

Total No. of Questions : 8]

SEAT No. :

PC4578

[6355]-1

[Total No. of Pages :2

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

- Q1)** a) Solve the differential equation by power series method  $y' - y = 0$ . [5]  
b) Explain Laplace equation in cylindrical form. [5]

- Q2)** a) Solve the differential equation by power series method  $y' - y = 0$ . [5]  
b) Expand the following function in terms of Legendre polynomials in the interval  $-1 < x < 1$   $f(x) = x^2 + 2x^2 - x - 3$ . [5]

- Q3)** a) Find the Laurent's expansion of  $f(z) = (7z - 2) / [(z + 1) z(z - 2)]$  in the region  $1 < z < 3$ . [5]  
b) Obtain the Laplace's equation in two dimensions for heat flow. [5]

- Q4)** a) Find the Laurent's expansion of  $f(z) = (7z - 2) / [(z + 1) z(z - 2)]$  in the region  $1 < z < 3$ . [5]  
b) Find the Laurent series expansion of  $(z - 1) / z^2$  for  $|z - 1| > 1$ . [5]

- Q5)** a) Solve the following system of ODE using Laplace transform method using initial conditions as  $x(0) = 1, y(0) = 0$  [4]  
 $x'' - y = e^t$   
 $y' + z = \sin t$

**P.T.O.**

- b) Genetic theory state that children having one parent of blood type A and the other blood type B will always be 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% were found to be types A, 45% type AB and remainder type B. Test the hypothesis by  $\chi^2$  test. ( $P^*$  = probability under  $H_0$  that  $\chi^2 > X^2$  at 5%).

[6]

Degree freedom	1	2	3	4	5
$P^*$	3.841	5.991	7.815	9.488	11.070

- Q6)** a) Discuss the procedure to calculate the mean from ungrouped data. [6]

- b) Discuss brief about test of goodness of fit. [4]

- Q7)** a) The mean of two single large samples of 1000 and 2000. members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from same population of standard deviation 2.5 inches (Test at 5% level of significance). [5]

- b) What types of errors are associated in testing hypothesis? [5]

- Q8)** a) 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

- b) Write note on rank correlation coefficient. [5]



Total No. of Questions : 8]

SEAT No. :

PC4579

[6355]-2

[Total No. of Pages :2

M.E. - I (Chemical Engineering)

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 about the applications of process optimization with examples. [10]

**Q2)** Enlist various optimization methods for the optimization of a one-dimensional function and explain the successive quadratic estimation method in detail.[10]

**Q3)** What are evolutionary optimization methods? Explain any of the evolutionary algorithm for optimization in detail. [10]

**Q4)** Explain convex and concave functions with respect to a general quadratic function and its Hessian. Determine the convexity/concavity of following functions: [10]

a)  $f(x) = 2x_1 + 3x_2 + 6$

b)  $f(x) = 2x_1^2 + 2x_1x_2 + 1.5x_2^2 + 7x_1 + 8x_2 + 24$

**Q5)** What is a penalty function in constrained optimization? Describe important penalty functions with equations. [10]

P.T.O.

**Q6)** Explain integer programming with any suitable example. **[10]**

**Q7)** What are Lagrange multipliers? Explain their role in Non-Linear Programming with suitable examples. **[10]**

**Q8)** Explain the fundamentals of Genetic Algorithm (GA). State the advantages of GA over the conventional gradient-based optimization methods. **[10]**



Total No. of Questions : 8]

SEAT No. :

PC4580

[Total No. of Pages : 1

[6355]-3

First Year 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 indicate full marks.

- Q1)** a) Explain in brief equipment used in cross filtration. [5]  
b) Describe in brief sifon filter used for solid-liquid separation. [5]
- Q2)** a) Explain in brief design aspects of ultrafiltration. [5]  
b) Explain in brief : Donnan dialysis and microfiltration. [5]
- Q3)** a) State the principle of prevaporation and mechanism of prevaporation in detail. [7]  
b) Explain Reverse Osmosis. [3]
- Q4)** a) State different types of adsorbents. [3]  
b) Explain different techniques used for analytical separations. [7]
- Q5)** Explain in brief types of equipment used for electrophoresis and dielectrophoresis. [10]
- Q6)** a) Describe in brief liquid chromatography. [5]  
b) Explain in brief Ion-exchange and electrodialysis. [5]
- Q7)** a) Describe in brief any one modern technique used for effluent treatment. [6]  
b) Write a short note on permeation techniques for liquid and gases. [4]
- Q8)** a) State applications of GC and HPLC. [5]  
b) Explain in brief mechanism of Reactive distillation. [3]  
c) State applications of reactive extraction. [2]



Total No. of Questions : 8]

SEAT No. :

**PC4581**

[Total No. of Pages : 2

**[6355]-4**

**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)** Compute the coefficient of correlation between X and Y using following data **[5]**

X	1	3	5	7	8	10
Y	8	12	15	17	18	20

b) Discuss fundamentals of time series analysis and spectral analysis along with one application in research work. **[5]**

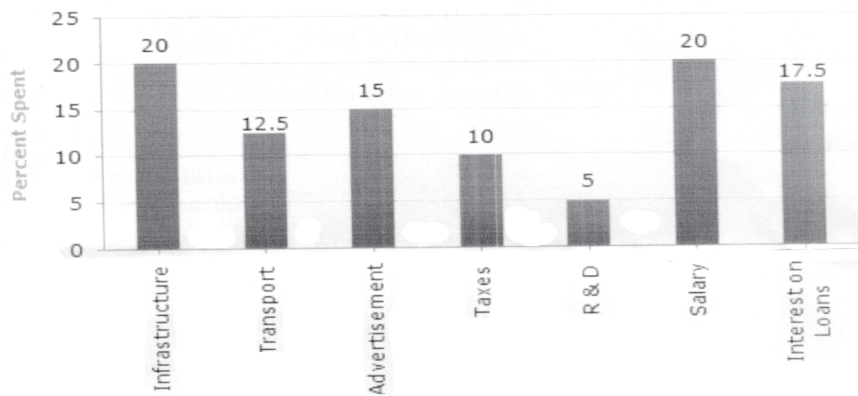
**Q3) a)** Explain One-way and Two-way ANOVA with suitable example. **[5]**

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) The bar graph given below shows the percentage distribution of the total expenditures of a company under various expense heads during 2022. Percentage Distribution of Total Expenditure of a Company. **[5]**

**P.T.O.**



- i) The total amount of expenditures of the company is how many times of expenditure on research and development?
- ii) If the expenditure on advertisement is 2.10 crores then the difference between the expenditure on transport and taxes is?
- iii) What is the ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans?
- iv) If the interest on loans amounted to Rs. 2.45 crores then the total amount of expenditure on advertisement, taxes and research and development is?

**Q5)** a) Discuss the steps involved in publishing a research idea in a journal. [5]  
 b) A sample of 10 is drawn randomly from a certain population. The sum of the squared deviations from the mean of the given sample is 50. Test the hypothesis that the variance of the population is 5 at 5 percent level of significance. [5]

**Q6)** a) Explain the sources which can and/or should be used for selecting a research problem. [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) Write an explanatory note on “interdisciplinary research”. [5]  
 b) Write an explanatory note on research hypothesis. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4582**

**[6355]-5**

[Total No. of Pages :1

**First Year M.E. (Chemical)**

**ADVANCED TRANSPORT PHENOMENA**

**(2017 Pattern) (Semester- II) (509107)**

*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)** Distinguish between substantial derivative, total derivative with example.[10]

**Q2)** Discuss Newtons Law of Viscosity and rheological behavior of non- Newtonian Fluid. [10]

**Q3)** Heat Conduction is flowing through an annular wall of inside radius  $r_0$  and outside radius  $r_1$ . The thermal conductivity varies linearly with temperature from  $k_0$  at  $T_0$  to  $k_1$  at  $T_1$ . Develop an expression for the heat flow through the wall. [10]

**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 energy equation in curvilinear coordinates. [10]

**Q6)** Discuss the equation of continuity in curvilinear coordinates. [10]

**Q7)** Explain time smoothing of the equation of change for incompressible fluid.[10]

- Q8)** a) Discuss in Detail Chilton & Colburn J Factor analogy in brief. [5]  
b) Discuss Reynolds Stresses. [5]



**P.T.O.**



Total No. of Questions : 8]

SEAT No. :

PC4583

[Total No. of Pages : 2

[6355]-6

**M.E. - I (Chemical Engineering)**  
**ADVANCED PROCESS CONTROL**  
**(2017 Pattern) (Semester - II) (509108)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

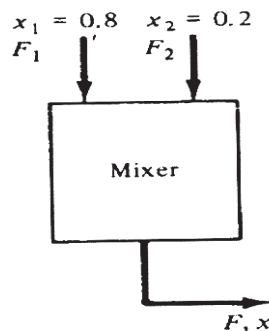
- 1) Answer any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

**Q1)** Discuss the impulse-response process model identification for a typical 1st order process with all the equations. **[10]**

**Q2)** Determine the degree of freedom of the stirred tank heater system with an input stream  $F_i$  at temperature  $T_i$  with coil heating through which steam at flowrate  $F_{st}$  flows, by deriving the appropriate model equations. **[10]**

**Q3)** What is Root-Locus plot? Describe the stepwise procedure to draw the root locus plot of a given system transfer function and state how its study is useful in the stability analysis and controller tuning of the system. **[10]**

**Q4)** Two streams with flowrates  $F_1$  and  $F_2$  and compositions in mole fractions  $x_1 = 0.8$  and  $x_2 = 0.2$  of component 'A' are mixed in a vessel. We need to design two control loops to regulate the product composition  $x$  and flowrate  $F$ , where the desired steady-state values are  $F = 200$  mol/hr and  $x = 0.6$  for which the values of the manipulated variables are  $F_1 = 133.4$  and  $F_2 = 66.6$ . **[10]**



The steady-state mass balances of the mixer are:

P.T.O.

$$F = F_1 + F_2$$

$$Fx = F_1x_1 + F_2x_2$$

Two control configurations are possible:

- a)  $F$  is controlled by manipulating  $F_1$ , and  $x$  is controlled by manipulating  $F_2$
- b)  $F$  is controlled by manipulating  $F_2$ , and  $x$  is controlled by manipulating  $F_1$

Develop the RGA matrix for the  $2 \times 2$  system and suggest the better control configuration of the two.

**Q5)** a) Explain the stability analysis of a typical first order discrete-time systems in the discrete complex plane. [5]

b) What is PRBS signal? Explain how it is more helpful in process identification. [5]

**Q6)** Discuss in brief about the IMC (Internal Model Control) design strategy and design a controller for the first-order process whose transfer function is given by: [10]

$$G(s) = \frac{5.0}{8s + 1}$$

using the IMC strategy. Convert this controller to the conventional feedback form.

**Q7)** Explain the Model Predictive Control (MPC) System in detail. [10]

**Q8)** Discuss about the common plant-wide control issues in brief. [10]



Total No. of Questions : 8]

SEAT No. :

**PC4584**

**[6355]-7**

[Total No. of Pages : 2

**First Year M.E. (Chemical)**  
**ADVANCED REACTION ENGINEERING**  
**(2017 Pattern) (Semester-II) (509109)**

*Time : 3 Hours]*

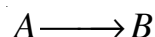
*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1)** Derive the time and radius relationship for the gas diffusion-controlled step of unchanging the size of the spherical particle. **[10]**

**Q2)** The first-order reaction **[10]**



is carried out in a 10 cm diameter tubular reactor 6.36 m in length. The specific reaction rate is  $0.25 \text{ min}^{-1}$ . The results of a tracer test is carried out in this reactor are as follows :

t(s)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (mg/L)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

Calculate conversion using

- a) The closed vessel dispersion model
- b) The tank in series model

**Q3)** Explain in detail modelling diffusion with reaction. **[10]**

**P.T.O.**

**Q4)** Derive the expression for the effectiveness factor of the single cylindrical pore of the catalyst. [10]

**Q5)** Explain Multiphase Reactor. [10]

**Q6)** Reactant 'A' is adsorbed on the surface of the catalyst and reacts with another component 'B' in the gas phase. The products of the reaction are : C adsorbed on the surface and D in the gas phase. The product C is then desorbed from the surface. (Derive the rate equation for the mentioned reaction assuming Surface) Reaction rate Controlling. [10]

**Q7)** Write a short note on. [10]

- a) Residence Time Distribution
- b) Weisz Prater Criterion for internal diffusion

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

- a) Mear's Criterion for external diffusion
- b) Fixed Bed Reactor



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 1

**PC4585**

**[6355]-8**

**S.Y.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)** Define Model and also explain the need of modeling. **[10]**

**Q2)** Explain different steady State Models. **[10]**

**Q3)** Explain with suitable example Linear and non-linear regression. **[10]**

**Q4)** Develop a model for batch Reactor. **[10]**

**Q5)** Write an assumption for a model of distillation column & develop a model. **[10]**

**Q6)** Give the simulation scheme for PFR. 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.

**Q8)** Explain Application of Optimization pertaining to Chemical Reactor. **[10]**



Total No. of Questions : 8]

SEAT No. :

**PC4586**

**[6355]-9**

[Total No. of Pages : 2

**S.Y.M.E. (Chemical Engineering)**  
**ADVANCED THERMODYNAMICS**  
**(2017 Pattern) (Semester-III) (509114)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of electronic pocket calculator is allowed.*

**Q1) a)** What is an azeotrope in phase equilibrium systems? State the mathematical conditions satisfied at the azeotrope point for binary mixtures. **[4]**

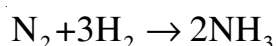
b) An azeotrope of the ethanol-benzene system has a composition of 44.8% (mol) ethanol with a boiling point of 341.4K at 101.3 kPa. At this temperature the vapour pressure of benzene is 68.9 kPa and the vapour pressure of ethanol is 67.4 kPa. What are the activity coefficients (as per the Van Laar Model) in a solution containing 10% alcohol? **[6]**

**Q2)** Explain the Ternary Equilibrium Diagram for Liquid-Liquid Equilibrium with a suitable example. **[10]**

**Q3) a)** Explain the effect of temperature on the reaction equilibrium from thermodynamic point of view. **[5]**

b) Discuss about the thermodynamic equilibrium of heterogeneous reactions in brief. **[5]**

**Q4)** In the synthesis of ammonia, stoichiometric amounts of nitrogen and hydrogen are sent to a reactor where the following reaction occurs **[10]**



The equilibrium constant for the reaction at 675 K may be taken equal to  $2 \times 10^{-4}$ . Determine the per cent conversion of nitrogen to ammonia at 675 K and 20 bar.

**P.T.O.**

**Q5) a)** Explain the Boltzmann's Entropy Concept based on statistical probabilities. [5]

b) Explain the term Degeneracy related to statistical thermodynamics. [5]

**Q6)** Explain the Onsager reciprocal relations law formulated for non-equilibrium thermodynamics. [10]

**Q7)** Explain the effect of curvature on surface thermodynamic properties. [10]

**Q8)** Discuss the effect of centrifugal force on the concentration of solution. [10]



Total No. of Questions : 8]

SEAT No. :

PC4587

[6355]-10

[Total No. of Pages :2

**First Year M.E. (Chemical) (Environmental Engineering)**  
**APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS**  
**(2017 Pattern) (Semester- I) (509131)**

*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)** The following are the details of income and expenditure of 10 households.[10]

Income	40	70	50	60	80	50	90	40	60	60
Expenditure	25	60	45	50	45	20	55	30	35	30

Determine the regression of expenditure on income and estimate the expenditure when the income is 65.

**Q2)** a) Explain Methods of Moment. [5]

- b) For a particular brand TV picture tube, it is known that the mean operating life of the tubes is 1000 hrs with a standard deviation of 250 hrs, what is the probability that the mean for a random sample of size 25 will be between 950 and 1050 hrs? [5]

**Q3)** Explain the Differences, Assumptions and Hypotheses One-Way and Two-Way ANOVA: Differences, Assumptions and Hypotheses. [10]

**Q4)** Explain the following Terms [10]

- a) Randomized Block Design
- b) Factorial Design

**P.T.O.**



**Q5)** Explain the graphical sensitivity in the light of simplex method. [10]

**Q6) a)** Explain the relationship between t and f distribution. [5]

b) Elaborate the model equation for latin square design. [5]

**Q7) a)** Explain the coefficient of variation. [5]

b) Find out the value of quartile deviation and its coefficient from following data: [5]

Roll No	1	2	3	4	5	6	7
Marks	20	28	40	12	30	15	50

**Q8)** Explain in details Correlation and Autocorrelation with examples and plots.[10]



Total No. of Questions : 8]

SEAT No. :

PC-4588

[Total No. of Pages : 2

[6355]-11

**M.E. (Environmental Engg.) (Chemical)**

**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) Discuss the various National standards for Environmental Management.[5]

b) Discuss the various advantages of Environmental Auditing. [5]

**Q2)** a) Discuss trade and environmental management. [5]

b) Explain EIA evaluation in India. [5]

**Q3)** a) What is 74<sup>th</sup> amendment of the constitutions. [5]

b) What are the impacts of Economical sub-systems of environment on Business? [5]

**P.T.O.**

- Q4)** Discuss the various Environmental Policies of the Government of India for Industrial Location with respect to Ecology. **[10]**
- Q5)** Explain in detail the difference between Regulation, Law and Notification Bills. **[10]**
- Q6)** Write short note on Safety Related rules in Chemical industry. **[10]**
- Q7)** Explain the role of Maharashtra Pollution Control Board for sustainable growth. **[10]**
- Q8)** Discuss general features of annual report of Ministry of Environment for current year. **[10]**



Total No. of Questions : 8]

SEAT No. :

PC-4589

[Total No. of Pages : 2

[6355]-12

**M.E. (Chemical - Environmental Engineering)**

**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)** What is COD? Explain its environmental significance and determination Technique. **[10]**

**Q2)** What is the role of Chemical kinetics in Environmental Engineering? Explain it in detail. **[10]**

**Q3)** How to do the Reclamation of oily soil? **[10]**

**Q4)** Explain the formation of photochemical smog? In which region of India it is been observed and why? **[10]**

**Q5)** What is CO<sub>2</sub> capture mechanism? **[10]**

**Q6)** What are the promising areas of Environmental Sciences & Engineering?**[10]**

*P.T.O.*

***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. :

PC-4590

[Total No. of Pages : 1

[6355]-13

**M.E. (Environmental Engg) (Chemical Engg.)**

**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 difference between research methods and research methodology. **[10]**

**Q2)** Explain the concept of correlation and regression in linear data analysis. **[10]**

**Q3)** Determine the size of the sample for estimating the true weight of the cereal containers for the universe with  $N = 5000$  on the basis of the following information;

- (1) the variance of weight = 4 ounces on the basis of past records.
- (2) estimate should be within 0.8 ounces of the true average weight with 99% probability.

Data:  $z = 2.57$  for 99% confidence level from standard table.

Will there be a change in the size of The sample if we assume infinite population in the given case? If so, explain by how much?

**Q4)** Explain Hypothesis Testing with a neat flow diagram. **[10]**

**Q5)** Explain the role of soft computing in research. **[10]**

**Q6)** Explain the referencing in research and academic writing. **[10]**

**Q7)** What is a review? Explain book review and case review. **[10]**

**Q8)** Describe the nature of intellectual property in detail. **[10]**



Total No. of Questions : 8]

SEAT No. :

PC-4591

[Total No. of Pages : 2

[6355]-14

**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 configurations for ideal and nonideal reactors. **[10]**

**Q2)** What are the important factors to be considered for selecting unit operations and processes. **[10]**

**Q3)** 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]**

**Q4) a)** Discuss general features of conventional rapid granular medium depth filters. **[5]**

b) What is backwash hydraulics. **[5]**

*P.T.O.*

**Q5) a)** How activated carbons are prepared and explain carbon regeneration and reactivation. **[5]**

b) Explain the concept of uptake capacity. **[5]**

**Q6)** Explain the applications of ion exchange for hardness and TDS removal. **[10]**

**Q7)** Determine the capacity of a chlorinator for a treatment plant with an average wastewater flow of  $1000 \text{ m}^3/\text{d}$ . 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)** Discuss the general design consideration for anaerobic treatment process. **[10]**





Total No. of Questions : 8]

SEAT No. :

PC-4592

[Total No. of Page : 1

**[6355]-15**

**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)* Illustrate the functional elements of the solid waste management. **[10]**

*Q2)* Explain the transportation of the solid waste in detail. **[10]**

*Q3)* Analyze the economics of solid waste generation rate. **[10]**

*Q4)* Explain the vermicomposting and its impact on the environment. **[10]**

*Q5)* Explain the biomethanation and its impact on the environment. **[10]**

*Q6)* Explain the energy recovery system from the biomethanation. **[10]**

*Q7)* Explain the various landfilling methods in detail. **[10]**

*Q8)* Explain the elements of functional management plan for solid waste system. **[10]**



Total No. of Questions : 8]

SEAT No. :

PC-4593

[Total No. of Page : 1

[6355]-16

**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 Trickling 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 Inorganic chemicals from industrial wastewater with neat flow diagram. **[10]**

**Q6)** Draw the flow sheet for treatment of dairy waste and focus on its cost benefit analysis with all 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 Oxidation Pond. **[10]**



Total No. of Questions : 8]

SEAT No. :

PC-4594

[Total No. of Pages : 2

[6355]-17

M.E.

