, integrity and authenticity in IoT communication. **[5]**

OR

Q4) a) Describe the key management fundamentals and cryptographic controls built into IoT messaging protocols. **[5]**

b) Explain how cipher suites, random number generation, and node authentication support secure communication in IoT networks. **[5]**

P.T.O.

Q5) a) Explain the stages of the Identity Lifecycle in IoT systems and how they ensure secure management of device identities. **[8]**

b) Describe different types of authentication credentials used in IoT devices. **[7]**

OR

Q6) a) Explain the components and functions of an IoT Identity and Access Management (IAM) infrastructure. **[8]**

b) Describe how authorization works in a Publish/Subscribe communication model. Also differentiate between role- based and attribute -based access control mechanisms in IoT. **[7]**

Q7) a) Explain the major privacy concerns in IoT data dissemination and how they differ from traditional network systems. **[6]**

b) Describe any three lightweight and robust privacy protection schemes used in IoT **[9]**

OR

Q8) a) Explain the relationship between Cloud Computing and the Internet of Things (IoT). Discuss the major IoT- related offerings provided by leading cloud service providers **[6]**

b) Describe the Key Cloud IoT security controls and outline an Enterprise IoT Cloud security Architecture. Also discuss emerging directions in cloud -enabled IoT computing such as edge computing, AI integration and zero -trust models. **[9]**

● ● ●

Total No. of Questions : 7]

SEAT No. :

PE-888

[Total No. of Pages : 2

[6585]-312

M.E. (Mechanical Engineering) (Robotics & Automation)

ADVANCED MATHEMATICS AND NUMERICAL METHODS

(2017 Pattern) (Semester - I) (MERA501)

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

Instructions to the candidates:

1) ***Answer any five questions from the following.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) Solve the following using Gauss Seidal method **[10]**

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$
$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$
$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$
$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

Q2) a) Given $\frac{dy}{dx} = x^2(1+y)$ and y(1) = 1, y(1.1) = 1.233, y(1,2) = 1.548, y(1.3) = 1.979, evaluate y(1.4) by Adams-Bashforth method. **[5]**

b) Use fourth order Runge - Kutta method to estimate y (0.4) when $y'(x) = x^2 + y^2$ with $y(0) = 0$. Assume h = 0.2 **[5]**

Q3) a) Obtain a regression plane to fit the data given in the table below using multiple linear regression **[5]**

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

b) Find by Newton Raphson method the real root of equation $3x = \cos x + 1$, correct to 4 decimal places. **[5]**

P.T.O.

Q4) Given the equation $y'(x) = 2y / x$ with $y(1) = 2$, estimate $y(2)$ using (a) Euler's method, (b) Heun's method and compare the results with exact solution. Take h = 0.25 **[10]**

Q5) a) Using Power Method, determine the largest eigen value and the corresponding eigen vector of the matrix **[5]**

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

b) Determine the coefficient of the characteristics polynomial of the system using the Fadeev - Laverrier method **[5]**

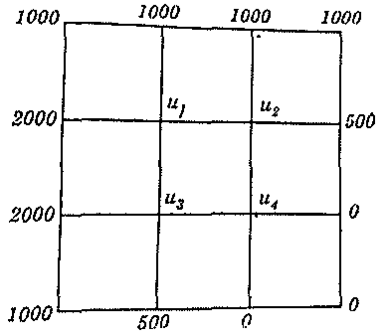
$$(-1-\lambda)x_1 = 0$$
$$x_1 + (-2-\lambda)x_2 + 3x_3 = 0$$
$$2x_2 + (-3-\lambda)x_3 = 0$$

Q6) a) From the table below, for what value of x, y is minimum? Also fine this value of y : **[4]**

x	3	4	5	6	7	8
y	0.205	0.240	0.259	0.262	0.250	0.224

b) Use Romberg's method to compare $\int_0^1 \frac{dx}{1+x^2}$ correct to 4 decimal places. **[6]**

Q7) a) Given the values of $u(x, y)$ on the boundary of the square shown in the figure, evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal points of this figure by Gauss-Seidal method **[7]**



b) Give the classification of partial differential equation. Explain the types of Laplace equation. **[3]**

Total No. of Questions : 7]

SEAT No. :

PE-889

[Total No. of Page : 1

[6585]-314

M.E. (Mechanical Engineering) (Robotics & Automation)

TOTAL INTEGRATED AUTOMATION AND INDUSTRY 4.0

(2021 Pattern) (Semester - I) (MERA503)

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

Instructions to the candidates:

1) ***Answer any FIVE questions from the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Explain the various levels of automation in a production system. Discuss their impact on productivity and flexibility. **[10]**

Q2) Discuss the role and significance of computer simulation in analyzing automated flow lines. How does it help in system design? **[10]**

Q3) Explain the functions and types of material handling equipment. How is material handling system performance analyzed? **[10]**

Q4) Describe the components and structure of a computer-based industrial control system. How does it facilitate automatic process control? **[10]**

Q5) What are the principles and methods of automated inspection? Discuss how sensor technologies aid automated inspection. **[10]**

Q6) Write and explain a sample PLC program for controlling a simple industrial process using comparison and data handling instructions. **[10]**

Q7) Discuss the steps involved in programming a PLC for an industrial automation task. What are the key considerations during documentation of a PLC system? **[10]**

Total No. of Questions : 7]

SEAT No. : ____

PE-890

[Total No. of Pages : 1

[6585]-316

M.E. Mechanical (Robotics and Automation)

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR ROBOTICS

(2021 Course) (2017 Pattern) (Semester - II) (MERA507)

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

Instructions to the candidates :

1) ***Answer any five questions from the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Explain the difference between uninformed (blind) search and informed (heuristic) search strategies. Illustrate your answer with examples of algorithms and discuss their relative advantages and limitations. **[10]**

Q2) What are Markov Logic Networks (MLNs)? Explain how they mix probability and first-order logic and describe in detail. **[10]**

Q3) What is approximate inference in Bayesian networks? Explain direct sampling methods? **[10]**

Q4) Explain the basics of utility theory. How does it help in making decisions.**[10]**

Q5) What is inductive bias in decision trees? Why is it important? **[10]**

Q6) What is the Naïve Bayes model? How does it apply probabilistic modeling for classification? **[10]**

Q7) What is the curse of dimensionality? How does it affect machine learning?**[10]**

Total No. of Questions : 7]

SEAT No. :

PE-891

[Total No. of Pages : 1

[6585]-317

M.E. (Mechanical) (Robotics & Automation)

DIGITAL SIGNAL AND VIDEO PROCESSING

(2017 Pattern) (2021 Course) (Semester - II) (MERA508)

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

Instructions to the candidates :

1) ***Answer any FIVE questions from the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Derive the Fourier Series representation of a periodic signal and explain its significance in signal processing. **[10]**

Q2) Explain the design principles of FIR and IIR filters. Compare their structures, advantages and limitations. **[10]**

Q3) Explain 2-D Discrete Fourier Transform and Discrete Cosine Transform. Compare their applications in image processing. **[10]**

Q4) Explain the concepts of coding redundancy and temporal redundancy in image compression. **[10]**

Q5) Discuss the Time Varying Image Formation models. Explain 3D motion models with diagrams. **[10]**

Q6) Describe different motion estimation techniques such as mesh-based, region-based and global motion estimation. **[10]**

Q7) Explain the concept and working of multi-resolution motion estimation. How does it improve accuracy and computational efficiency? **[10]**

Total No. of Questions : 7]

SEAT No. :

PE-892

[Total No. of Pages : 2

[6585]-318

M.E. (Mechanical Engineering) (Robotics & Automation)

ROBOTIC OPERATING SYSTEM

(2017 Pattern) (Semester - II) (MERA509)

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

Instructions to the candidates :

1) ***Answer any FIVE questions from the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Explain the fundamental components required to build a robot. Discuss different types of robot drive mechanisms with examples. **[10]**