**CHEMICAL - ENVIRONMENTAL ENGINEERING**  
**Remote Sensing and GIS Applications 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]**

**P.T.O.**

**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. :

PC-4595

[Total No. of Pages : 2

**[6355]-18**

**M.E. (Chemical/Environmental Engg.)**

**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)** Discuss about Environmental Policies and Regulations to encourage Pollution Prevention and Cleaner Production. **[10]**

**Q2)** a) Discuss the various Sustainability Strategies for pollution control and cleaner Production. **[5]**

b) Discuss the various key indicators for the sustainability. **[5]**

**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]**

a Production

b) Raw material substitution.

*P.T.O.*

**Q6)** Discuss the technical and Environmental Feasibility analysis of pollution prevention and cleaner production program. **[10]**

**Q7)** a) Explain the role of Cost Analysis for pollution prevention and control. **[5]**  
b) Write a note on Environmental Audit. **[5]**

**Q8)** Write short note on :

a) International Environmental Standards - ISO 14001 **[5]**  
b) Elements of life cycle costing. **[5]**



Total No. of Questions : 8]

SEAT No. :

PC-4596

[Total No. of Pages : 3

**[6355]-19**

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

**APPLICATION 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, Q.7 or Q.8.
- 2) Use of electronic pocket calculator only.
- 3) Figures to the right indicate full marks.

**Q1) a)** Explain the concept of a random variable in the context of Civil Engineering application. **[4]**

b) As only 3 students came to attend the class today, find the probability for exactly 4 students to attend the classes tomorrow. Solve with Poisson Distribution method. **[5]**

OR

**Q2) a)** Explain Binomial Distribution in brief **[4]**

b) Two coins are tossed 500 times and we get, **[5]**  
Two heads ÷ 105 times  
One head ÷ 275 times  
No head ÷ 120 times  
Find the Probability of each event to occur.

**Q3) a)** Explain the significance based on t-distribution. **[4]**

b) A Civil Engineer is analyzing traffic accident at a particular intersection. Based on historical data, accident occur at an average rate of 2 accident per week. Calculate the probability of the following scenarios using the Poisson Distribution. **[5]**

1. Exactly 3 accidents occurs in a week
2. Almost 1 accident occurring in a day

*P.T.O.*

OR

- Q4)** a) Explain the test of significance based on Chi-Square - distribution. [4]  
b) Calculate the Pearson correlation coefficient for the following data [5]

X	2	4	6	8	10
Y	3	5	7	9	11

- Q5)** a) A Civil engineer is studying the waiting time of vehicles at a toll booth during peak hours. The engineer randomly selects 50 vehicles & records their waiting time (in minutes) as follows : [8]

8, 6, 10, 7, 5, 9, 11, 8, 7, 6, 10, 12, 7, 6, 8, 9, 10, 5, 8, 7, 6, 9, 11, 8, 6, 10, 7, 5, 9, 11, 8, 7, 6, 10, 12, 7, 6, 8, 9, 10, 5, 8, 7, 6, 9, 11, 8, 6, 10, 7

Using waiting line models determine the average waiting time, the average number of vehicles waiting in line and the average number of vehicle in the system at the toll booth.

- b) What do you meant by Down time of equipment. How can it hamper on company profit. Explain with example. [8]

OR

- Q6)** a) What are the causes of Down time in construction site? How can we eliminate this causes? [6]

- b) Explain Cox and Nunally model in brief. [5]

- c) Explain the concept of "Failure Cost Profile" [FCP] in detail. Write down it's significance zelated with the construction site. [5]

- Q7)** a) Explain the "Sensitivity Analysis Mathematical model" in detail. [8]

- b) Explain the concept of "ABC" analysis?

A firm has 1000 "A" items (which it counts every week i.e. 5 day's), 4000 "B" items (counted every 40 days) and 8000 "C" items (Counted every 100 day's). How many items should be counted per day? [8]

OR



**Q8)** a) "Sharma group" monthly demands 1000 bags of cement. The unit cost of a bag is Rs. 200/- and the inventory carrying cost per unit per annum is 20% of average inventory cost. If the cost of procurement is Rs. 70/- Determine. [8]

i) EOQ

ii) Number of order / annum

iii) Total cost of purchasing

b) How do mathematical models based on probabilistic and statistical methods contribute to risk identification, analysis and mitigation in civil engineering projects? [8]



Total No. of Questions : 8]

SEAT No. :

PC-4597

[Total No. of Pages : 2

[6355]-20

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

**MANAGEMENT AND PROJECT PLANNING IN CONSTRUCTION**

**(2017 Pattern) (Credit) (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) *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) Enlist the various management styles. Explain any one in brief. [4]  
b) Explain the role of project management consultant in a building construction project. [5]

OR

- Q2)** a) Explain the Precedence Network analysis in brief. [4]  
b) Following table shows the activities of a construction project. [5]

Name of Activity	Immediate Predecessor Activity	Duration (Days)
A	--	4
B	A	3
C	A	5
D	A	4
E	B	3
F	B,C	6
G	B,C	3
H	D	5
I	E,F	7

*P.T.O.*

- i) Draw a CPM Network. Show the critical path and find out the total project duration.
- ii) Calculate - EST, EFT, LST and LFT for each activity.

- Q3)** a) Explain the step by step procedure of Resource Leveling. [4]  
 b) Explain the factors to be considered while selecting a job for work study. [5]

OR

- Q4)** a) What is meant by Network Crashing? Explain the procedure of crashing in brief. [5]  
 b) Explain the “Travel Chart” recording technique used in work study. [4]

- Q5)** a) Enlist the various hazards associated with crane operation. What safety measures to be undertaken to avoid the crane hazards? [8]  
 b) Write a short note on :  
     i) Personal Protective Equipment [4]  
     ii) Causes of accidents on various sites. [4]

OR

- Q6)** a) What is FMEA technique? Explain the FMEA analysis process in detail. [8]  
 b) Discuss the general safety precautions to be exercised for scaffolding work in detail. [8]

- Q7)** a) Discuss any two types of incentive schemes in detail. [8]  
 b) Write a brief note on :  
     i) Application of BIM in construction [4]  
     ii) Application of Artificial Neural Network in construction [4]

OR

- Q8)** a) What are the advantages and limitations of Merit Rating? [8]  
 b) Write a brief note on :  
     i) Application of Genetic Algorithm in construction. [4]  
     ii) Application of Fuzzy logic technique in construction [4]



Total No. of Questions : 8]

SEAT No. :

**PC4598**

[Total No. of Pages : 2

**[6355]-21**

**First Year M.E. (Civil-Construction and Management)**

**CONSTRUCTION TECHNOLOGY**

**(2017 Pattern) (Semester - I) (501023)**

*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 Electronic pocket calculators is allowed.*

**Q1) a)** What do you mean “bedding of conduits”? Explain. **[5]**

**b)** Explain “Vacuum Dewatering” in detail. **[4]**

OR

**Q2) a)** Explain micro tunneling explain in detail. **[5]**

**b)** Enlist the grouting materials used. Focus on chemical grouting in detail. **[4]**

**Q3) a)** What is Boom Placer? State its necessity and draw well sketch which is showing angles of its. **[5]**

**b)** Write down different causes of failure of piles. **[4]**

OR

**Q4) a)** Prepare Concrete mix design for M30 Grade concrete. **[5]**

**b)** Explain the sequential operations involved in construction of sheet pile cofferdam for construction of bridge pier. **[4]**

**Q5) a)** What do you mean by “Cofferdams”. Write down different type of Cofferdam. Explain any one in detail. **[8]**

**b)** What do you mean by “diaphragm wall”. Explain the construction work activity of diaphragm wall. **[8]**

OR

**P.T.O.**

- Q6)** a) Explain which factors are considered in geotechnical investigation of Cofferdam construction? State importance of each factor. [5]
- b) Explain coffer dams with touching and interlocking piles. [5]
- c) Explain with neat sketch earth and rock fill cofferdam with its advantages and disadvantages. [6]

- Q7)** a) What is mean by Caissons? Explain types of caissons. Explain any one in detail. [8]
- b) Write down a short note on pneumatic and precast caissons in detail.[8]

OR

- Q8)** a) Explain in detail caissons and write its advantages and disadvantages. [8]
- b) What are pneumatic caissons? State conditions where pneumatic caissons are recommended. [8]



Total No. of Questions : 10]

SEAT No. :

**PC4599**

[Total No. of Pages : 2

**[6355]-22**

**First Year M.E. (Civil) (Construction & Management)**

**TQM IN CONSTRUCTION**

**(2017 Pattern) (Semester - I) (501024)**

*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) *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 Total Quality Management required in Construction Industry.[5]  
b) Explain Analysis Techniques for Quality Costs in Construction Industry. [5]

OR

- Q2)** a) Explain the contributions of Deming to TQM. [5]  
b) Explain the barriers to TQM implementation in Construction Sector. [5]

- Q3)** a) Explain Statistical quality control and the importance of Statistical quality control in Construction industry. [5]  
b) Explain the terms quality and reliability Construction with example. [5]

OR

- Q4)** a) Explain about Rectifying inspection plans. [5]  
b) Explain about natural tolerance limits and Specification limits. [5]

- Q5)** a) Explain the DIFFERENT TYPES OF TRAINING in Construction industry. [5]  
b) Explain the causes of Variation? Explain about Process and Product Control. [5]

OR

**P.T.O.**

- Q6)** a) Explain training and development in the words of Lawrence S. Kleiman and Explain features of training. [5]  
b) Explain the importance of Statistical quality control in Construction industry. [5]

- Q7)** a) Explain the steps for Root cause analysis delay of construction project.[5]  
b) Explain the importance of Statistical quality control in construction industry. [5]

OR

- Q8)** a) Explain with examples random and common causes on construction site. [5]  
b) Explain the a non-conformity report on construction site. [5]

- Q9)** a) Explain the Process Capability on construction site defined as six times the standard deviation. [5]  
b) Explain the chart used to evaluate the quality by number of defects on construction sector. [5]

OR

- Q10)a)** Explain the sigma increases, cost of poor quality work goes down while profitability, productivity and customer satisfaction in construction. [5]  
b) Explain the Control Limits, Warning Limits & Tolerance Limits on construction site. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4600**

**[6355]-23**

[Total No. of Pages :2

**First Year 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) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) Neat Diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

**Q1)** a) Define contract as per the Indian Contract Act (1872) and explain the term Valid contract. **[5]**

b) Explain the role of project management services in construction project.**[5]**

OR

**Q2)** a) What is breach of contract and explain its effect. **[5]**

b) Explain the importance of pre-bid meeting in tendering. **[5]**

**Q3)** a) With reference to the MOS & PT contract conditions explain the following: **[5]**

i) Various advances and their recovery.

ii) Dispute resolution mechanism.

b) Write a brief meaning of Provision for Provisional sum work & Day work schedule under FIDIC conditions RED BOOK. **[5]**

OR

**Q4)** a) Discuss the circumstances under which the contractor shall be entitled to terminate the contract. **[5]**

b) Explain in detail responsibilities and duties of the Employer for contracts under Red Book. **[5]**

**P.T.O.**



**Q5) a)** What is the importance of role of various stakeholders in prevention of disputes? [5]

b) Explain in details Extra items and causes of claims in construction industry. [5]

c) What are the various causes of disputes in construction industry. [5]

OR

**Q6) a)** Explain in detail - Defect Liability Period. [5]

b) What is the importance of role of various stakeholders in prevention of disputes? [5]

c) What is Construction Claims, Types of construction claims and explain settlement of claims. [5]

**Q7) a)** Write a short note on-Conciliation related to contract. [5]

b) Explain are the various duties, power of arbitrators? [5]

c) Describe the clauses of escalation of cost: What is an arbitral proceeding. [5]

OR

**Q8) a)** Explain difference between Arbitration and Conciliation. [5]

b) Explain Conciliation and its provisions in the Act; also explain conduct of conciliation and arbitral proceedings? [5]

c) Explain in detail difference between 1940 Act and 1996? [5]



Total No. of Questions : 8]

SEAT No. :

**PC4601**

[Total No. of Pages : 3

**[6355]-24**

**First Year M.E. (Civil-Construction & Management)**  
**PROJECT ECONOMICS & FINANCIAL MANAGEMENT**  
**(2017 Pattern) (Semester - II) (501028)**

*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) Use suitable data if necessary.

**Q1) a)** Discuss on motives and obstacles in the growth of any business firm?[5]

b) Explain the concept of breakeven analysis with sketch. [4]

OR

**Q2) a)** What do you understand by working capital? Explain its necessity. [5]

b) List out any three project appraisal criteria's and explain any one in detail.[4]

**Q3) a)** What are the sources of long term finance? Discuss on any one in detail.[5]

b) Write a note on types of budgets. [4]

OR

**Q4) a)** Write down procedure to prepare master budget. [5]

b) Explain present tax system and its implication on the construction sector. [4]

*P.T.O.*

- Q5) a)** What are the advantages and limitations of ratio analysis? **[6]**
- b)** Trading and profit & loss account of Surya associates for the year ending 31-3-2023 is given below, Calculate Gross profit ratio, Expenses ratio, Operating ratio, Net profit ratio and Operating profit ratio. **[10]**

Particulars	Rs.	Particulars	Rs.
To, Opening stock	70,000	By, Sales	6,00,000
Purchases	2,00,000	Closing stock	50,000
Carriage & freight	20,000		
Wages	10,000		
Gross profit b/d	2,50,000		
	5,50,000		5,50,000
To, Administrative expenses	1,30,000	By, Gross profit b/d	2,50,000
Selling & distribution expenses	32,000	Non-operating incomes:	
Non-operative expenses	5,000	Interest on securities	2,500
Financial expenses	9,000	Dividend on shares	5,000
Net profit c/d	84,000	Profit on sales of shares	2,500
	2,60,000		2,60,000

OR

- Q6) a)** Discuss method of reporting and recording site accounts between project and head office. **[6]**
- b)** Segregate the given assets and liabilities and prepare balance sheet. Find out current and quick ratio using the data given. **[10]**

Particulars	Amt.(Rs.)	Particulars	Amt.(Rs.)
Equity share capital	40,000	Profit & loss a/c	12,000
Plant & Machinery	24,000	Cash in hand	12,000
Cash reserve	8,000	Taxation: Current	4,000
		Future	4,000
Loan	32,000	Short term investment	4,000
Debtors	12,000	Land & building	40,000
Creditors	16,000	Bank overdraft	4,000
stock	12,000	Furniture & fixtures	16,000

- Q7)** a) Draft detailed project appraisal report for a construction of Canal, considering technical, financial, social, environmental aspects. [8]
- b) Discuss in detail any case study on Mass transit system and its pros and cons. [8]

OR

- Q8)** a) Draft detailed project appraisal report for a construction of an earthen dam, considering technical, financial, social, environmental aspects. [8]
- b) Discuss in detail a case study of any govt. funded construction project with respect to project appraisal, raising of fund, risks involved, cost analysis etc. [8]



Total No. of Questions : 8]

SEAT No. :

PC4602

[6355]-25

[Total No. of Pages : 4

First Year M.E. (Civil -Construction & Management)

OPERATIONS RESEARCH

(2017 Pattern) (Semester-II) (501029)

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) Define-Operations Research. Explain the necessity of Operations Research in Civil Engineering. [4]

b) Solve the following Linear Problem using Graphical method: [5]

$$\begin{aligned} \text{Max. } Z &= 20x_1 + 50x_2 \\ \text{Subject to } 6x_1 + 3x_2 &\leq 1500 \\ 2x_1 + 5x_2 &\leq 1000 \\ x_1 + x_2 &\leq 450 \\ x_1 \geq 0, x_2 &\geq 0 \end{aligned}$$

OR

Q2) a) A Firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each three products and the daily capacity of the three machines are given below. [4]

Machine	Time per unit (minutes)			Machine capacity (minutes/day)
	Product-1	Product-2	Product-3	
M1	2	3	2	440
M2	4	----	3	470
M3	2	5	-----	430

It is required to determine the daily number of units to be manufactured for each product. The profit per unit for product 1,2 and 3 is Rs.4, Rs.3 and Rs. 6 resp. It is assumed that all the amounts produced are consumed in the market. Formulate the mathematical L.P. model that will maximize the daily profit.

P.T.O.

- b) For each of the following function show whether it is convex, concave or neither. [5]

i)  $f(x) = 15 - x^2$

ii)  $f(x) = x^4 + 6x^2 + 10x$

- Q3) a)** The unit cost of transporting cement from 3 factories to 4 warehouses is given in following table, along with the availability at each factory and the requirement of each warehouse. Find only initial feasible solution by [4]

i) North West Corner Method

ii) Least cost Method

iii) VAM Method

Factories	Ware Houses				Supply
	1	2	3	4	
1	3	7	6	4	5
2	2	4	3	2	2
3	4	3	8	5	3
Demand	3	3	2	2	10

- b) It is proposed to develop hydropower by building Dams across 3 possible river sites. The total financial resource available is 8 money units. The return functions for each of the possible investment are given below. The available resource is to be allocated optimally to these developments. Using DP determine the maximum return and give the allocation to various sites. [5]

Resource Allocated	Return from site		
	1	2	3
0	1	0	0
2	12	14	30
4	75	55	50
6	91	70	70
8	98	80	75

OR

- Q4) a)** A sale manager has assign salesman to 4 cities. He has 4 candidates of varying experience and capabilities and access the possible profit for each salesman in each district as given below. Find the assignment which maximizes the profit. [5]

Salesman	Cities			
	A	B	C	D
1	35	27	28	37
2	28	34	29	40
3	35	24	32	33
4	24	32	25	28

- b) Define the terms: [4]
- Unimodal function
  - Global and Local optima

- Q5) a)** Use the Lagrange multiplier method. [8]

$$\text{Minimize } f(x) = 3x_1^2 + 4x_2^2 + 5x_1x_2 - 8x_2$$

$$\text{Subject to } x_1 + x_2 = 4$$

- b) Maximize  $Z = 6x_1 - 2x_1^2 + 4x_2 - 2x_2^2 - 2x_1x_2$  with initial value (1,1) using Steepest Ascent/Descent Method. [8]

OR

- Q6) a)** Maximize  $Z = 6x_1 - x_1^2 + 6x_2 - 3x_2^2$  with initial value as  $x^0 = (2, 2)$  Use Newton's Modified Method to solve above problem. [8]

- b) Maximize  $f(x) = 3x_1 + x_1x_2 - x_1^2 - x_2^2$  with initial value (0, 0) using Steepest Ascent/Descent Method. [8]

- Q7) a)** Solve the following sequencing problem. [8]

Job	A	B	C
1	13	6	18
2	10	8	19
3	11	12	14
4	17	9	12
5	14	11	17

- b) A firm is considering replacement of machine, whose cost price is Rs. 12,200 and the scrap value is Rs. 200. The running ( maintenance and operating) costs are found from experience to be as follows: [8]

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

When should the machine to be replaced?

OR

- Q8) a) Reduce the following game by dominance and find the game value. [8]

Player B

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

Player A

- b) A sample of 100 arrivals of automobiles at a toll booth is found to be according following distribution [8]

Time of Arrivals in minutes	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Frequency	2	6	10	24	20	15	10	7	4	2

A study of service time reveal the following distribution.

Service in time in minutes	0.5	1	1.5	2.0	2.5
Frequency	13	22	37	20	8

Estimate the average waiting time, percentage waiting time of the vehicle, average idle time and percentage idle time of the server for 10 arrivals. Use the following Random No.

Arrivals	16	77	23	02	77	28	06	24	25	93
Service time	56	65	05	61	86	90	92	10	79	80





Total No. of Questions : 10]

SEAT No. :

**PC4603**

**[6355]-26**

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

**S.Y.M.E. (Civil-Construction and 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, Q.7 or Q.8, Q.9 or Q.10.*
- 2) Draw neat sketch 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)** Describe the area consideration of mega projects like National Highways. **[5]**

b) Enlist the Environment Impact Factors of Mega projects like. **[5]**

i) Airports

ii) Power Projects

OR

**Q2) a)** Explain in detail the importance of studying socio economic impact of project along with techno economic and environmental impact assessment. **[5]**

b) Explain in detail Fiscal Impacts Analysis. **[5]**

**Q3) a)** Enlist various environmental laws pertaining to any civil engineering project. Explain in detail energy conservation act 2001. **[5]**

b) What is carbon credit system? Why it is important for developing countries? **[5]**

OR

**Q4) a)** What is Prototype Carbon Funds (PCF). Explain in detail its significance. **[5]**

b) What is Conference of Parties (COP). Explain its importance. **[5]**

**P.T.O.**

**Q5) a)** Explain in detail various kinds of energy efficient services provided on construction site for energy conservation. [5]

b) What is Defferred Payment Financing? Explain in detail its significance.[5]

OR

**Q6) a)** Explain in detail role of UNFCCC in climate change. [5]

b) How Clean Development Mechanism is beneficial for Energy Conservation in Projects. Explain with suitable example. [5]

**Q7) a)** What is HVAC systems? How these are beneficial for energy savings?[5]

b) Enlist the various types of wastages. What are priority conservative measures to minimise it. [5]

OR

**Q8) a)** Explain in detail power factor. State its significance. [5]

b) Comment of energy savings in [5]

i) Pumps

ii) Fans

**Q9) a)** Explain Thermal Comfort and ways to achieve it. [5]

b) Explain in brief management of maximum energy demand. [5]

OR

**Q10)a)** Explain in brief passive heating and air cooling systems. [5]

b) Describe in brief energy recovery dehumidifier. [5]



Total No. of Questions : 8]

SEAT No. :

**PC5125**

[Total No. of Pages : 2

**[6355]-27R**

**S.Y. M.E. (Civil) (Construction & Management)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester - III) (601034)**

*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 indicates full marks.*
- 4) *Assume suitable data, if necessary and clearly state.*
- 5) *Use of electronic pocket calculator is allowed.*

- Q1)** a) What are the different sources of research problem? [4]  
b) Explain the strategies of literature survey. [5]

OR

- Q2)** a) Explain different characteristics the hypothesis must process in order to be a good research. [5]  
b) Explain the elements and objectives of literature survey. [4]

OR

- Q4)** a) Enumerate the different methods of collecting data. What is observation method of data collection. [5]  
b) Explain the Null hypothesis and Alternative Hypothesis. [4]

- Q5)** a) Write a note on 'Principle components method' of factor analysis. [8]  
b) Write note on Correlation, regression analysis and factor analysis. [8]

OR

*P.T.O.*

**Q6)** a) Explain Multi-dimensional measurement and what are the sources of error in measurement are. [8]

b) Write short note on discriminant analysis and cluster Analysis. [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) Discuss the steps involved in publishing a research idea in a journal and Enlist the types of report. [8]

OR

**Q8)** a) Discuss the important factors to be considered during presenting a research idea. [8]

b) Write a note on “Process for patenting and a research idea” and “Plagrism in research”. [8]



Total No. of Questions : 10]

SEAT No. :

**PC4605**

**[6355]-28**

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

**M.E. - I (Civil) (Environmental)**  
**ENVIRONMENTAL LEGISLATION AND**  
**MANAGEMENT SYSTEM**  
**(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 indicate full marks.*
- 3) Assume Suitable data if necessary.*
- 4) Question 09 and question 10 are compulsory.*

**Q1)** Explain in detail; Polluter Pays Principle. **[5]**

OR

**Q2)** Explain in detail; Montreal Protocol. **[5]**

**Q3)** Explain in detail; Water (P & CP) Act, 1974: Power & functions of regulatory agencies. **[5]**

OR

**Q4)** Explain in detail; Air (P & CP) Act, 1981: Power & functions of regulatory agencies. **[5]**

**Q5)** Write a detailed note on; Environment (Protection) Act 1986: Genesis of the Act. **[5]**

OR

**Q6)** Write a detailed note on; Siting of Industries. Support your answer with suitable example. **[5]**

**Q7)** Explain in detail international and national efforts at environmental protection. **[5]**

OR

**P.T.O.**

**Q8)** Write a detailed note on; Public Interest Litigation. Support your answer with suitable example. [5]

**Q9) a)** Explain in detail: Important powers and functions of the MPC board under both the water and air acts. [8]

b) Explain in detail: Role of SPCB in implementation of various notifications issued by Central Govt. under Environment (Protection) Act, 1986. [7]

**Q10)a)** Explain Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier. [8]

b) Explain in detail: procedure of public hearing for obtaining Environmental Clearance. [7]



Total No. of Questions : 8]

SEAT No. :

PC4606

[6355]-29

[Total No. of Pages :2

First Year M.E. (Civil - Environmental Engg.)

ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

(2017 Pattern) (Semester- I) (501062)

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 and clearly state.
- 5) Use of an electronic pocket calculator is allowed.

**Q1)** Explain in detail colloidal chemistry & nuclear chemistry related to the measurement of pollution parameters. Support your answer with suitable examples. [10]

**Q2)** Write with suitable examples, detailed notes on: [10]

- a) Acid Rain
- b) Ozone depletion

**Q3)** Enlist the different carcinogenic compounds. Discuss the general effects of carcinogenic compounds in detail. [10]

**Q4)** Explain in detail about classification of Surfactants. Describe the functions of various detergents. Explain in brief effects of detergents on environment. [10]

**Q5)** Discuss different techniques for Isolation of microorganisms in detail. [10]

P.T.O.

**Q6)** What are the Physical and Chemical properties of aflatoxin? Explain its mechanism of action in detail. **[10]**

**Q7)** What are the adverse effects of polymer-based materials on the environment? Explain in detail. **[10]**

**Q8)** Discuss the applications of Environmental Microbiology to Environmental Engineering. Support your answer with suitable examples. **[10]**





Total No. of Questions : 8]

SEAT No. :

PC4607

[Total No. of Pages : 3

[6355]-30

First Year M.E. (Civil) (Environmental)

**PHYSICO-CHEMICAL PROCESS FOR WATER AND WASTE  
WATER 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) What do you mean by reaction rate. [4]
- b) A rectangular sedimentation basin is to handle 12MLD of raw water. A sedimentation basin of width to length ratio of 1/3 is proposed to trap all particles larger than 0.05mm in size. Assume a relative density of 2.62 for the particles and 20°C as the average temperature, determine the basin dimensions. If the effective depth of tank is 3m, calculate the detention time. [5]

OR

- Q2)** a) Explain in detail, with suitable example the mass balance principle used in treatment processes. [5]
- b) Find the time of exposure of water falling through distance of 3m at gravity aerator : [4]
- i) in single descent
  - ii) in four descents
- Q3)** a) Water receiving an average degree of pretreatment and responding in average fashion to coagulation is to be filtered at a rate of 122 L/min/m<sup>2</sup> through a layer of sand grains 0.1 cm in diameter. Find the requisite minimal depth of sand that will prevent breakthrough of turbidity at a terminal loss of head of 2.44 m. Take value of the breakthrough index as  $1 \times 10^{-3}$ . [4]

P.T.O.

- b) Design of high rate single stage trickling filter for treating domestic sewage flow of 8 mld using N.R.C. use following data. [5]

- i)  $BOD_5$  of raw sewage = 240mg/l
- ii) BOD removed during primary treatment = 30%.
- iii) Organic loading rate = 0.8Kg/m<sup>3</sup>/d
- iv) Hydraulic loading rate = 15m<sup>3</sup>/m<sup>2</sup>/d
- v) Recirculation ratio = 2

Determine volume of filter media, Dimensions of trickling filter, Efficiency of trickling filter.

OR

- Q4)** a) The population of a city is 50000 and per capita consumption is 135 lit/day. Calculate the total area of filter and depth of sand bed. Assume break through index as  $4 \times 10^{-4}$ , rate of filtration 100 lit/min/m<sup>2</sup>, head loss 1.7m, mean size of sand as 1mm. [5]
- b) Estimate efficiency of a 30m diameter and 1m deep single stage high rate trickling filter for the following data
- i) Sewage flow 4.5 MLD
  - ii) Recirculation ratio = 1.4
  - iii) BOD of raw sewage = 250 mg/l
  - iv) BOD removed in primary clarifier = 25% [4]

- Q5)** a) What are the design considerations for good performance of the UASB? [8]
- b) Design a Sludge digestion tank with the following data Average flow of sewage = 50 MLD, TSS=400mg/l, VSS = 300mg/l, Moisture content in the digested sludge = 85%, Removal in PST = 60%, Moisture content in fresh sludge = 95%. [8]

OR

- Q6)** a) Design an UASBR for an average flow of 10 MLD of wastewater. Use following additional data: COD of wastewater = 400 mg/l; HRT = 6 hrs; Design COD loading: 1.5 kg COD/Cu M/d; Rising velocity permissible: 0.7 m/hr; Velocity of wastewater in settling chamber < 1.5 m/hr; Flow area covered by each inlet : 2 sq. M. [8]
- b) Explain, with flow chart, various processes involved in sludge treatment and disposal. [8]

**Q7)** a) Enlist and discuss the Oxidizing agents useful in Water and Wastewater Treatment. [8]

b) How the performance of RO process can be measured? Discuss in details. [8]

OR

**Q8)** a) Compare physical methods and chemical methods of water softening. Support your answer with suitable example. [8]

b) What is ion exchange method of treatment? What are the factors affecting ion exchange? [8]



Total No. of Questions : 8]

SEAT No. :

PC-4608

[Total No. of Pages : 2

[6355]-31

**M.E. (Civil) (Environmental Engineering)**

**ENVIRONMENTAL SANITATION**

**(2017 Pattern) (Semester- I) (501064)**

*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 right indicate the marks to the question.*
- 3) Your answers will be valued as a whole.*
- 4) Assume suitable data whenever necessary*

**Q1)** Enlist and discuss the applications of epidemiology. **[5]**

OR

**Q2)** Discuss the Communicable diseases. **[5]**

**Q3)** Discuss the followings : **[5]**

- a) Factors of diseases control methods
- b) Plague control methods

OR

**Q4)** Enlist and any two disinfectants useful in sanitation practices. **[5]**

**Q5)** How industrial sanitation safeguard the health of workers? Justify your answer with suitable example **[5]**

OR

**Q6)** What the different types of industrial poisons. Discuss with suitable example. **[5]**

**P.T.O.**

**Q7)** Enlist the factors affecting the rural sanitation? How local participation is useful in rural sanitation? [5]

OR

**Q8)** Enlist and discuss any two rural sanitation improvement schemes. [5]

**Q9) a)** Under which condition the One-Pipe System and Two pipe system is advisable? Discuss in details. [7]

b) Enlist the factors to be considered for design of Water supply in buildings? Discuss any two. [7]

OR

**Q10)a)** What is the difference in Break pressure tank system and Hydro-pneumatic system. [7]

b) What are the considerations to be made during the design of water pipes. [7]

**Q11)a)** Draw and discuss about the Gully Traps and Intercepting Traps. [8]

b) What are the applications of the followings [8]

- i) Flushing Cistern,
- ii) Wash Basin,
- iii) Lavatory Basin and
- iv) Sink

OR

**Q12)a)** Discuss the principles governing design of building drainage [8]

b) How drainage design of high rise buildings differ than the other buildings? Give suitable example [8]



Total No. of Questions : 12]

SEAT No. :

PC-4609

[Total No. of Pages : 2

**[6355]-32**

**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, 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)** Give a short note on toxicity and bioassay test. **[5]**

OR

**Q2)** Discuss the followings with their application- **[5]**

- a) Equalization and Neutralization
- b) Flotation and Precipitation

**Q3)** How Nitrification is differ than the de-nitrification process? Discuss in details. **[5]**

OR

**Q4)** Enlist and discuss the limitations of wet air oxidation process. **[5]**

**Q5)** What care should be taken during disposal of effluent from dairy industry? Discuss in detail. **[5]**

OR

**Q6)** How the effluent from food processing industry is treated and disposed? Discuss. **[5]**

*P.T.O.*

**Q7)** Discuss the characteristics of effluent from Mineral Processing Industry. [5]

OR

**Q8)** How the manufacturing process of Pharma industry is differ than that of the Petroleum industry. [5]

**Q9) a)** What is CETP? What the major hurdles encountered in its management? [7]

b) How zero effluent discharge system plays a key role in effluent management? Give suitable example. [7]

OR

**Q10)a)** Discuss the general design considerations and principles involve in of CETP? [7]

b) What are the ways to reuse the waste water? How such practice of wastewater reuse help the industry? [7]

**Q11)a)** What are the advantages and disadvantages of polymer coagulation? Discuss its limitation in details. [8]

b) What are the major design components to be considered for wastewater treatment plant for petroleum industry. [8]

OR

**Q12)a)** Discuss the dye stuff and dye manufacturing industries. Give their effluent discharge standards. [8]

b) Discuss the applications of Freundlich adsorption isotherm and Langmuir adsorption isotherm in detail. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4610

[Total No. of Pages : 2

[6355]-33

**M.E. (Civil - Environmental Engineering)**

**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, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat figures wherever necessary.*

- Q1)** a) Explain the plume rise and how it is estimated? [4]  
b) What are the assumptions in Gaussian modelling for the estimation of pollutant concentrations? [5]

OR

- Q2)** a) Write the Gaussian equation to determine air pollutant concentration when the receptor is at [4]  
i) Ground level  
ii) Plume centreline  
iii) Beneath the plume centreline  
iv) Beneath the plume centreline from ground level release.  
b) A power plant is emitting SO<sub>2</sub> with exhaust rate of 127 g/s through a stack that has effective height of 75 m. The atmospheric conditions are moderately to slightly stable. The wind velocity at the top of the stack is 6 m/s. Determine the ground level concentration at a distance of 3 km downwind at the centreline of the plume.  $\sigma_y = 280$  m and  $\sigma_z = 170$  m. [5]

- Q3)** a) Describe the principles and working of electrostatic precipitator. [4]  
b) How does sulphur dioxide is reduced from flue gas? [5]

OR

*P.T.O.*



- Q4) a)** Differentiate between bag house filter and ESP. [4]  
**b)** What is the difference between physical and chemical adsorption for gaseous contaminant control system? [5]

- Q5) a)** Write in a tabular form annual and 24 hrs National Ambient Air Quality Standards (NAAQS) for  $\text{SO}_2$ ,  $\text{NO}_2$ ,  $\text{PM}_{10}$ ,  $\text{PM}_{2.5}$  specified by Central Pollution Control Board. [8]  
**b)** Explain the purpose and process of ambient air sampling of particulate matter and stack gas sampling. [8]

OR

- Q6) a)** What is significance of isokinetic sampling? Explain with neat sketch isokinetic sampling. [8]  
**b)** Explain with neat sketch the determination of ambient  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$  using particulate dust sampler. [8]

- Q7) a)** What are the major air pollutants emitted from vehicular sources? What are the measures taken to control it in Delhi? [8]  
**b)** What are the causes of indoor air pollution? Explain the measures to be taken to control it. [8]

OR

- Q8) a)** What are the sources of the odours produced in chemical, tanneries, fertilizer and food industries? [8]  
**b)** What is air cleaning system for control of indoor air pollution? Explain method of mechanical ventilation. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4611

[Total No. of Pages : 2

**[6355]-34**

**M.E. (Civil Environmental Engineering)  
SOLID WASTE AND HAZARDOUS WASTE  
MANAGEMENT**

**(2017 Pattern) (Semester - II) (501069)**

*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 side indicate full marks.*
- 3) Use of Calculator is allowed.*
- 4) Assume Suitable data if necessary.*

- Q1) a)** Write a detailed note on Proximate and Ultimate analysis of MSW. **[4]**
- b)** Discuss Hauled container collection system in detail. **[5]**

OR

- Q2) a)** Explain the direct load and discharge load Transfer station in detail. **[4]**
- b)** Explain the functional elements of Solid Waste Management in detail. **[5]**

- Q3) a)** Explain any 2 types of composting in detail. **[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 500 Kg/m<sup>3</sup>. A planning restriction limits the height of the landfill to 10m. **[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 any 2 in detail. [8]

b) Explain in detail the potential health and environmental risks associated with improper biomedical waste management. [8]

OR

**Q6) a)** Explain any 2 methods for disposal of Nuclear and Radioactive waste in detail. [8]

b) What are the different methods used for separating the solid waste? Explain any 2 in detail. [8]

**Q7) a)** Explain in detail Electronics waste management. [8]

b) Explain the characteristics of Hazardous waste management in detail. [8]

OR

**Q8) a)** Write a detailed note on TCLP test. [8]

b) Explain the Stabilization and solidification of Hazardous waste management in detail. [8]

\*\*\*

Total No. of Questions : 12]

SEAT No. :

PC-4612

[Total No. of Pages : 2

**[6355]-35**

**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 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) 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 project screening in the context of EIA? Describe the methods used for project screening and the significance of defining project thresholds. [5]

OR

**Q2)** What is the scope of studies in Environmental Impact Studies (EIS)? How do scope studies contribute to the overall assessment process? [5]

**Q3)** What types of background information are essential for conducting a thorough impact assessment? Discuss how this information influences the overall assessment process. [5]

OR

**Q4)** Explain the selection process for impact assessment methodologies. What factors influence the choice of methodologies? [5]

**Q5)** What factors influence the propagation of noise, and how are, these factors taken into account in impact assessments? [5]

OR

**Q6)** How are existing noise levels determined, and what standards are used to evaluate noise pollution? [5]

*P.T.O.*

**Q7)** Explain the concept of water quality standards. How are these standards established, and what role do they play in regulating and protecting water resources? [5]

OR

**Q8)** How are impacts on water quality identified in environmental assessments? Discuss the sources and pathways of contaminants involve in it. [5]

**Q9) a)** Describe the existing socioeconomic environment of the study area. How are factors such as population demographics, employment patterns, income levels, and social infrastructure assessed? [7]

b) How do factors such as development activities, land use changes, and infrastructure projects affect cultural heritage? [7]

OR

**Q10)a)** Explain the importance of public participation in environmental decision-making processes. What are the objectives of public participation in environmental impact assessments? [7]

b) What the requirements for public participation in environmental decision-making. How do these requirements ensure transparency and accountability in the decision-making process? [7]

**Q11)a)** Discuss the differences between rapid and comprehensive EIA approaches. How do these approaches vary in terms of scope, depth of analysis, and timeline? [8]

b) What is an Environmental Management Plan (EMP), and why is it essential for project implementation? Discuss the components typically included in an EMP. [8]

OR

**Q12)a)** How does an EMP help mitigate potential environmental impacts and ensure sustainable project development? [8]

b) Describe the procedures and methodologies used for post-environmental monitoring. How are monitoring findings utilized to assess the effectiveness of mitigation measures and ensure compliance with environmental regulations? [8]



Total No. of Questions : 8]

SEAT No. :

PC-4613

[Total No. of Pages : 2

[6355]-36

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

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Credit) (Semester - III) (601074)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side 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 are the sources of research Problem? **[4]**

b) What do you mean by literature survey? Explain its need. **[5]**

OR

**Q2) a)** What are different funding agencies for research proposal in India? State their types of funding for? **[5]**

b) Write short note on different sources of literature. **[4]**

**Q3) a)** What are different methods of data collection? Explain any one in detail. **[4]**

b) Explain the meaning of analysis of variance. Describe briefly the technique of analysis of variance. **[5]**

OR

**Q4) a)** Explain any two method of collecting primary data particularly in descriptive research. **[5]**

b) Write a note on "Non-parametric tests for Hypothesis testing" **[4]**

*P.T.O.*

- Q5) a)** Explain "Descriptive Statistics: Measures of Central Tendency, Measure of Dispersions. Measures of Skewness and Measures of Relationship".[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]

OR

- Q6) a)** Different methods of factor analysis & explanation of any one method.[8]
- b)** What is Multi-dimensional Scaling? Explain metric & non-metric approach of MDS & also explain significance of MDS. [8]
- Q7) a)** What are characteristics of good Abstract for a journal paper. Discuss as to why abstract is necessary. [8]
- b)** What is difference between product patent and process patent? Explain steps involved in obtaining patent. [8]

OR

- Q8) a)** Describe in brief, the structure of report. What do you mean by plagiarism? [8]
- b)** Write a research proposal for a suitable research problem (Any problem related to Environmental Engineering can be considered) to a funding agency with reference to the following terms: Title, Introduction, origin of the problem, expected out come, literature review, significance of the study in the context of current status, objectives, methodology, year wise plan. [8]



Total No. of Questions : 12]

SEAT No. :

PC-4614

[Total No. of Pages : 2

[6355]-37

**M.E. (Civil) (Geotechnical Engineering)**

**ADVANCE SOIL MECHANICS**

**(2017 Pattern) (Semester - I) (501121)**

*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 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)** Write a short note on soil bodies exhibiting non-homogeneous properties. **[4]**

**Q3)** State and explain effective stress principle. **[4]**

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]**

**Q5)** Briefly explain at-rest earth pressure, active earth pressure and passive earth pressure with suitable diagrams. **[4]**

OR

**Q6)** Briefly explain lateral earth pressure in braced cuts. **[4]**

*P.T.O.*



**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) What are various types of machine foundation? Explain them in detail. [6]

b) Discuss the use of single degree freedom system in the analysis of machine foundations. What are its limitations? [6]

c) Explain the terms : [4]

i) Frequency

ii) Resonance

OR

**Q10)** a) Explain modes of vibrations in foundations of reciprocating machines. [6]

b) State and explain the dynamic response of embedded block foundation. [6]

c) Write a note on forced vibration in machine foundations. [4]

**Q11)** a) Describe the design criterias for foundation of rotary machine. [6]

b) Explain two dimensional Combined method for the design of foundations of rotary machines. [6]

c) Why vibration isolation is required? Describe the methods of vibration control? [6]

OR

**Q12)** a) Explain “physical separation method” in vibration isolation with neat sketches. [6]

b) List out and describe the properties of any two vibration isolating materials. [6]

c) Write a short note on : [6]  
Construction details of machine foundations.