Q2) Describe the mathematical modelling process of a robot. How are robot kinematics implemented in simulation using ROS and Gazebo? **[10]**

Q3) Illustrate the hardware design of ChefBot with a block diagram. Explain the interfacing process of DC geared motors and quadrature encoders with the Tiva C LaunchPad. **[10]**

Q4) Discuss the working principles and ROS-based integration of ultrasonic sensors, IR proximity sensors, and the Inertial Measurement Unit in mobile robots. **[10]**

Q5) Describe how Kinect can be programmed using Python in combination with ROS, OpenCV, and OpenNI. Also explain the role of PCL in handling point cloud data. **[10]**

P.T.O.

Q6) Explain the process of writing a Python ROS driver for ChefBot. How do launch files help in initializing and managing ChefBot nodes? **[10]**

Q7) Discuss the calibration process of the Xbox Kinect and wheel odometry for ChefBot. How can GUI-based testing enhance robot performance validation? **[10]**



Total No. of Questions : 7]

SEAT No. :

PE-893

[Total No. of Pages : 1

[6585]-319

M.E. (Mechanical Engineering) (Robotics & Automation)

MERA-513 : ROBOTICS APPLICATIONS

(2017 Pattern) (Semester - III)

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

Instructions to the candidates:

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

Q1) Explain the classification of robots based on configuration and control with suitable examples. **[10]**

Q2) Describe various drive systems used in robots and discuss their advantages and limitations. **[10]**

Q3) Derive and explain the transformation matrices used for 2D rotation and translation in robotic kinematics. **[10]**

Q4) Explain the constructional features and working principles of different types of grippers used in robotic systems. **[10]**

Q5) Explain in detail the concept of trajectory planning and different methods used for trajectory generation. **[10]**

Q6) Discuss various types of robot control systems such as point-to-point, continuous path, and adaptive control. **[10]**

Q7) Explain the major industrial applications of robots in manufacturing, assembly, and inspection. **[10]**



Total No. of Questions : 7]

SEAT No. : ____

PE-894

[Total No. of Pages : 2

[6585]-320

M.E. (Mechanical Engineering) (Robotics & Automation)

MERA-514 : AUTOMATIC CONTROL & POWER SYSTEM

(2017 Pattern) (Semester - III)

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

Instructions to the candidates :

1) ***Answer any five questions from the following.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) Discuss the modeling of thermal, hydraulic, and electrical systems with examples and derive their transfer functions. **[10]**

Q2) A feedback system has forward path T.F. $G(s)=\frac{(s+2)}{s(s+1)}$. Determine rise time, peak time, peak overshoot, setting time (2 % tolerance) and delay time. **[10]**

Q3) Derive the overall transfer function of a given block diagram using block diagram reduction techniques. **[10]**

Q4) Explain the working of P, PI, and PID controllers and discuss their effect on system performance. **[10]**

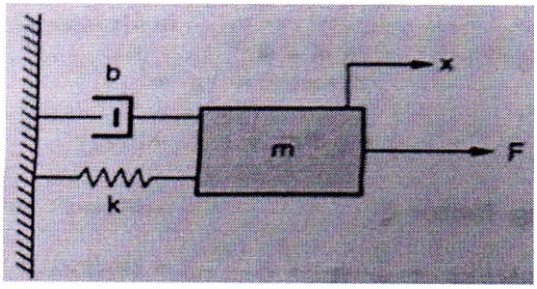
Q5) Explain the concepts of controllability and observability for linear time-invariant systems with suitable examples. **[10]**

P.T.O.

Q6) For the mechanical system shown in figure assume M (mass) = 1 kg, K (stiffness) = 2 N/m and b (damping coefficient) = 0.5 Ns/m. The displacement *x* of the mass *m* is measured from equilibrium position. In this system the external force *f*(*t*) is input and *x* is output. Determine : **[10]**

a) Transfer function

b) Identify location of poles and zeros.



Q7) Explain the concept of minimum phase, non-minimum phase, and all-pass systems using polar plots. **[10]**

⌘⌘⌘