Total No. of Questions : 8]

SEAT No. :

PC-4615

[Total No. of Pages : 2

[6355]-38

**M.E. (Civil) (Geotechnical Engineering)**  
**GROUND IMPROVEMENT TECHNIQUES**  
**(2017 Pattern) (Semester - I) (501122)**

*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) Draw neat figures wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of Calculator is allowed.*
- 6) Assume Suitable data if necessary.*

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

b) Describe the behavior of chemically stabilized soils. [4]

OR

**Q2)** a) What are atomic bonds? Explain the bonds in clay minerals. [5]

b) Explain granular stabilization. [4]

**Q3)** a) Explain Chemical stabilization in detail. [5]

b) Describe process of dynamic consolidation. [4]

OR

**Q4)** a) Write a short note on kinetic stabilization. [4]

b) Explain electro-osmosis. [5]

**Q5)** a) Explain stabilization of clays by heating and freezing. [8]

b) Discuss the design considerations for sand drains. [8]

**P.T.O.**

OR

- Q6)** a) Discuss the technique of sand drains. [8]  
b) Write short note on granular trench stabilization. [8]

- Q7)** a) Explain permeation and hydro fracture grouting techniques. [8]  
b) How is bearing capacity of lime group is determined. [8]

OR

- Q8)** a) State and explain the various types of grouts. [8]  
b) Draw and explain the grouting equipments. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4616

[Total No. of Pages : 2

**[6355]-39**

**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) Figures to the right indicate 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)** Write a note on the importance of rock mechanics for dry underground excavations. **[4]**

b) State the different index properties of rock mechanics? Explain any one in detail. **[6]**

**Q2) a)** Explain flat Jack Method. **[4]**

b) State and explain the stresses around circular opening with sketch. **[6]**

**Q3) a)** Explain Rock Grouting. **[4]**

b) Write a note on Rock Blasting. **[6]**

**Q4) a)** Explain the Mohr Coulomb failure criteria for rocks. **[4]**

b) State and explain the different modes of rock failure. **[6]**

*P.T.O.*

- Q5)** a) Describe failure propagation of jointed rocks. [5]  
b) Explain the factors affecting the rupture behavior of rock. [5]
- Q6)** a) Explain principle of limit equilibrium method for the analysis of rock structure. [5]  
b) Write a note on analysis of general slip surface. [5]
- Q7)** a) Write a note on allowable bearing pressure for rock foundations [5]  
b) Discuss stress and deflection in rock under footing. [5]
- Q8)** a) Briefly explain review of design methods of tunnels. [5]  
b) Explain plastic behavior around tunnels. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4617

[Total No. of Pages : 2

[6355]-40

**M.E. (Civil-Geotechnical Engineering)**  
**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) 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)** What is the identification of hazardous, Non-hazardous and domestic waste? **[4]**

**b)** Explain the effects of pollutants on soil properties? **[5]**

OR

**Q2) a)** Discuss, “Soil-waste interaction”. **[5]**

**b)** Explain how the solid waste is collected, removed and transported. **[4]**

**Q3) a)** Describe the need for solid waste management. **[4]**

**b)** Write detail note on “Ash ponds and Tailing ponds”. **[5]**

OR

**Q4) a)** What is composting? Write the classification of it. **[5]**

**b)** State the different types of land fill and explain any one. **[4]**

**Q5) a)** Explain in detail the different engineering properties of solid waste. **[8]**

**b)** Write detail note on “Re-clamation of old solid waste dumps”. **[8]**

**P.T.O.**

OR

- Q6)** a) Discuss the engineering properties of solid waste in detail. [8]  
b) What is “Demolition of waste”? Explain. [8]

- Q7)** a) State and discuss the applications of “Clay liners”. [8]  
b) Write the application of “Geo-synthetics in waste disposal design”. [8]

OR

- Q8)** a) What are the different steps considered in land fill construction? Explain.[8]  
b) Describe “construction quality control and performance monitoring” in landfill. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4618**

**[6355]-41**

[Total No. of Pages : 2

**First Year 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) *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) Comparison of general shear failure, local shear failure and punching shear failure. [4]
- b) Determine the area ratio for the following soil samplers and comment on the nature of the samples obtained. [5]
- i) Core cutter : 170 mm outer diameter, 155 mm inner diameter.
  - ii) Seamless tube (Shelby) : 55 mm outer diameter, 52 mm inner diameter.

OR

- Q2)** a) A square footing is founded on clay deposit. The depth of the foundation is 1.5 m, and the width is 4.5 m. The unconfined compressive strength of the clay is 110 kPa,  $\gamma_b = 17.2 \text{ kN/m}^3$ . What is the gross safe bearing capacity of the foundation? FOS = 3. Use Skempton's analysis. [5]
- b) Discuss the planning of subsoil exploration work. [4]

- Q3)** a) Briefly describe cantilever sheet pile. [4]
- b) Explain design steps of raft foundation by conventional (rigid) method. [5]

OR

**P.T.O.**



- Q4)** a) Enlist the different types of sheet pile walls with sketches. [5]  
b) State in which conditions the raft foundation is preferred. [4]

- Q5)** a) Explain Feld's rule for group efficiency of piles. Determine the efficiency of group of nine piles (3x3) by Feld's rule. [8]  
b) A group of 16 piles of 30 cm diameter is arranged with centre to centre spacing of 0.9 m. The piles are 12 m long and are embedded in soft clay with cohesion 45 kN/m<sup>2</sup>. Bearing resistance may be neglected for the piles. Adhesion factor is 0.6 Determine the ultimate load capacity of the pile group. [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<sup>2</sup>, 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) Explain Terzaghi's analysis of lateral stability of well foundation. [8]



Total No. of Questions : 8]

SEAT No. :

**PC 4619**

**[6355]-42**

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

**First Year 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 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)** Explain pile raft foundation and its application. **[4]**

b) Explain in detail different pile drivers with their suitability. **[5]**

OR

**Q2) a)** Explain in detail Circular cofferdam. **[4]**

b) Describe the procedure of setting and driving of sheet piles. **[5]**

**Q3) a)** Explain the procedure of seal construction of grout intrusion method. **[4]**

b) Discuss how Cofferdam will destroyed by surge. **[5]**

OR

**Q4) a)** Describe the procedure of construction of pneumatic caisson with neat sketch. **[5]**

b) Discuss, how is sinking of open caisson achieved? **[4]**

**Q5) a)** Describe the selection criteria of explosives for rock excavations. **[8]**

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

i) Over break control

ii) Pre-splitting

OR

**P.T.O.**

- Q6)** a) State the various equipments are used for drilling in rock excavation. Explain any one in detail. [8]  
b) Discuss the process of loading and hauling equipment for rock excavation. [8]

- Q7)** a) Distinguish between Single stage and Multistage method of tunneling.[8]  
b) Explain Sinking caisson and Shield tunneling method. [8]

OR

- Q8)** a) Explain full face tunneling without support method. [8]  
b) Describe the process of tunneling by Tunnel boring machines. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4620**

**[6355]-43**

[Total No. of Pages : 2

**M.E.-I (Civil-Geotechnical)**  
**STABILITY OF SLOPES AND EARTH DAM**  
**(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 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) State and explain the criteria for stability of infinite slopes. [4]  
b) Sketch a typical section of earthen dam and explain function of each component. [5]

OR

- Q2)** a) Explain swedish slip circle method for stability of finite slopes. [5]  
b) Discuss step by step procedure for construction of earthen dam. [4]

- Q3)** a) State and explain the measures to control seepage through embankment with sketches. [4]  
b) Describe the checks required to be carried out to investigate the stability of earth dam. [5]

OR

- Q4)** a) Explain the procedure to locate the topmost seepage line in flow net for homogeneous dam with horizontal drainage. [5]  
b) Draw neat sketch showing all forces acting on earth dam and state formula to determine each forces. [4]

- Q5)** a) Write short note on vibrating wire pressure cell and distributed fibre optics temperature tool. [8]  
b) State parameters for selection of instrument in dam and how is maintenance and calibration of the instrument carried out. [8]

OR

**P.T.O.**

- Q6)** a) Discuss the importance of measurement of settlement in earthen dam and the types of instruments used for this purpose. [8]
- b) Write note on instrumentation data system and vibrating wire settlement cell. [8]

- Q7)** a) Explain the technical specifications for railway ballast as per Indian Railway codal provisions. [8]
- b) Discuss the criteria for design in case of soil nailing and provision of gabions. [8]

OR

- Q8)** a) Explain in detail the categories of reinforcement used for slope stability with their design criteria. [8]
- b) Write short note on - use of geosynthetics for road pavement and railway track. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4621**

**[6355]-44**

[Total No. of Pages : 2

**M.E. - II(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 diagram 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 the term “Elastic Rebound Theory”. [6]
- b) What is soil-structure interaction? Why is it important in geotechnical engineering? [7]

OR

- Q2)** a) Explain the steps for strong motion recording with the help of seismographs. [6]
- b) Explain 3-d ground response analysis. [7]

- Q3)** a) What is liquefaction? Describe the phenomenon and the conditions under which it occurs in soils. [6]
- b) Discuss the different design parameters used for recording ground motion. [6]

OR

- Q4)** a) Describe evaluation criteria of slope stability analysis. [6]
- b) Discuss the ‘Effect of local site conditions’ on ground motion. [6]

**P.T.O.**

**Q5)** a) What is the Jai Krishna approach in the response analysis of embankment dams? Discuss the key principles in this approach. [6]

b) Discuss 'Effects of liquefaction'. [6]

OR

**Q6)** a) Explain Evaluation of liquefaction hazards. [6]

b) Explain Goodman and Seed approach. [6]

**Q7)** a) Explain the Bearing capacity of foundations and its importance during Seismic design of Retaining wall. [7]

b) Discuss the method for mitigation of earthquake effects. [6]

OR

**Q8)** a) Explain the term "Grouting of soil". [6]

b) Explain 'Seismic Design of Retaining wall'. [7]



Total No. of Questions : 8]

SEAT No. :

**PC4622**

**[6355]-45**

[Total No. of Pages : 2

**S.Y.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 indicates 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) Discuss elements and objectives of literature survey. [5]  
b) What do you mean by research? Describe the different types of research. [4]

- Q3)** a) What is a hypothesis? Explain basic concepts concerning testing of hypothesis. [5]  
b) Enlist different types of sample designs and explain probability sampling. [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) What are the several multidimensional scaling techniques? Write short notes on significance of multidimensional scaling. [8]
- b) Differentiate descriptive statistics and inferential statistics. [8]

- Q7)** a) Explain in detail the format used for writing proposals. Also state the difference between a journal and conference paper. [8]
- b) Discuss the important points to be considered during presenting a research idea. [8]

OR

- Q8)** 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]



Total No. of Questions : 8]

SEAT No. :

**PC4623**

[Total No. of Pages : 3

**[6355]-50**

**First Year 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 is necessary.*
- 3) *Figures to the right indicate full marks*
- 4) *Assume suitable data if necessary.*
- 5) *Use of calculator is allowed.*

**Q1) a)** A rectangular channel is 3.10 m wide and carries a discharge of  $16 \text{ m}^3/\text{s}$  at a depth of 2.1 m. At a certain section of the channel, it is proposed to reduce the width to 2.0 m and to alter the bed elevation by  $\Delta Z$  to obtain critical flow at the contracted section without altering upstream depth. What should be the value of  $\Delta Z$ ? **[5]**

b) Water from a low dam is released through a sluice gate on a horizontal rectangular channel. The depth of water upstream of the sluice gate is 16.0 m above the channel bed and the gate opening is 1.5 m. The sluice gate can be assumed to be sharp edged. If a free hydraulic jump is formed just downstream of the gate, find the sequent depths and the percentage of the initial energy lost in the jump. **[4]**

OR

**Q2) a)** Explain **[4]**

- i) Specific energy diagram
- ii) Specific force diagram

b) At the bottom of a spillway the velocity and depth of flow are 12.0 m/s and 1.5 m respectively. If the tail water depth is 5.5 m find the location of the jump with respect to the toe of the spillway. What should be the length of the apron to contain this jump? Assume the apron to be horizontal and Manning's  $n = 0.015$ . **[5]**

**Q3) a)** Explain characteristics of S1, S2 and S3 profiles. **[5]**

b) A side channel spillway channel is 100 m long and is rectangular in cross section with  $B = 5.0 \text{ m}$ ,  $n = 0.02$ ,  $\beta = 1.30$  and  $S_o = 0.15$ . If the lateral inflow rate is  $1.75 \text{ m}^3/\text{s}/\text{m}$ , find the critical depth and its location. **[4]**

**[4]**  
**P.T.O.**

**Q4) a)** Show that in a wide rectangular critical slope channel the gradually varied flow profiles calculated by using Chezy formula with  $C = \text{constant}$  are horizontal lines. [5]

b) A rectangular channel is 2.0 m wide and carries a flow of  $3 \text{ m}^3/\text{s}$  at a depth of 0.9 m. At a certain location in this channel a uniformly discharging side weir is proposed to divert  $0.3 \text{ m}^3/\text{s}$  of flow laterally. The weir crest is horizontal and is placed at a height of 0.65 m above the bed at the commencement of the side weir. Calculate the length of the side weir and other dimensions of the channel geometry to achieve the objective. [4]

**Q5) a)** A wide tidal river has a low water velocity of 1.5 m/s and a depth of 2.5 m. A tide in the sea causes a bore which travels upstream. [8]

i) If the height of the bore is 0.9 m, estimate the speed of the bore and the velocity of flow after its passage.

ii) If the bore is observed to cover a distance of 2.5 km in 10 minutes determine its height.

b) Show that in a positive surge moving down a rectangular channel with absolute velocity  $V_w$ , the depths before the passage of the surge  $y_1$  and after the passage of the surge  $y_2$  are related as [8]

$$\frac{y_2}{y_1} = \frac{1}{2} \left[ -1 + \sqrt{1 + 8F_a^2} \right]$$

Where  $F_a^2 = \frac{(V_w - V_1)^2}{gy_1}$  and  $V_1$  = absolute velocity in the channel before the passage of the surge.

OR

**Q6) a)** A positive surge is often known as a moving hydraulic jump. Obtain an expression in terms of depths  $y_1$  and  $y_2$  for the energy loss in a moving hydraulic jump in a horizontal rectangular channel. [8]

b) A rectangular channel carries a discharge of  $1.5 \text{ m}^3/\text{s}/\text{m}$  width at a depth of 0.75 m. If the sudden operation of a sluice 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. [8]

**Q7) a)** Distinguish between: [7]

- i) hydraulic and hydrologic method of flood routing
- ii) hydrologic storage routing and hydrologic channel routing
- iii) prism storage and wedge storage

**b)** A small reservoir has the following storage elevation relationship. [9]

Elevation (m)	55	58	60	61	62	63
Storage ( $10^3 \text{ m}^3$ )	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 ( $\text{m}^3/\text{s}$ )	5	20	40	60	50	32	22	15	10

OR

**Q8) a)** Describe a numerical method of hydrologic reservoir routing. [7]

**b)** A small reservoir has a spillway crest at elevation 200.00 m. Above this elevation, the storage and outflow from the reservoir can be expressed as: [9]

Storage:  $S = 36000 + 18000 y \text{ (m}^3\text{)}$

Outflow:  $Q = 10 y \text{ (m}^3/\text{s)}$

Where  $y$  = height of the reservoir level above the spillway crest in m.

Route an inflow flood hydrograph which can be approximated by a triangle as

$I = 0$  at  $t = 0 \text{ h}$

$I = 30 \text{ m}^3/\text{s}$  at  $t = 6 \text{ h}$  (peak flow)

$I = 0$  at  $t = 26 \text{ h}$  (end of inflow)

Assume the reservoir elevation as 200.00 m at  $t = 0 \text{ h}$ . Use a time step of 2 h.



Total No. of Questions : 8]

SEAT No. :

PC4624

[6355]-53

[Total No. of Pages : 2

S.Y.M.E. (Civil - Hydraulics)

OPTIMIZATION TECHNIQUES

(2017 Credit Pattern) (Semester-III) (601051)

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 Non programmable electronic pocket calculator is allowed.

**Q1)** Use the Two Phase Simplex method to, [14]

Maximize  $Z = 5x_1 - 4x_2 + 3x_3$ .

Subject to  $2x_1 + x_2 - 6x_3 = 20$ ,  
 $6x_1 + 5x_2 + 10x_3 \leq 76$ ,  
 $8x_1 - 3x_2 + 6x_3 \leq 50$ ,  
 $x_1, x_2, x_3 \geq 0$ .

OR

**Q2)** Solve by dual simplex method the following problem: [14]

$Z = 2x_1 + 2x_2 + 4x_3$

$2x_1 + 3x_2 + 5x_3 \geq 2$ ,  $3x_1 + x_2 + 7x_3 \leq 3$ ,  $x_1 + 4x_2 + 6x_3 \leq 5$ ,  $x_1, x_2, x_3 \geq 0$ .

**Q3)** Solve the non-linear programming problem given below: [12]

Optimize  $Z = x_1^2 + x_2^2 + x_3^2$ ,

Subject to  $x_1 + x_2 + 3x_3 = 2$ ,  
 $5x_1 + 2x_2 + x_3 = 5$ ,  
 $x_1, x_2, x_3 \geq 0$ .

OR

P.T.O.

**Q4)** Minimize:

[12]

$$f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$$

Starting from the point.  $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$  Use Newtons Method.

**Q5)** Maximize  $Z = 50x_1 + 100x_2$

[12]

S.t.  $10x_1 + 5x_2 \leq 2500,$

$$4x_1 + 10x_2 \leq 2000,$$

$$x_1 + \frac{3}{2}x_2 \leq 450,$$

$$x_1, x_2 \geq 0.$$

OR

**Q6)** a) Discuss in detail characteristics of Dynamic Programming. [6]

b) Discuss the procedure adopted in the analysis of Dynamic programming problems. [6]

**Q7)** a) A person repairing total station equipment finds that the time spent on the total station sets has exponential distribution with mean 20 minutes. If the total stations are repaired in the order in which they come in and their arrival is approximately Poisson with an average rate of 15 for 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? [10]

b) Explain in brief Monte Carlo Simulation. [2]

OR

**Q8)** Reduce the following game by dominance property and solve it.

[12]

		Player B				
		I	II	III	IV	V
Player A	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1



Total No. of Questions : 8]

SEAT No. :

PC4625

[6355]-55

[Total No. of Pages :2

**First Year M.E. (Civil) (Structural Engineering)**  
**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, 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) Develop a strain displacement relationship in polar coordinate system. [5]  
b) Write short notes on elasticity and basic equations of elasticity. [4]

OR

- Q2)** a) Write down the Airy's stress function for fourth degree polynomial from Pascal's triangle. [5]  
b) Write a short notes on the deviatoric state of stress and state of pure shear. [4]

- Q3)** a) Explain with examples the axisymmetric problems. Hence write down the corresponding basic equations of equilibrium, compatibility and strain displacement relations. [5]  
b) Derive the expression for shear stress of a bar with elliptical cross section subjected to a torque of 'T'. [4]

OR

- Q4)** a) Prove that for axisymmetric problems, the circumferential strain is  $\varepsilon_\theta = \frac{u_r}{r}$ , radial strain is  $\varepsilon_r = \frac{\partial u_r}{\partial r}$  and axial strain is  $\varepsilon_z = \frac{\partial u_z}{\partial z}$ , Where  $u_r$  is radial displacement and  $u_z$  is axial displacement. [5]  
b) Derive expression for moment and maximum stress due to torsion of a hollow shaft. [4]

**P.T.O.**

- Q5)** a) Derive the expression showing plastic stress strain relationship. [8]  
b) Explain in brief Tresca's failure criteria with suitable example. [8]

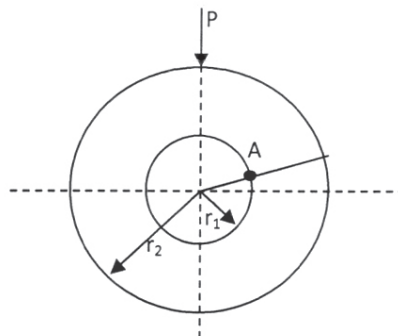
OR

- Q6)** a) Explain maximum strain energy theory and distortion energy theory. [8]  
b) Write short notes on Plastic bending and Torsion in elasto-plastic materials. [8]

- Q7)** a) Derive the expression of expansion of a thick walled tube considering elastic condition and initial yielding. [8]  
b) State the behavior of ideally plastic thick walled cylinders under internal pressure alone. [8]

OR

- Q8)** a) State the behavior of ideally plastic thick walled cylinders under internal pressure alone with plane strain condition. [8]  
b) A ring with rectangular section is subjected to diametric compression  $P$  as shown in figure below. Determine the bending moment and stress at point A of the inner radius across a section  $\theta$ . Where  $r_1$  and  $r_2$  are the inner and outer radii respectively. [8]





[6355]-56

First Year 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, Q.7 or Q.8.
- 2) Figures to the right indicates full marks.
- 3) Neat diagrams must be drawn wherever necessary.

**Q1)** Calculate the equivalent stiffness for the system shown in Fig. 1. [9]

Consider :  $m = 100\text{kg}$ ,  $k_1 = 2 \times 10^6 \text{ N/m}$ ,  $k_2 = 3 \times 10^6 \text{ N/m}$ ,  $E = 210 \times 10^9 \text{ N/m}^2$ ,  
 $I = 3.8 \times 10^{-5} \text{ m}^4$ .

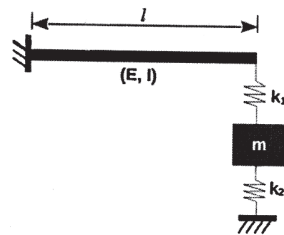


Fig. 1

OR

**Q2)** For the system shown in Fig. 2, determine the following parameters. [9]

- a) Frequency of the system;
- b) Logarithmic decrement;
- c) Amplitudes of the three cycles if the initial displacement is 3 mm.

Consider  $m = 1\text{kg}$ ;  $k = 9.8 \text{ kN/m}$ ;  $c = 5.9 \text{ N.s/m}$ .

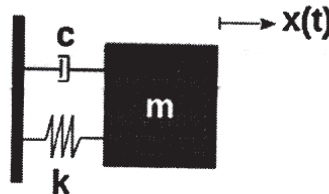


Fig. 2

- Q3)** Using the Duhamel integral, derive the expression for the response of an undamped system subjected to the forcing functions shown in Fig. 3. [9]

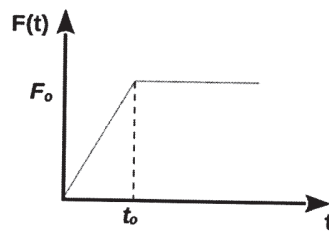


Fig. 3

- Q4)** Using the Duhamel integral, derive the expression for the response of an undamped system subjected to the forcing functions shown in Fig. 4. [9]

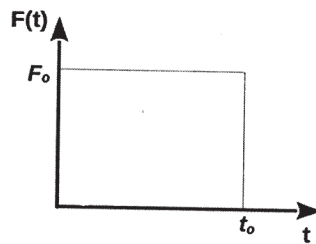


Fig. 4

- Q5)** Calculate the natural frequencies and plot the mode shapes for the system shown in Fig. 5. [16]

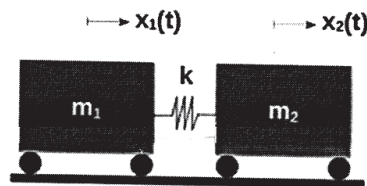


Fig. 5

OR

- Q6)** Calculate the natural frequencies and the mode shapes for a building modelled as shown in Fig. 6. The girders are assumed to be rigid, and the columns have flexural rigidities and with negligible masses. Consider  $m_1 = 2m$ ,  $m_2 = m$ ,  $h_1 = h_2 = h$ , and  $EI_1 = EI_2 = EI$ . [16]

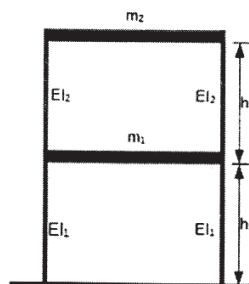


Fig. 6

- Q7)** a) Explain the lumped mass and continuous systems with appropriate examples. [8]
- b) A fixed beam is subjected to transverse vibrations. Derive the frequency equation. [8]

OR

- Q8)** a) A cantilever beam is subjected to transverse vibrations. Determine the equation of natural frequencies of vibration. [8]
- b) A beam of span  $l$  is supported on a roller support at one end and a hinged support at the other. The beam is subjected to transverse vibrations. Determine the equation of natural frequencies of vibration for the beam. [8]



Total No. of Questions: 8]

SEAT No. :

**PC4627**

[Total No. of Pages : 2

**[6355]-57**

**First Year M.E. (Civil-Structural)**

**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, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*
- 4) *Figures to the right indicates full 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)** a) Explain the fabrication procedure of castellated beam and write down its advantages. [3]
- b) The design factored forces coming in member of a hoarding structure are 225 kN tensile force, and 160 kN compressive force. Design a double unequal angle section back to back on opposite faces of 12 mm thick gusset plate with M20 black bolt of 4.6 grade of steel. Take length of member as 2.9 m c/c. Draw the design sketch. [6]

OR

- Q2)** Design the column of 4.5 m length using tubular round section subjected to an axial load of 400 kN as per IS 806 and 1161. Both ends of the column is hinged. [9]

- Q3)** Two channel sections without bent lips 180 mm × 50 mm are connected with webs to act as a beam The thickness of channel section is 2.0 mm. The effective span of simply supported beam is 4.5 m. Determine the maximum uniformly distributed load including self weight, which may be supported by the beam. Adopts properties of the channel section from IS : 811-1961. [9]

OR

- Q4)** A light gauge steel rectangular box section 200mm × 100mm × 2.0mm is used for a column. The effective length of column is 3.6m. Determine the safe load carrying capacity of the section. Take basic design stress  $\sigma_b$  as 125N/mm<sup>2</sup>. [9]

**P.T.O.**

- Q5)** a) Explain how the height and other dimensions of a steel chimney are determined. [8]
- b) A steel chimney of 72 m height and the diameter of cylindrical shell is 3 m. The moment at the base of chimney is 8830kNm and the weight of chimney shell is 756kN. It has a 100mm thick lining brick lining. Design base Plate and Anchor bolt. [8]

OR

- Q6)** a) What forces act on the base plate of steel chimney? Explain the design procedure of base plate. [8]
- b) State and explain in details stability of steel chimneys. [8]
- Q7)** a) A steel chimney carries wind load moment 11590 kNm and dead load 950 kN rest on M15 grade of concrete. Design the foundation for the chimney. [8]
- b) State and explain design criterion of anchor bolt in steel chimney. [8]

OR

- Q8)** A self supporting steel stack is 72 mts 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]



[6355]-58

First Year M.E. (Civil-Structural)

NUMERICAL METHODS IN STRUCTURAL ENGINEERING

(2017 Pattern) (Semester - I) (501004)

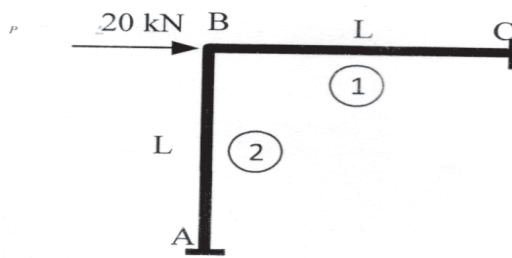
Time : 3 Hours]

[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 to the right indicate full marks.
- 3) If necessary, assume suitable data and indicate clearly.
- 4) Use of electronic pocket calculator is allowed.

- Q1) a)** Using the transformation  $[Sm]_G = [R]^T [Sm]_L [R]$ , where  $[Sm]_L$  is member stiffness matrix in local coordinates and  $[R]$  is the rotation transformation matrix. Express the member stiffness matrix  $[Sm]_G$  in global coordinates for element 2 of the frame shown in form  $[Sm]_G = [R]^T [Sm]_L [R]$ . [5]

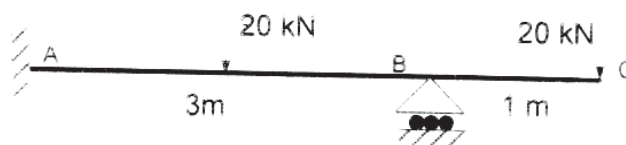


- b)** Using partial pivoting technique in Gauss Elimination method, find the solution of the system of equation with the augmented matrix. [4]

$$[A|B] = \begin{bmatrix} 1 & 1 & 1 & 4 \\ 2 & 1 & 3 & 7 \\ 3 & 1 & 6 & 2 \end{bmatrix}$$

OR

- Q2) a)** A beam AC with overhang of 1 m is loaded and supported as shown in figure. Using member stiffness approach of matrix method of analysis, determine the rotations at B and C. The 20 kN load is acting at the center of span AB and at the free end of span BC. [4]



P.T.O.

- b) Use Cholesky factorisation to find the solution to the problem [5]

$$\begin{bmatrix} 1 & -1 & 1 \\ -1 & 1 & 1 \\ 0 & 1 & -1 \\ 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 1 \\ -1 \end{bmatrix}$$

- Q3) a)** Find the dominant eigenvalue and corresponding eigenvectors of the matrix. [5]

$$A = \begin{bmatrix} 2 & -12 \\ 1 & -05 \end{bmatrix}$$

- b) For an integral  $\int_a^b f(x)dx$ , derive the one-point and two point Gauss quadrature rule and hence evaluate  $\int_2^5 (2x^3 - 5x)dx$ , using Gauss quadrature method. [4]

OR

- Q4) a)** Using the Runge Kutta fourth order method to find the approximate solution of pair of equations. [5]

$$\frac{dy}{dx} = x + yz; \frac{dz}{dx} = x^2 - y^2 \text{ at } y(0.2) \text{ and } z(0.2) \text{ with initial conditions } y(0) = 1 \text{ and } z(0) = 1/2 \text{ taking step size } = 0.2.$$

- b) When the values of y at values of x at uniform interval are known, state how the area under the curve is to be calculated using Simpson's rule and Gauss Quadrature. [4]

- Q5) a)** A fixed beam is subjected to uniformly varying load with maximum intensity of 'w' at the mid span and zero intensity at the supports. Using Finite difference method, estimate the maximum deflection and moments at mid span of the beam. Divide the beam in four subintervals. [8]

- b) Estimate the deflection at the nodal points of the grid, using grid interval of  $h=a/2$  for a simply supported uniform plate of length  $2a$  and width  $a$ . The plate supports a uniformly distributed load 'w' over the entire plate along with a central point load P. Use finite difference method. [8]

OR

**Q6) a)** A flat bar of uniform thickness 10 mm is fixed at one end and free at the other end. It has a width of 240 mm for a length of 1.2 m from a fixed end and width of 120 mm for the next 0.8 m length. Calculate the maximum axial buckling load it can carry. [8]

b) Derive the bi Harmonic Finite difference net for a plate simply supported at its edges. Explain how the boundary conditions are incorporated. [8]

**Q7) a)** Find the least square linear fit for the given data. [8]

x	1.5	1	2.8	0.4	1.3	2.0
y	4.0	3.3	6	2.4	3.3	5

b) Find the cubic splines for the following table of values [8]

x	0	1	2	3
y	1	-1	-1	0

OR

**Q8) a)** Fit a Lagrangian polynomial to satisfy the points (1,1), (2,8), and (3,27). Compare the behaviour of this curve with that of  $y=x^3$  on which these three points lie. [8]

b) Explain Regression Analysis with suitable examples. [8]





Total No. of Questions : 8]

SEAT No. :

**PC4629**

**[6355]-59**

[Total No. of Pages :2

**First Year M.E. (Civil) (Structural)**  
**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. 7or 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)** What are the limitations of Galerkin's formulation? **[4]**

**b)** Derive the element stiffness matrix for bar element by using potential energy approach. **[5]**

OR

**Q2) a)** Give any two examples of finite element modelling. **[4]**

**b)** Derive the element stiffness matrix for truss element by using potential energy approach. **[5]**

**Q3) a)** Draw the Pascal's triangle. **[4]**

**b)** Write the properties of shape functions. **[5]**

OR

**Q4) a)** A four noded element has coordinates (1, 1), (3,0) (3.5, 2.5) (2,3) Determine the Jacobian matrix and its value at (1.3,1.5). **[5]**

**b)** List the general steps of the finite element method. **[4]**

**Q5) a)** Derive the shape function for 8-node rectangular Serendipity Elements. **[10]**

**b)** What is the purpose of isoparametric element? **[6]**

OR

**P.T.O.**

- Q6)** a) Write down the stiffness matrix equation for four noded isoparametric quadrilateral elements? [10]  
b) Define Natural coordinate system. [6]

- Q7)** a) Describe in details about the Reissner - Mindlin thick plate theory. Draw the bending of thick plate. [8]  
b) Describe in detail the overview of shell finite elements. [8]

OR

- Q8)** a) Explain how axi-symmetric problems can be analyzed using axi-symmetric elements in Finite element method. [8]  
b) Explain in detail curved solid elements and curved shell element. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4630**

[Total No. of Pages : 2

**[6355]-60**

**First Year M.E. (Civil-Structural)**  
**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)** Prove that in a slightly bent plate under pure bending, the directions of maximum slope and zero slopes are at right angle to each other. Find the expression for maximum slope. **[5]**

b) What are the assumptions made in thin plates with small deflections?**[4]**

OR

**Q2) a)** Find the deflection equation for a plate subjected to hydrostatic pressure use Levy's basic equation for calculating deflection **[5]**

b) Derive the governing differential equation for deflections of a plate subjected to a distributed moment load  $M_x(x, y)$  and  $M_y(x, y)$  applied to the middle surface. **[4]**

**Q3) a)** A uniform loaded solid circular plate with radius 'a' has its edges simply supported obtain the expressions for the maximum deflection and obtain bending moments. **[5]**

b) Explain the following terms with neat sketches. **[4]**

- i) Shells of revolution
- ii) Shells of translation
- iii) Ruled surfaces

OR

**P.T.O.**

- Q4)** a) Discuss the method of analyzing a circular plate subjected to a ring load P. Assume outer edge of the plate is fixed. [5]  
b) Explain the bending and membrane theories for analysis of shells. [4]

- Q5)** a) Derive the equations of equilibrium for symmetrically loaded circular pipes. [8]  
b) Differentiate membrane and bending theory for circular cylindrical shell.[8]

OR

- Q6)** a) Show that the particular solution in a equilibrium equation of symmetrically loaded pipe may be replaced by membrane solution. [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]

- Q7)** a) Enumerate the basic assumptions made in the analysis of cylindrical shells in the D. K. J. 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 Schorer's Theory. [8]  
b) Explain in details arch analysis for cylindrical shells. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4631

[Total No. of Pages : 2

[6355]-61

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 side indicate marks.
- 3) Use of IS 456-200, 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 suitable data, if necessary.

- Q1)** a) Explain guidelines for establishing axes of rotations and yield lines. [4]  
b) Design a grid slab for a floor of hall  $12\text{m} \times 16\text{m}$  c/c having square grid of  $1.5\text{m}$ . Use M20 Fe 500 take live load  $4\text{kN/m}^2$  and floor finish load  $1.5\text{kN/m}^2$ . Design for flexure only. [5]

OR

- Q2)** a) Draw yield line pattern for: A rectangular slab with fixed support on three sides with shorter side free. [4]  
b) Design a grid slab for a floor of hall  $12\text{m} \times 14\text{m}$  having a square grid of  $2\text{m}$ . Take live load  $6\text{kN/m}^2$  and floor finish load  $1.4\text{kN/m}^2$  Use M20 and Fe 415 steel. [5]

- Q3)** a) Explain different types of flat slab and list the advantages of flat slab.[4]  
b) An open circular tank  $12\text{m}$  diameter and  $3\text{m}$  deep and supported  $7\text{m}$  above the ground level on beams and columns. Design the tank, beam and columns. Use M25 concrete and Fe 415 steel. [5]

OR

- Q4)** a) Design an interior panel of a flat slab  $6\text{m} \times 6\text{m}$  for a live load of  $4\text{kN/m}^2$  and F.F. of  $1.3\text{kN/m}^2$ . Use M25 and Fe 415. Design for flexure. [5]  
b) Explain in detail wind load analysis of columns for water tank supported on four identical columns with their lower end fixed to the base and braced at intermediate levels. [4]

P.T.O.

**Q5) a)** Design a square bunker to store 300 kN furnace slag. Unit weight of slag is  $8000\text{N/m}^2$ . Angle of repose is  $24^\circ$ . Use M25 and Fe500. Draw reinforcement details. [8]

**b)** A concrete bin is  $3.8\text{m} \times 3.8\text{m}$  and contains wheat weighing  $8.75\text{kN/m}^3$ . The coefficient of friction between grain and grain is 0.45. The coefficient of friction between grain and concrete is 0.42. If the depth of wheat is 4m, determine the lateral pressure per meter run of the bin wall. [8]

OR

**Q6) a)** Design a circular bunker to store 100 kN of coal take density of coal as  $8.5\text{kN/m}^3$ , angle of repose is  $25^\circ$ . 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 15m and contains cement weighing  $15\text{kN/m}^3$ . 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  $17.5^\circ$ . Determine the lateral pressure at 5m interval on the walls of silo. [8]

**Q7) a)** A group of 25 piles is arranged with 5 rows and 5 piles each. The piles are 350mm diameter and spaced 1.2 m centers each pile can carry 370kN working load, if it can act independently. Determine the carrying capacity of the pile group. [8]

**b)** Design the formwork for slab  $4\text{m} \times 4\text{m}$  having thickness of 180mm. It is proposed to deposit concrete in one stage. [8]

OR

**Q8) a)** In a group of 16 piles of diameter 450mm and center to center spacing of pile being 1.5m. The piles are arranged in square area. Each pile is 10m long and taking  $m = 0.7$  and  $c = 50\text{kN/m}^2$ . Ascertain whether the failure will occur with the piles acting individually or as a group. Also specify the failure load. [8]

**b)** Design raft foundation for center-to-center distance of columns in both directions is 3.4 m, column size  $400\text{mm} \times 400\text{mm}$ , working axial load on each column is 650kN. The depth of strata is 2m. Use M20 and Fe500. The safe bearing capacity of strata is  $120\text{kN/m}^2$ . Draw reinforcement details. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4632

[Total No. of Pages : 2

**[6355]-62**  
**M.E. (Civil)**  
**STRUCTURE ENGINEERING**  
**Research Methodology**  
**(2017 Pattern) (Semester - III) (601013)**

*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 side indicates full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Distinguish between Research methods and Research methodology. **[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 are the criteria or characteristics of good research problem? **[4]**
- b) Enlist the various funding agencies for engineering research grants. Explain any one in detail. **[5]**

OR

- 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]**
- Q4)** a) What is mean by literature review? State and explain the different sources of literature. **[4]**
- b) How to write literature review to develop conceptual framework for research? **[5]**

**P.T.O.**

- Q5) a)** Critically examine the qualitative and quantitative research methods. Elaborate your answer by giving suitable example. [8]
- b)** Explain sampling concept with different sampling design in brief. [8]

OR

- Q6) a)** Explain the characteristics of good sample design with suitable example.[8]
- b)** 'What is hypothesis testing? Define Null hypothesis and Alternative hypothesis. Explain type 1 and type 2 error with suitable example. [8]

- Q7) a)** Write a format of a good report indicating different parts and their positioning in the report. [8]
- 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]

OR

- Q8) a)** Write down the procedure to file a patent in India. [8]
- b)** 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]





Total No. of Questions : 8]

SEAT No. :

PC-4633

[Total No. of Pages : 2

[6355]-63

M.E. (Civil Structure)

**ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT  
STRUCTURES**

**(2017 Pattern) (Semester - III) (601014)**

*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) *Figure to the right side indicates full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 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. IS 1893 is allowed.*

**Q1)** a) Write the major types of plates in engineering seismology. [5]

b) Write the design consideration for Earthquake resistant design. [4]

OR

**Q2)** a) List out some disastrous earthquakes occurred in past history in India.[5]

b) Explain the importance of orientation of building in earthquake resistant design. [4]

**Q3)** a) Explain center of rigidity of a structure. [5]

b) Compare convergent and divergent boundaries. [4]

OR

**Q4)** a) Differentiate between P-waves and S-waves. [5]

b) Define Ductility. Explain concept of ductile detailing as per IS 13920 - 2016. [4]

**Q5)** a) Explain Seismic design philosophy with neat sketches. [4]

b) Design a rectangular beam for 8m span to support a DL of 10kN/m and a LL of 12kNm inclusive of its own weight. Moment due to earthquake load is 1000kNm and shear force is 80kN. Use M20 grade concrete and Fe415 steel. [12]

**P.T.O.**

OR

**Q6)** a) Explain capacity based design and detailing for RC building with example. [8]

b) Brief the step by step procedure to analyze a frame by equivalent static lateral load method. [8]

**Q7)** a) Explain about the design procedure of elevated water tank in detail. [8]

b) Design a shear wall for 14 storeyed reinforced concrete building with reinforced concrete building as per the design requirement of IS 13920: Assume relevant data if any needed. [8]

OR

**Q8)** a) Calculate time period of water tank whose mass is 400000 kg and stiffness is  $2.9 \times 10^8 \text{ N/m}$ . [8]

b) Examine types of shear wall and what do you prefer for high rise building? Explain it. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4634

[Total No. of Pages : 2

[6355]-64

M.E. Civil

**WATER RESOURCES AND ENVIRONMENTAL ENGG.**

**Planning and Management of Water Resource**

**(2017 Pattern) (Semester - I) (501081)**

*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)** a) State and explain objectives of management of water resources. [5]  
b) Comment on spatial and temporal characteristics of water resources.[4]

OR

- Q2)** a) Explain constraints like reversibility for development of water resources.[5]  
b) Explain objectives of water resources planning. [4]

- Q3)** a) Explain how conjunctive use of water play important role in water management. [4]  
b) How can reservoir sedimentation be measured and monitored. [5]

OR

- Q4)** a) Explain Ground water recharge. [4]  
b) Explain role of water doctrines to resolve disputes. [5]

- Q5)** a) Comment on causes of floods, effects of flood and methods to control floods. [8]  
b) Discuss central water policy with regards to water allocation. [8]

**P.T.O.**

OR

**Q6)** a) Explain essential data necessary for water power studies for storage project. [8]

b) Explain repayment of cost and allocation of cost for multipurpose project. [8]

**Q7)** a) Explain financial performance analysis to check economic viability of long term sustainable projects. [8]

b) Explain in detail basin planning (principles & procedures) [8]

OR

**Q8)** a) Explain with an example Inter Basin Water Transfer. [8]

b) Explain discounting techniques for financial analysis of large dams. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4635

[Total No. of Pages : 2

**[6355]-68**  
**M.E. (Civil)**  
**(Water Resource & Environmental Engg.)**  
**HYDROLOGY**  
**(2017 Pattern) (Semester - II) (501087)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

- Q1)** a) Write a note on Instantaneous Unit Hydrograph (IUH) [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]

*P.T.O.*

- 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

- 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 in detail. [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 : 8]

SEAT No. :

PC-4636

[Total No. of Pages : 2

[6355]-72

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

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester - III) (601094)**

*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) *Your answers will be valued as a whole.*
- 4) *Assume suitable data, if necessary.*

**Q1)** a) Discuss the criteria's to be considered while formulation of research hypotheses. [5]

b) Discuss the need to assess the appropriate source of literature review.[4]

OR

**Q2)** a) Distinguish between Applied and Fundamental Research. [5]

b) Discuss the errors in research problem. [4]

**Q3)** a) Enlist different types of Sampling methods. Discuss Cluster Sampling method in detail with suitable example. [5]

b) Discuss the effects of committing Type I and Type II error in research.[4]

OR

**Q4)** a) Discuss the conditions in which t-test and chi-square test is used for Hypothesis testing. [5]

b) Explain one way analysis of variance techniques is used in research. [4]

*P.T.O.*

- Q5) a)** Discuss Multiple Regression Analysis and its significance. [8]  
b) What do you mean by multivariate techniques? Explain their significance in context of research studies. [8]

OR

- Q6) a)** Discuss the important characteristics of cluster Analysis and Regression analysis. [8]  
b) Discuss the basic principle of Inferential statistics. Discuss atleast 2 examples where it can be used in research. [8]

- Q7) a)** What are characteristics of good journal paper. Discuss as to why abstract is necessary. [8]  
b) Explain the steps for filing a patent and the elements of effective presentation. [8]

OR

- Q8) a)** A Non- Technical project report must be submitted to an organization. Discuss the report structure, report formulation for the same. [8]  
b) Discuss the precautions to be taken while writing a research report. [8]





[6355]-73

**M.E. (Computer Egg.) (Data Science) (AI & DS)**  
**MATHEMATICAL FOUNDATION FOR DATA SCIENCE**  
**(2017 Pattern) (Semester - I) (510301)**

*Time : 3 Hours]*

*[Max. Marks : 50*

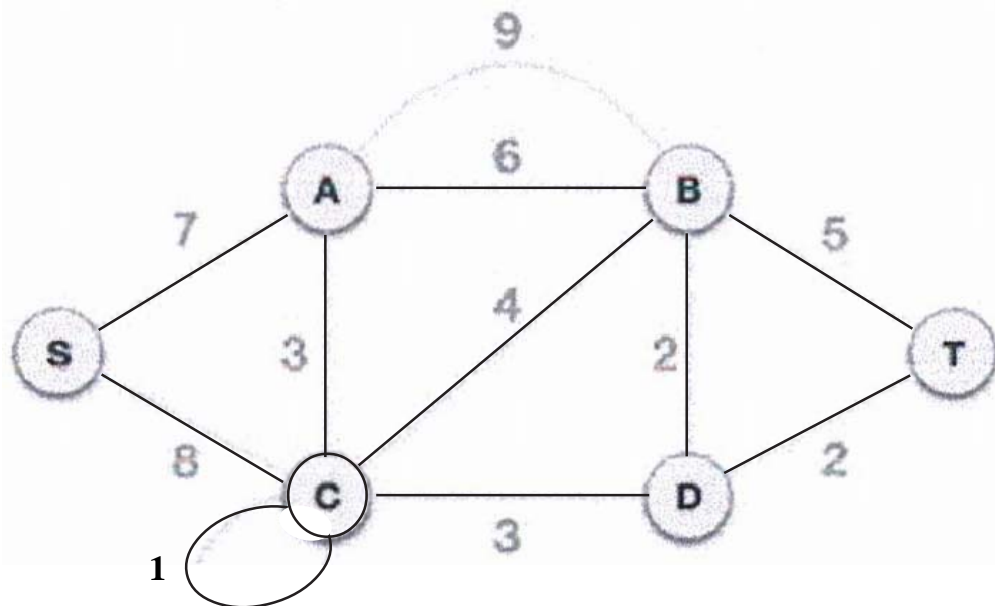
*Instructions to the candidates :*

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

**Q1)** Write difference between B tree & B+ tree. Explain B+ tree with example. [8]

OR

**Q2)** Represent given graph using adjacency list. Explain any shortest path algorithm and using same find the shortest path from vertex S to Vertex T using shortest path algorithm. [8]



P.T.O.

**Q3)** 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?

OR

**Q4)** 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.
- e) a black marble in his second draw

**Q5)** Explain Chi-Square Tests and t-test with example. [9]

OR

**Q6)** Explain Central tendency and dispersion measures of numerical data with example. [9]

**Q7)** Discuss different methods of to calculate Karl Pearson's Coefficient of Correlation. [8]

OR

**Q8)** a) Use these methods to normalize the following group of data: [4]

200, 300, 400, 600, 1000

- i) z-score normalization
  - ii) z-score normalization using the mean absolute deviation instead of standard deviation.
- b) Find covariance for following data set  $x = \{2, 5, 6, 8, 9\}$ ,  $y = \{4, 3, 7, 5, 6\}$   
Comment on the movement of X and Y values with respect to covariance. [4]

**Q9)** What is Jacobian? Let  $x(u, v) = u^2 - v^2$ ,  $y(u, v) = 2uv$ . Find the Jacobian  $J(u, v)$ . [8]

OR

**Q10)** Solve the system of equations  $x_1 + x_2 + x_3 = 1$ ,  $3x_1 + x_2 - 3x_3 = 5$  and  $x_1 - 2x_2 - 5x_3 = 10$  by LU decomposition method. [8]

**Q11)** Suppose we have the following dataset with one response variable  $y$  and two predictor variables  $X_1$  and  $X_2$ . Fit a multiple linear regression model to this dataset. [8]

X1	60	62	67	70	71	72	75	78
X2	22	25	24	20	15	14	14	11
Y	140	155	159	179	192	200	121	215

OR

**Q12)** Explain Gradient descent with example. [8]



Total No. of Questions : 12]

SEAT No. :

PC-4638

[Total No. of Pages : 2

[6355]-74

M.E.(AI & DS) / (Computer Engineering)

**BASICS OF DATA SCIENCE**

**Data Science**

**(2020 Pattern) (Semester- I) (510302)**

*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, Q.9 or Q.10 or Q.11 or Q.12.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Assume suitable data if necessary.*

**Q1)** a) Give the comparative analysis of Categorical vs Quantitative Data on the basis of Type of Values, Nature, Mathematical Operations, Level of Measurement, Examples. [5]

b) Compare Big Data and small data on the basis of Volume, Velocity and Variety [5]

OR

**Q2)** a) Explain Data Science Process life cycle with diagram in details [5]

b) What Are the Roles and Responsibilities of a Data Scientist? [5]

**Q3)** a) What are outliers? How do they affect the calculation? How to treat them? [4]

b) Explain KDE in details [4]

OR

**Q4)** a) Give the Comparison of Pearson vs Spearman Correlation Coefficients [4]

b) Why is exploratory data analysis important in data science? What are Exploratory data analysis tools [4]

**P.T.O.**

- Q5) a)** Explain K-Nearest Neighbors Classifiers and Model Example With Diagrams and Data Set. [4]  
**b)** What is Web Scraping? How Web Scrapers Work? Types of Web Scrapers [4]

OR

- Q6) a)** Explain Naive Bayes algorithm in detail. [4]  
**b)** Give the comparison between Naive Bayes to k-NN [4]

- Q7) a)** How do you choose the appropriate visualization type for your data?[4]  
**b)** What is the importance of storytelling in data visualization? [4]

OR

- Q8) a)** What are some common mistakes to avoid when creating data visualizations? [4]  
**b)** What is a pie chart, and when is it suitable for visualizing data? [4]

- Q9) a)** What are the different evaluation metrics for Recommender Systems?[4]  
**b)** What is Content-Based Filtering? Give the example [4]

OR

- Q10)a)** What is hybrid Recommender Systems [4]  
**b)** What is Matrix Factorization? [4]

- Q11)a)** What is distance in social network analysis? [4]  
**b)** How do you calculate betweenness centrality of a network? [4]

OR

- Q12)a)** What are social network graphs? How does clustering of social network graphs work? [4]  
**b)** Explain in detail The Girvan–Newman algorithm [4]



Total No. of Questions : 8]

SEAT No. :

PC-4639

[Total No. of Pages : 2

**[6355]-75**

**M.E. (Artificial Intelligence and Data Sciences)**

**ARTIFICIAL INTELLIGENCE**

**(2017 Pattern) (Semester - I) (510501)**

*Time : 3 Hours]*

*[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 side indicate full marks.*
- 4) *Assume Suitable data, if necessary.*

**Q1)** Explain the evolution of Artificial Intelligence till current development. **[9]**

OR

**Q2)** Explain how Bayes theorem is applied in probabilistic reasoning. **[9]**

**Q3)** Differentiate between informed and un informed searches. Give an uninformed search with example and pseudocode. **[9]**

OR

**Q4)** Explain reinforcement learning. **[9]**

**Q5) a)** How planning algorithm is applied in moving cargo on aeroplane from one airport to another airport. **[8]**

b) Explain the elements of First Order Logic. **[8]**

OR

**Q6) a)** Explain the applications of AI in different fields. **[8]**

b) What is sentiment analysis? Give the steps of using classification algorithm in sentiment analysis. **[8]**

*P.T.O.*

- Q7)** a) How Wumpus world problem can be solved using knowledge based agent? [8]  
b) Explain the inference in FOL using any method. [8]

OR

- Q8)** a) Explain A\* algorithm with an example and state its limitations. [8]  
b) How genetic algorithm is applied for 8 Queens problem? [8]



Total No. of Questions : 6]

SEAT No. :

PC-4640

[Total No. of Pages : 2

[6355]-76

**M.E. (Artificial Intelligence and Data Science)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester- I) (510101)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to right indicate the marks to the question.*
- 3) *Assume suitable data whenever necessary.*

**Q1) a)** Explain in detail the flow chart of Research Process. **[9]**

OR

b) What is Research Methodology? Elaborate on the importance of objectives and outcomes of research. **[9]**

**Q2) a)** Define and Explain significance of IPR; Copyright and Patents in research. **[5]**

b) What are the Measures of research impact, Literature review, publication cost? **[4]**

OR

a) Write a short note on Impact Factor and plagiarism. **[5]**

b) Explain Types of publications. **[4]**

**P.T.O.**



**Q3) a)** What are types of errors and sources of errors in analysis? How statistical analysis is used to address uncertainty and errors? [9]

OR

b) What is hypothesis and Null hypothesis? How statistical analysis helps for testing of hypothesis? Explain use of partial coefficients in multidimensional analysis. [9]

**Q4) a)** What is significance of the research proposal? What is an outline of a research proposal? What are the criteria for evaluating the research proposal? [8]

OR

b) Differentiate between Two-Parameter Optimization and Multi- Parameter Optimization. State steps of Monte Carlo Optimization Method. [8]

**Q5) a)** State the use of the following tools: [8]

- i) PSPP
- ii) SOFA
- iii) AQUAD
- iv) CAT

OR

b) Write short note on Simplex Optimization method and Gradient Optimization method. [8]

**Q6) a)** Explain steps involved in research presentation. [7]

OR

b) Discuss the IEEE/ACM paper template. Enlist and explain best practices in writing Paper title, abstract and keywords and references. [7]



Total No. of Questions : 8]

SEAT No. :

PC-4641

[Total No. of Pages : 2

**[6355]-77**

**FY.M.E. (Artificial Intelligence and Data Sciences)**

**DATA WAREHOUSING AND MINING**

**(2017 Pattern) (Semester - II) (510308)**

*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 do we mean by strategic information? For a commercial bank, what may be the strategic information? **[4]**

b) Explain Business Intelligence with some suitable real time Applications where BI can be applied. **[4]**

c) What is need of Metadata? **[2]**

**Q2) a)** Distinguish between Star Schema and Snowflake schema. **[4]**

b) Explain the concept of aggregation hierarchies. **[4]**

c) What are other integration approaches? **[2]**

**Q3) a)** Discuss the major design issues that need to be addressed before proceeding with the data warehouse design. **[4]**

b) Explain with example Dimension, fact and Measure in data warehouse designing. **[4]**

c) What are aggregate fact tables? **[2]**

*P.T.O.*

- Q4)** a) Explain with diagram Extract Transform Load Operations in Data Warehouse. [4]  
b) A dimension table is wide; the fact table is deep. Explain with suitable example. [4]  
c) How the Web works as a data source for our data warehouse? [2]
- Q5)** a) Define initial load, incremental load, and full refresh. [4]  
b) Describe briefly two major features of the Web-enabled data warehouse. [4]  
c) List any four key capabilities of an OLAP system. [2]
- Q6)** a) List four major activities during data warehouse deployment. For two of these four activities, describe the key tasks. [4]  
b) Write some test case for data warehouse testing. [4]  
c) How do the statistics help in fine-tuning the data warehouse? [2]
- Q7)** a) List any four of the physical design steps. Describe any two steps. [5]  
b) Apply suitable technique and design a system to detect the outliers in data. [5]
- Q8)** a) Apply suitable data mining technique for discovering web access patterns and trends on data warehouse. [5]  
b) Why the data warehouse must be backed up. How is this different from an OLTP system? [5]



Total No. of Questions : 8]

SEAT No. :

PC-4642

[Total No. of Pages : 2

**[6355]-78**

**M.E. (Artificial Intelligence and Data Sciences)**

**MACHINE LEARNING**

**(2017 Pattern) (Semester - II) (510309) (2020 Course)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Solve any FIVE full 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)** Compare any 3 models of Machine learning. **[6]**

b) Comment on Binary and multi-class classification. **[4]**

**Q2) a)** Describe Parametric and Non-Parametric Machine Learning models. **[5]**

b) Define feature extraction. Explain algorithm of feature extraction in short. **[5]**

**Q3) a)** Explain use of Linear Discriminant Analysis (LDA) technique in feature extraction. **[4]**

b) Explain the following terms. **[6]**

i) Bias

ii) Variance

**Q4) a)** Explain Support Vector Machine in detail with all steps and its applications. **[6]**

b) What is linear and non-linear classifier? Explain with examples. **[4]**

*P.T.O.*

- Q5)** a) What is Multi-layer Perceptron? Explain in detail. [6]  
b) Write a short note on Regression trees. [4]
- Q6)** a) Explain K-means clustering algorithm. [5]  
b) Explain ID3 algorithm in detail. [5]
- Q7)** a) Describe discriminative learning with maximum likelihood. [5]  
b) Explain Hidden Markov model in detail. [5]
- Q8)** a) Write a note on Credit card fraud detection. [5]  
b) Explain the different text mining tasks. [5]



Total No. of Questions : 12]

SEAT No. :

PC-4643

[Total No. of Pages : 2

**[6355]-79**

**M.E. (Artificial Intelligence of Data Science)**

**VIRTUAL REALITY AUGMENTED REALITY**

**(2020 Course) (2017 Pattern) (Semester - II) (510504)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) Neat diagram must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Assume suitable data, if necessary.*

**Q1) a) How to Geometric modeling is done? [4]**

**b) What is EWK? How its useful AR? [4]**

**OR**

**Q2) a) Compare the AR, VR and MR. [4]**

**b) Explain 2D rotation with suitable example. [4]**

**Q3) How 3 cues that gives us preception depth. [8]**

**OR**

**Q4) Explain rendering work for VR. [8]**

**Q5) How ARVR marker works? With suitable example. [9]**

**OR**

**Q6) Explain abject of sence Recognition in details. [9]**

**Q7) Describe the markerless Augmated reality with suitable example? [8]**

**OR**

**Q8) What is visual tracking? Why its important. [8]**

**P.T.O.**

**Q9)** What are different head mounted displays? [8]

OR

**Q10)** Explain concept of highlevel content creation. [8]

**Q11)** Write short notes on : [9]

a) VR SDK

b) AR Toolkit

OR

**Q12)** Explain the various VR SDK's and explain their benefit over another. [9]



Total No. of Questions : 8]

SEAT No. :

PC-4644

[Total No. of Pages : 2

**[6355]-80**

**M.E. (Artificial Intelligence and Data Science)  
SOFT COMPUTING AND DEEP LEARNING  
(2017 Pattern) (Semester - III) (610501)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

- Q1)** a) Explain working of Simple Genetic algorithms. [4]  
b) Explain all the Hybrid soft computing approaches in Soft computing in short with neat diagram. [4]  
c) What is objective function in G.A.? [2]
- Q2)** a) Draw the architectural diagram for Fuzzy Expert system and explain its working. [4]  
b) Explain defuzzification with any two defuzzification methods. [4]  
c) What is fuzzification? Why it is required? [2]
- Q3)** a) Explain back propagation Neural network architecture with diagram. [4]  
b) What are applications Shallow Neural Network? Explain its working with diagram. [4]  
c) Compare Shallow and Deep Neural Networks. [2]
- Q4)** a) How NAG enhances convergence performance? [4]  
b) Explain Learning Parameters of a feedforward neural network. [4]  
c) Why and how PCA is used in Deep Learning? [2]

*P.T.O.*



- Q5)** a) What is the problem of the vanishing gradient . How to Handle the problem of the vanishing gradient? [4]  
b) Design a system with applying neural network to solve weather prediction problem. [4]  
c) What is fooling Convolutional Neural Networks. [2]
- Q6)** a) Draw and explain working of Long Short-Term Memory Recurrent Neural Network. [4]  
b) Explain working principal of RNN. [4]  
c) What are the applications where we need to apply LSTM? [2]
- Q7)** a) Design controller for Air conditioner applying fuzzy logic. [5]  
b) Design a model applying Genetic Algorithm in solving scheduling problem. [5]
- Q8)** a) Write a Short note on various Cross over operators used in G.A. [5]  
b) Design a solution to solve 0-1 knapsack problem using Genetic Algorithms. What type of Crossover operator is applicable for this problem? [5]



Total No. of Questions : 12]

SEAT No. :

**PC4645**

[Total No. of Pages : 2

**[6355]-81**

**S.Y.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 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 or 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)** Explain the concept of data variety in the context of big data analytics. **[9]**

OR

**Q2)** Explain approximate near neighbors search with kd-trees. LSH Families, MinHash for Jaccard and SimHash for L2. **[9]**

**Q3)** Explain Parallel data processing, different strategies used for Apache Spark and Programming language options on ApacheSpark? **[9]**

OR

**Q4)** Explains Data Frames. Creating DataFrames from- RDDs, JSON and databases using JDBC? **[9]**

**Q5)** Explain statistical calculations with suitable examples. **[9]**

- i) Standard deviation
- ii) Covariancematrices
- iii) Kurtosis

OR

**P.T.O.**

**Q6)** Describe in detail Apache Spark RDD and How parallelism in applying basic statistical calculations in Apache Spark RDD? **[9]**

**Q7)** Explain Linear Regression with Apache SparkML. **[9]**

OR

**Q8)** Compare and contrast SparkML with other machine learning libraries. **[9]**

**Q9)** Explain use of GraphX API with suitable example. **[9]**

OR

**Q10)** Explain the concept of Graph? Explain Graph Properties, Graph Operators illustrate with suitable examples. **[9]**

**Q11)** Explain function name masking and column functions in SparkR. **[5]**

OR

**Q12)** Explain SparkR DataFrames - SQL operations and set Operations with suitable examples. **[5]**



Total No. of Questions : 12]

SEAT No. :

**PC4646**

[Total No. of Pages : 2

**[6355]-82**

**F.Y. M.E. (Computer Engineering) (Data Science)**

**BIG DATA ANALYTICS**

**(2017 Pattern) (Semester - I) (510303)**

*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) Draw neat diagrams wherever necessary.*
- 4) Assume suitable data, if necessary.*

**Q1)** Explain Big Data Architecture components and functions of each component. **[9]**

OR

**Q2)** What are different phases of data analytics life cycle? Explain each in detail. **[9]**

**Q3)** What are advantages and disadvantages of implementation of Big Data on the cloud? **[8]**

OR

**Q4)** Describe in detail components of the Hadoop distributed file system. **[8]**

**Q5)** What is Hbase? Explain features of Hbase in Hadoop. **[8]**

OR

**Q6)** Describe the steps in process of importing data from relation database into Hadoop ecosystem using Apache Sqoop. **[8]**

**Q7)** Explain the role Apache Flume in data ingestion and collection for Hadoop-based big data analytics pipelines. **[8]**

OR

**P.T.O.**

**Q8)** Explain important features of Apache sparks that are suitable for Big Data Analytics. [8]

**Q9)** What are core components of the Apache spark? Explain role of each components. [8]

OR

**Q10)**How does RHadoop integrate with the Hadoop ecosystem and what advantages does it offer for R uses in Big Data Analytics? [8]

**Q11)**Describe visualization techniques used in big data analytics and explain how they help in exploring and understanding complex datasets. [9]

OR

**Q12)**Discuss the role of dashboarding tools in big data analytics. How they facilitate real-time monitoring, reporting and decision-making based on data insights. [9]



Total No. of Questions : 6]

SEAT No. :

**PC4647**

[Total No. of Pages : 1

**[6355]-83**

**F.Y.M.E. (Computer Data Science)  
DATA WAREHOUSING & MINING  
(2017 Pattern) (Semester - II) (510308)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1)** a) Define Data Warehouse. Compare operational versus decision support systems. [5]

b) Explain Data Warehouse with respect to evolution of Business Intelligence. [5]

**Q2)** a) Write in brief about Advanced dimension modelling? [5]

b) Describe ETL operations in Data Warehouse. [5]

**Q3)** a) Explain star schema and write its advantages. [5]

b) Describe the Snowflake schema and its advantages. [5]

**Q4)** a) What is OLAP in the data warehouse? [5]

b) Write in brief about information delivery, delivery tools with respect to data warehouse. [5]

**Q5)** a) Explain Data mining as a process of Knowledge Discovery. [5]

b) Discuss Clustering, its basic concept, and methods. [5]

**Q6)** a) Describe processes involved in Physical design of data warehouse. [5]

b) What are the different activities needed for data warehouse maintenance? [5]



Total No. of Questions : 12]

SEAT No. :

**PC4648**

[Total No. of Pages : 2

**[6355]-84**

**F.Y.M.E. Computer Engineering (Data Science)**

**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) Enlist and explain any two Machine learning models. **[5]**
- b) Explain One vs One and One vs All methods of multi-class classification in detail with example. **[4]**

OR

- Q2)** a) What is classification? Explain binary classification as a two-step process with example in detail. **[5]**
- b) Differentiate between Parametric and non-parametric models. **[4]**

- Q3)** What is concept learning? Explain hypothesis space in detail. **[8]**

OR

- Q4)** State the reasons for dimensionality reduction. Explain in detail two methods of dimensionality reduction: feature selection and feature extraction. **[8]**

*P.T.O.*

- Q5) a)** Given the following data where X and Y are the 2 input variables and Class is the dependent variable. [5]

X	Y	class
2	3	P
2	2	N
1	2	P
1	0	P
1	-1	N
0	2	N
0	1	P
-1	1	N

Predict the class of new data point  $x=1$  and  $y=1$  using kNN where value of  $k$  is 3. To which class the new data point belongs to?

- b)** What is perceptron? How to train perceptron. [4]  
OR

- Q6)** What is linear regression? Explain how least square method is used in linear regression with example. Also, state the pros and cons of least square method. [9]

- Q7)** What is hierarchical clustering? Explain any one hierarchical clustering method with example. [8]  
OR

- Q8)** What is decision tree? Write a decision tree algorithm and explain with an example. [8]

- Q9)** Explain Gaussian Mixtures and compression based models in detail. [8]  
OR

- Q10)** Explain normal distribution and its geometric interpretations in detail. [8]

- Q11)** Write a short note on: [8]  
i) Credit card fraud detection.  
ii) Detecting malicious websites in adversarial classification.

OR

- Q12)** Write short note on: [8]  
i) Topic models of the underground Internet economy.  
ii) Profiling the online storefronts of counterfeit merchandise.





Total No. of Questions : 12]

SEAT No. :

**PC4649**

[Total No. of Pages : 2

**[6355]-85**

**F.Y.M.E. (Computer Engg.) (Data Science)**

**SOFT COMPUTING**

**(2017 Pattern) (Semester - II) (510310)**

*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 or Q.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)** What do you understand by soft computing? Explain its characteristics. [6]

OR

**Q2)** Compare hard computing with soft computing. [6]

**Q3)** Write a short note on fuzzy sets and its operations. [6]

OR

**Q4)** Write a short note on defuzzification. [6]

**Q5)** What are the basic operations and technologies in genetic algorithms? [8]

OR

**Q6)** Discuss about the differences between traditional and genetic algorithm. [8]

**Q7) a)** Explain about the back propagation network. [5]

b) Explain about back propagation learning. [5]

OR

*P.T.O.*

- Q8)** a) What are the limitations of “Perceptron” model? Explain. [5]  
b) Explain the Architecture of Backpropagation (BP). [5]

- Q9)** a) How unsupervised learning is carried out with neural network? [5]  
b) Explain the concept of associative memory in ANN. [5]

OR

- Q10)** a) Explain Bidirectional Associative Memory. [5]  
b) Explain Networks Unsupervised Learning. [5]

- Q11)** a) Explain the Neuro-Fuzzy Hybrid Systems. [5]  
b) Explain Fuzzy-Genetic Hybrid Systems. [5]

OR

- Q12)** a) Explain GA based Back propagation Networks. [5]  
b) Explain Optimization of TSP using GA. [5]



Total No. of Questions : 12]

SEAT No. :

**PC4650**

**[6355]-86**

[Total No. of Pages : 2

**M.E. - II (Computer Data Science)**

**DEEP LEARNING**

**(2017 Pattern) (Semester-III) (610301)**

*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 indicate full marks.*
- 4) Assume suitable additional data, if necessary.*

**Q1)** What is Perceptron? What are the steps involved for training a perceptron in Deep Learning? **[9]**

OR

**Q2)** Differentiate between shallow and deep neural networks. **[9]**

**Q3)** What is gradient decent. Explain following three variants of Gradient Descent: Batch, Stochastic and Mini batch. **[9]**

OR

**Q4)** What are Learning Parameters of a feed forward neural network. **[9]**

**Q5)** What is Bias Variance trade-off? Explain with suitable examples. **[9]**

OR

**Q6)** What is the need of Ensemble methods? Discuss in brief about Ensemble Methods. **[9]**

**Q7)** Explain the different layers in CNN. Why do we use a Pooling Layer in a CNN? **[9]**

OR

**P.T.O.**

**Q8)** Write short note on: [9]

- a) Visualizing CNNs
- b) Deep Dream
- c) Fooling CNN

**Q9)** How to apply autoencoders for dimensionality reduction? Discuss the types of autoencoders. [9]

OR

**Q10)** Explain Generative Adversarial Network and Compare Variational autoencoders and Generative Adversarial Network? [9]

**Q11)** Explain the architecture of an LSTM network. [5]

OR

**Q12)** Explain RNN and its application? Discuss the limitations of RNN? [5]



Total No. of Questions : 12]

SEAT No. :

**PC4651**

[Total No. of Pages : 2

**[6355]-87**

**S.Y.M.E. (Computer Data Science)  
DATA MODELING AND VISUALIZATION  
(2017 Pattern) (Semester - III) (610302)**

*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) Explain Visual Representation and Presentation components of visualization. [4]  
b) What are the four steps in working with data? Explain. [4]

OR

- Q2)** Explain the three state model of visual information processing. [8]

- Q3)** a) How the Line graph and bar charts are useful in visualization of Numerical data? [4]  
b) How the streamlines are used in visualization of the Flow? [4]

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 the node link diagram and shade maps 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 : 12]

SEAT No. :

**PC4652**

**[6355]-88**

[Total No. of Pages :2

**First Year M.E. (Computer Networks)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester- I) (510201)**

*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) Assume suitable data where ever necessary.*
- 3) Figures to right indicates will get full marks.*

**Q1)** Explain Meaning, nature, scope, and significance of research. **[10]**

OR

**Q2)** Explain IEEE Code of Ethics? **[10]**

**Q3)** Differentiate between types of publications. **[8]**

OR

**Q4)** Write short notes on Research gate and Google Scholar. **[8]**

**Q5)** Explain the Null hypothesis testing in detail. **[8]**

OR

**Q6)** Explain the various sources of error and uncertainty in measurement. **[8]**

**Q7)** Explain in detail sequential uniform sampling optimization method. **[8]**

OR

**Q8)** Explain merits and demerits of Monte Carlo optimization technique. **[8]**

**P.T.O.**

**Q9)** Explain importance of Statistical analysis and Reporting in research. **[8]**

OR

**Q10)** Explain General survey guidelines and Survey statements. **[8]**

**Q11)** Explain different Intellectual Property Rights. **[8]**

OR

**Q12)** Write short notes on Standard research methods and experimental techniques. **[8]**





Total No. of Questions : 12]

SEAT No. :

**PC4653**

**[6355]-89**

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

**First Year M.E. (Computer Networks)**

**NETWORK SECURITY**

**(2017 Pattern) (Semester- I) (510202)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Answer 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. No. 12.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**Q1)** Enlist the challenges involved in detecting attacks on Wireless Sensor Networks (WSNs). Choose three specific detection approaches and provide a detailed explanation of each. **[9]**

OR

**Q2)** Explain the methods for detecting and preventing black hole attacks in a Mobile Ad Hoc Network. **[9]**

**Q3)** Define network sniffing and elaborate on its significance in network security. **[8]**

OR

**Q4)** Define hackers and categorize them into different types based on their intentions. Additionally, describe the tools commonly used by hackers in their activities. **[8]**

**Q5)** Explain the concept of web injections, specifically focusing on SQL injections and how they operate. **[8]**

OR

**Q6)** Write a note on: **[8]**

- a) BeEF with Better Cap
- b) BeEF with man-in-the-middle framework (MITMF)

**P.T.O.**

**Q7)** What is a hash? What is the problem with windows NTLM? Which tool is used insist of windows NTLM for authentication? Explain in detail. [8]

OR

**Q8)** Explain the functioning of cryptographic hash functions. Discuss how hackers acquire hashes and describe the impact of pass-the-hash attacks on businesses. [8]

**Q9)** Describe ARP cache poisoning and provide examples of ARP. poisoning commands with detailed explanation. [8]

OR

**Q10)** Discuss the utilization of network sniffing for monitoring wireless networks. Enlist its advantages and disadvantages. [8]

**Q11)** Evaluate the role of physical threat hunting platforms in modern cybersecurity. What capabilities do these platforms offer for detecting and mitigating threats, including those related to evil twins and spoofing attacks? [9]

OR

**Q12)** Address spoofing is a common technique used in network attacks. Describe what. address spoofing is, how it is carried out, and its impact on network security. [9]



Total No. of Questions : 8]

SEAT No. :

**PC4654**

[Total No. of Pages : 2

**[6355]-90**

**First Year M.E. (Computer Networks)**

**WIRELESS SENSOR NETWORKS**

**(2017 Pattern) (Semester - I) (510203)**

*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)** Discuss Categories of aggregation operations. **[6]**

b) Differentiate between traditional networks and wireless sensor networks. **[6]**

OR

**Q2) a)** Discuss Data-centric routing methods (One-shot interactions, Repeated interactions) **[6]**

b) With suitable diagram explain the Hightrob Node Architecture. **[6]**

**Q3) a)** Characteristics of MAC Protocols in Sensor Networks. **[6]**

b) Discuss Single-hop localization. **[6]**

OR

**Q4) a)** Describe Contention-Free MAC Protocol : The Lightweight Medium Access Control (LMAC) protocol. **[6]**

b) Explain possible approaches exists to determine a node's position in wireless networks. **[6]**

**Q5) a)** Explain several data transport tasks to provide Reliability requirements in sensor networks. **[7]**

b) Explain Mechanisms for congestion detection and congestion handling in WSN. **[6]**

OR

**P.T.O.**

**Q6)** a) Discuss Single packet delivery in transport layer. [6]

b) Discuss Block delivery in sensor network. [7]

**Q7)** a) What is DoS attack? Explain Physical Layer and Link layer DoS. [6]

b) Explain Security Protocol for Sensor Networks. [7]

OR

**Q8)** Write Short Notes on (Any Two) [13]

a) Challenges of Security in Wireless Sensor Networks.

b) Defences Against Aggregation Attacks.

c) Key Management.



Total No. of Questions : 12]

SEAT No. :

PC-4655

[Total No. of Pages : 2

**[6355]-91**

**M.E. (Computer Networks)**

**HIGH PERFORMANCE NETWORKS**

**(2017 Pattern) (Semester - I) (510204)**

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

**Q1)** Enlist the challenges involved in detecting attacks on High Performance Networks (HPNs). Enlist three specific approaches and provide a detailed explanation of each. **[9]**

OR

**Q2)** Enlist various High performance networks. Discuss any three of the high performance networks in detail. **[9]**

**Q3)** What is gigabit Ethernet? Explain Ethernet frame format in detail. **[8]**

OR

**Q4)** Explain the terms: **[8]**

- i) Architecture of gigabit Ethernet
- ii) Gigabit Ethernet physical layer.

**Q5)** What is MPLS. Explain MPLS forwarding operations. **[8]**

OR

**Q6)** Write a note on: **[8]**

- i) Cells Vs frames,
- ii) IP over MPLS architecture & terminology.

*P.T.O.*

**Q7)** Enlist different MPLS encapsulation standards. Explain two standards in detail. [8]

OR

**Q8)** Explain the MPLS signaling and routing protocols in detail. [8]

**Q9)** Explain the Optical Networks in detail. Enlist any four Optical Networking devices. [8]

OR

**Q10)** Explain what the Large-Scale Optical Switches in detail are. [8]

**Q11)** Explain the Structure of Optical Cross Connects (OXC). How does the routing happen in these types of networks. [9]

OR

**Q12)** Explain [9]

- i) The Borderless Network Architecture.
- ii) Enlist the Distribution-Layer Network Design Recommendations.



Total No. of Questions : 10]

SEAT No. :

PC-4656

[Total No. of Pages : 3

[6355]-92

F.Y. M.E. (Computer Engineering/Computer Networks)

OPERATION RESEARCH

(2017 Pattern) (Semester - II) (510108/510208)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) Solve using Graphical Method

[5]

Maximize  $Z = 3x_1 + 5x_2$  subject to the constraints

$$x_1 \leq 4$$

$$2x_2 \leq 12$$

$$3x_1 + 2x_2 \leq 18 \text{ and } x_1, x_2 \geq 0$$

Q2) Determine Value of Game. Also indicate that they are fair or strictly determinable. [5]

	B1	B2	B3	B4
A1	6	-2	-3	8
A2	-1	-2	-7	0
A3	8	9	-6	-7
A4	9	5	-7	7

Q3) What do you mean by Degeneracy in Linear Programming? Demonstrate the same with reference to following [5]

$$\text{Max } z = x_1 + x_2 + x_3$$

$$\text{S.t. } x_1 + x_2 \leq 1$$

$$-x_2 + x_3 \leq 0$$

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

P.T.O.

**Q4)** A firm makes two products P1 & P2 and has production capacity of 18 tons per day. P1 & P2 require the same production capacity. The firm must supply at least 4 tons of P1 and 6 tons of P2 per day. Each ton of P1 & P2 requires 60 hours of machine work each. Maximum machine hours available are 720. Profit per ton for P1 is Rs. 160 & P2 is Rs. 240. Find optimal solution by graphical method. [5]

**Q5)** Explain critical path method of project planning and network Analysis. [5]

**Q6)** Using North west corner rule (NWC) , Compute the initial basic feasible solution for the Transportation problem [5]

Routes	Chilling centers				Route Capacity
	P	Q	R	S	
<b>A</b>	<b>16</b>	<b>18</b>	<b>21</b>	<b>12</b>	<b>150</b>
<b>B</b>	<b>17</b>	<b>19</b>	<b>14</b>	<b>13</b>	<b>160</b>
<b>C</b>	<b>32</b>	<b>11</b>	<b>15</b>	<b>10</b>	<b>90</b>
<b>Chilling Center Capacity</b>	<b>140</b>	<b>120</b>	<b>90</b>	<b>50</b>	<b>400</b>

**Q7)** A plant manager has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. This estimate of the times each man would take to perform each task is given in the effectiveness matrix below. [5]

	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>A</b>	<b>8</b>	<b>26</b>	<b>17</b>	<b>11</b>
<b>B</b>	<b>13</b>	<b>28</b>	<b>4</b>	<b>26</b>
<b>C</b>	<b>38</b>	<b>19</b>	<b>18</b>	<b>15</b>
<b>D</b>	<b>19</b>	<b>26</b>	<b>24</b>	<b>10</b>

How should the tasks be allocated, one to a man, so as to minimize the total man hours?



**Q8)** Discuss the following characteristics : **[5]**

- a) Strategy
- b) Pure Strategy
- c) Mixed Strategy

**Q9)** For what value of  $\lambda$ , the game with the following payoff matrix is strictly déterminable? **[5]**

		Player B		
		B1	B2	B3
Player A	A1	$\lambda$	-1	-2
	A2	6	$\lambda$	-7
	A3	2	4	$\lambda$

**Q10)** You are the manager of a manufacturing company and you need to decide which machine to purchase for a new production line. **[5]**

You have thoroughly researched the market and gathered complete information about two available options :

Machine A and Machine B. The performance metrics for both machines are as follows:

- Machine A: Produces 100 units per hour with a maintenance cost of Rs. 500 per month.
- Machine B: Produces 120 units per hour with a maintenance cost of Rs. 600 per month.

You know that your production target is 1000 units per day and you have calculated that the monthly production requirement is approximately 22,000 units. Given this information, which machine should you choose to maximize production efficiency and minimize costs?



Total No. of Questions : 6]

SEAT No. :

PC-4657

[Total No. of Pages : 2

**[6355]-93**

**M.E. (Computer Networks)**

**NETWORK DESIGN AND ANALYSIS**

**(2017 Pattern) (Semester - II) (510209)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

**Q1) a)** What are the Network design issues? **[4]**

b) Define and explain User, Application, Device, Network and other requirements. **[4]**

**Q2) a)** What is IP Packet fragmentation? Explain with diagram. **[5]**

b) Difference between IPv4 and IPv6. **[5]**

**Q3) a)** What is the little's formula for queueing network analysis? Explain with example. **[4]**

b) What are queue performance parameters ? Explain M/M/1 model. **[4]**

**Q4) a)** Explain Link prediction algorithms with Bellman's Algorithm. **[4]**

b) Describe Incremental shortest path algorithm with suitable example. **[4]**

*P.T.O.*

- Q5)** a) What are the different Mechanisms for improving QoS? [4]  
b) Explain in detail Queue management algorithm. [4]
- Q6)** a) What is cyber physical systems and its usage? [4]  
b) What is the modern testing tool for network. [4]



Total No. of Questions : 12]

SEAT No. :

PC-4658

[Total No. of Pages : 2

**[6355]-94**  
**M.E. (Computer Networks)**  
**DATA ALGORITHMS**  
**(2017 Pattern) (Semester - II) (510210)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Answer the question of 1 or 2,3 or 4,5 or 6,7 or 8,9 or 10, 11 or 12
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary

**Q1)** Explain Secondary sort in Hadoop and how it works? **[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)** What is mean by outer join? What is left outer join? Give the syntax in SQL for Left outer Join. Apply the left outer join SQL query to the following tables of Class and Class-Info and show the result after Left outer join. **[8]**

Class table,

ID	Name
1	Abhijit
2	Aditya
3	Amar
4	Anurag
5	Ashish

Class info table,

ID	Address
1	Delhi
2	Mumbai
3	Chennai
4	Noida
5	Pune

OR

*P.T.O.*

**Q4)** Left Outer Join  $(T_1, T_2, K) = \{(k, t_1, t_2) \text{ where } k \in T_1 \text{ and } k \in T_2, K\} \cup \{(k, t_1, null) \text{ where } k \in T_1 \text{ and } k \notin T_2, K\}$  [8]

Above is the given a mathematical definition in term of set theory for left outer join. What K,  $T_1$  and  $T_2$  signifies, take suitable example and explain.

**Q5)** What is moving average? And how do we calculate it? Give the suitable example. [9]

OR

**Q6)** “One can sort the input data and then easily select the K largest records from the sorted file. This is often the most efficient method for very large K.” to implement this sort give the construct of Map and Reduce functions. [9]

**Q7)** What is market basket analysis? What are the association rules? What is the role of association rules in market basket analysis? In the following example calculate support, confidence and lift. [8]

\*Assume there are 100 customers

\*10 of them bought milk, 8 bought butter and 6 bought both of them.

OR

**Q8)** What is POJO? How does POJO handle the common friends solutions? Give the pseudo code snippet? How the same common friends solutions resolve using MAP-REDUCE? [8]

**Q9)** Explain in brief five method template for implementing scatter search. [9]

OR

**Q10)** What is the scatter search algorithm? What are its characteristics? And Give the algorithmic procedure. [9]

**Q11)** Explain Bellman’s equation and acyclic graph? What is significance of bellman’s equation in shortest path finding? [8]

OR

**Q12)** How can we solve maximum bipartite matching problem using a network flow approach explain with example. [8]



Total No. of Questions : 12]

SEAT No. :

PC-4659

[Total No. of Pages : 2

**[6355]-95**

**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 diagrams must be drawn whenever necessary.*
- 3) Figures to the right side of question indicate full marks.*

**Q1)** Explain various error correction codes in detail with examples? **[9]**

OR

**Q2)** Explain Discrete (Markov) Model in detail with example? **[9]**

**Q3)** What is fault modeling? Explain fault modeling levels in detail? **[9]**

OR

**Q4)** Explain in detail about deductive fault simulation algorithm? **[9]**

**Q5)** Explain I Iterative-Based Heuristic Routing Algorithm with example? **[8]**

OR

**Q6)** Explain in detail Node Labeling Technique? **[8]**

**Q7)** What is Block-Shift Network (BSN)? Explain Edges Groups, Construction, Degree in detail? **[8]**

OR

**Q8)** Explain in detail about degree and diameters in Hierarchical cubic networks?[8]

*P.T.O.*

**Q9)** Explain various Classifications of Fault-Tolerant Switching Architectures? **[8]**

OR

**Q10)** Explain in detail about Daisy-Chain Architectures and Multi-Drop Architectures? **[8]**

**Q11)** Explain the following terms **[8]**

- a) Faults
- b) Errors
- c) Failures
- d) Process resilience

OR

**Q12)** What is Mutable checkpoint? Explain in detail with example? **[8]**



Total No. of Questions : 8]

SEAT No. :

PC-5121

[Total No. of Pages : 2

[6355]-96

M.E. (Computer Networks)

MOBILE ADHOC NETWORKS

(2017 Pattern) (Semester - III) (610202)

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) Compare the pros & cons of using scheduling-based MAC protocols over reservation based MAC protocols. [6]

b) What is multipath propagation? Explain how it affects signal quality?[6]

OR

**Q2)** a) What are the limitations of the IEEE 802.11 MAC protocol that prevent it from supporting QoS traffic? [6]

b) Differentiate between cellular networks & ADHOC wireless networks.[6]

**Q3)** a) Explain Multicast Routing protocol based on zone routing in detail. [6]

b) Why TCP does not perform well in ADHOC wireless networks? [6]

OR

**Q4)** a) Explain Battery aware MAC protocol for energy management solution.[6]

b) What are the two basic approaches for maintenance of the multicast tree in Bandwidth Efficient Multicast Protocol (BEMRP)? Which of the two performs better? Why? [6]

P.T.O.



- Q5)** a) Describe the sybil attack & the sinkhole attack on sensor network. [6]  
b) Why are public key cryptographic solutions not suitable for the security of sensor networks. [7]

OR

- Q6)** a) Explain in brief layered sensor architecture with the help of diagram. [6]  
b) How does hybrid usage of TDMA & FDMA minimize energy consumption? [7]

- Q7)** a) Compare & contrast UWB communication with conventional wide band communication techniques based on spread spectrum techniques? [6]  
b) Explain how TCP over ADHOC networks works. What are different Transport Layer protocols? [7]

OR

- Q8)** Write short note on (any two) : [13]  
a) Software defined Radio-Based Multimode systems.  
b) Issues in Wi-Fi systems  
c) Optical Wireless WDM



Total No. of Questions : 12]

SEAT No. :

PC-4660

[Total No. of Pages : 2

[6355]-97

M.E. (Cyber Security)

MATHEMATICAL FOUNDATION FOR CYBER SECURITY

(2017 Pattern) (Semester - 1) (510401)

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, Q.9 or Q.10 and 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 Binary operations and Integer division. [8]

OR

Q2) Explain Linear Congruence with Example. [8]

Q3) What are Rings. Explain sub rings and quotient rings with example. [9]

OR

Q4) Explain Lattice as algebraic system and sub lattice with example. [9]

Q5) What are Relative prime numbers? Explain Cardinality of Primes with example. [9]

OR

Q6) Discuss Miller--Rabin primality test in detail. [9]

P.T.O.

**Q7)** Write short note on : **[8]**

i) Pollard rho method

ii) Fermat method

OR

**Q8)** Explain Chinese Remainder Theorem (CRT) with it's applications. **[8]**

**Q9)** Explain Baye's Theorem with Example. **[8]**

OR

**Q10)** What is Pseudorandom number generator? Explain with example. **[8]**

**Q11)** Explain minimum distance and equivalence of codes. **[8]**

OR

**Q12)** Discuss Hamming codes with example. **[8]**



Total No. of Questions : 6]

SEAT No. :

PC-4661

[Total No. of Pages : 2

**[6355]-98**

**M.E. (Computer Engineering) (Cyber Security)**

**MODERN CRYPTOGRAPHY**

**(2017 Pattern) (Semester - I) (510402)**

*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) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**Q1) a)** What is Cryptanalysis? Describe “One-Time Pad” with its cryptanalysis. **[5]**

b) What is perfect security? Differentiate semantic security and perfect security. **[5]**

**Q2) a)** Describe Advanced Encryption Standard in detail. **[5]**

b) Explain the Blowfish algorithm in detail. **[5]**

**Q3) a)** Explain the pros and cons of RSA. **[5]**

b) Describe the Diffie -Hellman Key Exchange algorithm in detail. **[5]**

**Q4) a)** Describe digital certificates. What is the difference between digital signature and digital certificate. **[5]**

b) Differentiate between Steganography and Cryptography. **[5]**

*P.T.O.*

- Q5)** a) Discuss the need of cyber security policy. [5]  
b) Describe the Cyber Laws and regulation in detail. [5]
- Q6)** a) Elaborate security policy objectives and security metrics. [5]  
b) Discuss cyber security management in detail. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4662

[Total No. of Pages : 2

**[6355]-99**

**M.E. (Cyber Security)**

**SECURE SOFTWARE DESIGN, CODING PRACTICES  
AND ETHICS**

**(2017 Pattern) (Semester - I) (510403)**

*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, Q.7 or Q.8*
- 2) *Figure to the right side indicates full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) What is mean by system complexity? What is role of software assurance in system development? [4]
- b) Discuss about benefits of early detection of defects in software development? [5]

OR

- Q2)** a) What are the threats and sources present in system design? Explain each in detail. [4]
- b) Discuss about OWASP Security knowledge framework. [5]

- Q3)** a) Discuss about SQUARE Model and output in detail. [4]
- b) What are the architectural risk analysis in secure software? Explain in detail. [5]

OR

- Q4)** a) Discuss about requirement elicitation method in detail. [4]
- b) Which are the different guidelines and attack patterns? Explain in detail. [5]

*P.T.O.*

- Q5) a)** Write short note on : [8]  
i) Security failures  
ii) Maturity of practice  
**b)** Discuss about Governance and security. [8]

OR

- Q6) a)** Write short note on : [8]  
i) System complexity drivers  
ii) Deep technical problem  
**b)** Discuss about Software penetration testing. [8]

- Q7) a)** What do you mean by Agile development process? Explain with suitable example. [8]  
**b)** Describe agile vulnerability management with example. [8]

OR

- Q8) a)** Write short note on any two following : [8]  
i) Getting security into requirements  
ii) Code review for security  
ii) Agile security testing  
**b)** Discuss about Risk based Software testing. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4663**

[Total No. of Pages : 2

**[6355]-102**

**F.Y.M.E. (Computer Engineering)/(Cyber Security)**

**DISASTER RECOVERY AND MANAGEMENT**

**(2017 Pattern) (Semester - II) (510409)**

*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, Q7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Differentiate between Hazard and Disaster. [4]  
b) What could be the repercussions of Earthquake? [4]

OR

- Q2)** a) What is Natural Disaster? Give the causes of Natural Disaster. [4]  
b) Explain the effects of Oil Slicks and Spills? [4]

- Q3)** a) What is a seismic zone also called? What are the 4 seismic zones of India? [4]  
b) What are factors included in Disaster Preparedness? [6]

OR

- Q4)** a) Discuss Post-Disaster Diseases and Epidemics? [4]  
b) What are the applications of remote sensing in disaster risk management? [6]

- Q5)** a) What could be replications of any National Disaster? [8]  
b) Discuss the concepts and Elements of Disaster Risk. [8]

OR

*P.T.O.*



- Q6)** a) What is the concept of disaster risk reduction? Explain national disaster risk. [8]  
b) Discuss the strategies for Survival. [8]

- Q7)** a) What do you mean by mitigation? Explain Concept And Strategies of Disaster Mitigation. [8]  
b) Discuss the strategies of Disaster Mitigation. [8]

OR

- Q8)** a) Explain Prevention and mitigation of Common Disasters in India. [8]  
b) Discuss structural Mitigation and Non-Structural Mitigation [8]



Total No. of Questions : 12]

SEAT No. :

**PC4664**

**[6355]-103**

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

**First Year M.E. (Cyber Security)**

**FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY**

**(2017 Pattern) (Semester-II) (510410)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Answer questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 Q.7, or Q.8, Q.9 or Q.10, Q.11, or Q.12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.

**Q1)** Explain the different technologies that are borrowed in Blockchain. **[9]**

OR

**Q2)** What is Hash Function and also discuss about **[9]**

- a) Puzzle friendly Hash
- b) Collison resistant Hash

**Q3)** Explain Merkle Patricia Tree and also Explain Chain Policy. **[9]**

OR

**Q4)** Explain in detail Mining Mechanism in Blockchain. **[9]**

**Q5)** Explain in detail Sybil Attack. **[8]**

OR

**Q6)** Discuss about Energy Utilization and Alternate in Distributed Consensus. **[8]**

**Q7)** Explain Transaction Verifiability and anonymity. **[8]**

OR

**Q8)** What is hardness of mining in Bitcoin Blockchain? Explain in detail. **[8]**

**P.T.O.**

***Q9)*** Explain in detail Hyperledger Architecture. **[8]**

OR

***Q10)*** Explain the Concept of Plug and play Platform and mechanisms in  
permissioned blockchain. **[8]**

***Q11)*** Explain Pseudo-anonymity vs. anonymity. **[8]**

OR

***Q12)*** Explain Supply chain management in Blockchain. **[8]**



Total No. of Questions : 12]

SEAT No. :

**PC4665**

**[6355]-105**

[Total No. of Pages : 2

**S.Y.M.E. (Cyber Security)/(Computer Engineering)**

**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 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) Assume suitable data if necessary.*

**Q1)** What is Cyber Crime ? Explain with suitable example. **[8]**

OR

**Q2)** What are Cyber Target and Cyber Threats ? Give examples of each. **[8]**

**Q3)** What is Risk management? Explain with diagram. **[8]**

OR

**Q4)** Write a note on “Cyber Security Steps”. **[8]**

**Q5)** What is Infrastructure management? What are its types? **[8]**

OR

**Q6)** Write a note on. **[8]**

- i) Network Management
- ii) Storage Management

**Q7)** What are components of IT Infrastructure? **[9]**

OR

**Q8)** What are types of Computer Software used for Infrastructure Management in Business? **[9]**

**P.T.O.**

**Q9)** How operational excellence and customer intimacy is achieved? Explain in detail. [8]

OR

**Q10)** Write a note on “Ethical and social Issues in Information systems” [8]

**Q11)** What are the challenges in Storage Infrastructure Management ? Brief. [9]

OR

**Q12)** What are storage security domains ? What are its impact on implementation in storage networking? [9]



Total No. of Questions : 8]

SEAT No. :

PC4666

[6355]-106

[Total No. of Pages :2

**First Year M.E. (Electrical) (Control Systems)**  
**OPTIMIZATION TECHNIQUES IN CONTROL SYSTEM**  
**(2017 Pattern) (Semester- I) (503101)**

*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) *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)** State whether function is convex, concave or neither  $F(x) = x^4 + 12x^2 + 24x$ . **[4]**

b) Find the Maxima & Minima if any of the function  $F(x) = 4x^3 - 18x^2 + 20x - 6$ . **[5]**

OR

**Q2)** Explain the method of obtaining extreme point of multi - variable optimization with equality constraints. **[9]**

**Q3)** Use analytical method to investigate for extreme points. **[9]**

$$F(x) = X_1^3 + X_2^3 + X_3^3 + 2X_1^2 + 6X_2^2 + 9X_3^2$$

OR

**Q4)** Write the steepest descent method of optimization of a problem. **[9]**

**Q5)** Explain the multistage Decision process in Dynamic Programming. **[16]**

OR

**P.T.O.**

**Q6)** Explain multistage decision process with its types of problem. [16]

**Q7)** a) Explain the Gomory's cutting plane method. [8]

b) Explain the integer nonlinear programming. [8]

OR

**Q8)** Explain Stochastic Linear Programming. [16]



Total No. of Questions : 6]

SEAT No. :

**PC4667**

**[6355]-107**

[Total No. of Pages :1

**First Year M.E. (Electrical) (Control Systems)**

**AUTOMATION IN MANUFACTURING**

**(2017 Pattern) (Semester- I) (503102)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer Questions from 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.*

- Q1)** a) State different types of transducers for displacement measurement. [5]  
b) Explain importance of PID controller with block diagram. [5]  
c) Explain any one type of stepper motor. [4]  
d) What is cyber Physical System and explain its features. [4]

OR

- Q2)** a) Explain following static characteristics related to sensors [4]  
i) Static error  
ii) Precision  
iii) Threshold  
iv) Resolution  
b) Write short note on linear motion bearings with diagrams. [5]  
c) Explain with diagram complete working of Hydraulic actuating systems. [5]  
d) Explain architecture of Cyber Physical system. [4]

- Q3)** a) What are the advantages of Digital Manufacturing? [8]  
b) Explain important features of Digital Manufacturing. [8]

OR

- Q4)** a) Explain different methods of Digital manufacturing science? Explain any one. [8]  
b) Explain Operation Reference Mode of Digital Manufacturing. [8]

- Q5)** a) Explain End to end Digital integration within smart factory. [8]  
b) Explain characteristics of Industry 4.0. [8]

OR

- Q6)** a) List out the drivers of Industry 4.0. Explain in detail. [8]  
b) Explain the benefits of Industry 4.0. [8]





Total No. of Questions : 6]

SEAT No. :

PC4668

[Total No. of Pages : 2

[6355]-108

First Year 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) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.
- 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) Figures to the right indicate full marks.

- Q1)** a) Compare with suitable example Linear and Non-Linear system. [6]
- b) Draw the phase plane trajectory for the following equation using Isocline method  $\ddot{x} + 4\dot{x} + 5x = 0$ , given  $\dot{x} = 1.5, x = 0$ . [6]
- c) Explain with suitable example. [6]
- i) Positive and Negative Definiteness.
  - ii) Positive and Negative Semi-Definiteness.

OR

- Q2)** a) The systems equations are given below : [6]

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

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

Select  $V = \frac{x_1^2}{2} + \frac{x_2^2}{2}$  as Liapunov function and determine stability.

- b) Explain following terms [6]
- i) Phase plane
  - ii) Phase plane Trajectory
  - iii) Isoclines
- c) Explain Popov criterion for absolute stability. [6]

P.T.O.

- Q3)** a) Explain the terms [6]
- i) Sliding phase
  - ii) Reaching phase
  - iii) Chattering as used in sliding control
- b) Write a short note on input-output 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.

OR

- Q6)** Explain clearly for input-output Linearization and state input for the system given as below : [16]

$$\dot{x}_1 = x_1^2 + x_2 + u$$
$$\dot{x}_2 = -2u$$



Total No. of Questions : 6]

SEAT No. :

**PC4669**

[Total No. of Pages : 2

**[6355]-109**

**First Year M.E. (Electrical) (Control Systems)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester - I) (503104)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

- Q1)** a) Mention various types of technical papers. Also explain any one paper in detail. [4]
- b) Explain structure and components of scientific research report. [5]
- c) Explain in brief trade related aspects of Intellectual Property right. [5]
- d) Find linear dependence and independence [4]
- if  $u=(1,1,0)$  ,  $v=(1,3,2)$ ,  $w=(4,9,5)$
- for i)  $3u+5v-3w$
- ii)  $2u+2v-3w$

OR

- Q2)** a) What are different steps involved in report writing of project? [5]
- b) Elaborate about the role of literature survey in writing research report.[4]
- c) Write short notes on [4]
- i) Copy write
- ii) Royalty
- d) Write short notes on [5]
- i) Field
- ii) Sealar
- iii) Vector
- iv) Vector Space
- v) Linear equation

*P.T.O.*

- Q3) a)** Express M as linear combination of matrices A,B,C Where [8]

$$M = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}, A = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 4 \\ 2 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$$

Using scalar  $x_1, x_2, x_3$ . Also find magnitude of  $x_1, x_2, x_3$ .

- b) Explain in detail homogeneous and non homogeneous systems with illustration. What are various types of linear equations? [8]

OR

- Q4) a)** Solve the following linear equation Gaussian elimination method [8]

$$x - 3y - 2z = 6$$

$$2x - 4y - 3z = 8$$

$$-3x + 6y + 8z = -5$$

- b) Explain Echelon form & free variable form linear equations. [8]

- Q5) a)** Explain Eigen vectors, Eigen vector pair & Eigen values. Also elaborate properties of Eigen values & Eigen vector. [8]

- b) Find characteristic polynomial and diagonalization of [8]

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 3 & 2 \\ 1 & 3 & 9 \end{bmatrix}$$

OR

- Q6) a)** Write Diagonalization Algorithm for n square matrix. [8]

- b) Find characteristic equation and minimal polynomial of [8]

$$A = \begin{bmatrix} 2 & 2 & -5 \\ 3 & 7 & -15 \\ 1 & 2 & -4 \end{bmatrix}$$



Total No. of Questions : 6]

SEAT No. :

**PC 4670**

**[6355]-110**

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

**First Year M.E. (Electrical Engineering) (Control System)  
MULTIVARIABLE AND OPTIMAL CONTROL SYSTEM  
(2017 Pattern) (Semester-II) (503107)**

*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 indicates 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) Define and explain the singular control solutions. [8]

b) Explain in details the applications of optimal control in discrete and continuous systems. [8]

OR

**Q6)** a) Explain in details Numerical solution of matrix Riccati equation. [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. :

PC-4671

[Total No. of Pages : 2

**[6355]-111**

**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 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) Explain the roles & objectives of power electronic converters. [6]  
b) Explain different control families of power electronic converter. [6]  
c) Write a note on Sampled data type model. [6]

OR

- Q2)** a) Explain in brief Control principals of Power Electronic Converters. [12]  
b) State Relations Between Modelling and Control. [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

- Q4)** a) Explain pole placement based on observer design for linear feedback control. [8]  
b) State equilibrium point and static transfer function for Buck and Boost converter. [8]

*P.T.O.*

- Q5)** a) Explain variable structure control of power electronic converters. [8]  
b) Explain in detail grid connected single phase DC-AC converter with examples. [8]

OR

- Q6)** Explain variable structure control design with one application as DC-DC power stage. [16]





Total No. of Questions : 8]

SEAT No. :

PC-4672

[Total No. of Pages : 2

[6355]-112

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) Describe the Power Series Expansion method to determine Inverse Z -transform. [5]

b) Explain Linear Convolution and its properties. [4]

OR

**Q2)** a) Classify FFT algorithms. Explain Radix-2 DIT and DIF, FFT algorithms. [5]

b) Define DFT of discrete-time sequence. Explain the various properties of DFT. [4]

**Q3)** a) Explain the time response of discrete time systems. [5]

b) Define transfer function. Explain the steady state and transient response of first order and second order systems. [4]

OR

**Q4)** a) Describe the steps to design of IIR filters using Impulse Invariance method. [5]

b) Explain in detail Chebyshev filter approximation. [4]

P.T.O.

- Q5)** a) Explain the process of windowing using illustrations. What is a rectangular window function? Obtain its frequency-domain characteristics. [8]
- b) Explain the Realization of FIR filters by direct form, cascade form and parallel form frequency-domain characteristics. [8]

OR

- Q6)** a) Comparison between FIR and IIR filters. [8]
- b) Discuss the symmetric and antisymmetric FIR filters. [8]

- Q7)** a) Discuss the Condition monitoring and speed control of Electrical Machines. [8]
- b) Discuss advanced PWM generation by DSP. [8]

OR

- Q8)** a) Explain various methods of measurement of power by DSP. [8]
- b) Discuss design of Discrete PID controller using DSP. [8]



Total No. of Questions : 6]

SEAT No. :

PC-4673

[Total No. of Pages : 2

[6355]-113

**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) *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) Write a note on Pulse width Modulated inverter fed induction motor drive. [4]
- b) Explain in detail thermal consideration of the given rating of the motor. [5]
- c) Differentiate the VSI with CSI supplying the three phase induction motor, on the basis of the following : i) Circuit diagram and commutation ii) Performance of the motor. [5]
- d) Write a note on direct torque control of three phase induction motor drive. [4]

OR

- Q2)** a) Write a note on spatial MMF distribution in the airgap of three phase inverter fed induction motor drive. Discuss the effect of space harmonics on the production of torque pulsations. [5]
- b) Why choppers are preferred for speed control of DC motors? State the applications. [4]
- c) With neat diagram, explain system model and derive the transfer function of the converter fed D.C.motor. [5]
- d) Prove the steady state criterion of electrical drives. State the assumptions [4]

**P.T.O.**

**Q3) Write a note on :**

- a) Permanent magnet synchronous motor and its solid state controller. [8]
- b) Sinusoidal SPM drive. [8]

OR

**Q4) Explain the following in detail:**

- a) Switched Reluctance Motor [8]
- b) Trapezoidal SPM drive. [8]

**Q5) Explain in detail the role of following in the closed loop control system of the electrical drive.**

- a) PI controller [8]
- b) PID controller [8]

OR

- Q6) a) Write a note on modern trends in electric drives control. [8]**
- b) Explain the effect of RMS voltage variation on the performance of electrical drive in closed loop control. [8]



Total No. of Questions : 7]

SEAT No. :

PC-4674

[Total No. of Pages : 2

[6355]-114

M.E. (Electrical Control System)

**SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL**  
**(2017 Course) (Semester - III) (603102)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Answer Qu 1 or 2, Qu 3 or 4, Qu 6 or Qu 7 Qu 5 is compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 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 parametric and non parametric methods of system identification. **[4]**

b) Computer the QR factorization of matrix:  $\begin{bmatrix} 12 & 27 \\ 4 & 2 \\ 6 & 10 \end{bmatrix}$  **[5]**

OR

**Q2) a)** Derive least square estimate of  $\theta$  for model given by  $y = \phi\theta$  **[5]**

b) What is the importance of persistently exciting input signal in system identification? What order of p.e. is white noise? **[4]**

**Q3)** Write short notes on any three: **[9]**

- a) Instrumental variable method
- b) Recursive estimation
- c) Pattern recognition
- d) Bayesian learning
- e) Maximum likelihood method
- f) Model structure.

*P.T.O.*

OR

**Q4) a)** Prove the matrix inversion lemma :

$$[A + BCD]^{-1} = A^{-1} - A^{-1} B [C^{-1} + DA^{-1} B]^{-1} DA^{-1} \quad [4]$$

$$[A + BCD]^{-1} = [A + BCD] \{A^{-1} - A^{-1} B [C^{-1} + DA^{-1} B]^{-1} DA^{-1}\} 1 = 1$$

b) With the help of block diagram explain 'self tuning regulator'. [5]

**Q5) a)** Write short note on [8]

i) MIT rule

ii) Kalman filter as a state estimator.

b) What are various adaptive schemes and how they are implemented? [8]

**Q6)** With the help of both MIT rule and Lyapunov theory, desired 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

$$V(\theta) = \frac{1}{2} \left[ e^2 + \frac{1}{by} (b\theta_2 + a - a_m)^2 + \frac{1}{by} (b\theta_1 - b_m)^2 \right] \quad [16]$$

OR

**Q7)** Consider a position servo described by  $\frac{dv}{dt} = -av + bu$  and  $\frac{du}{dt} = v$  ; 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

$$G_m(s) = \frac{w^2}{s^2 + 2\xi ws + w^2} \text{ determine an adaptive control law that adjusts the}$$

parameters so that the desired objective is obtained. [16]



Total No. of Questions : 4]

SEAT No. :

PC-4675

[Total No. of Pages : 2

[6355]-115

**M.E. (Power Electronics and Drivers)**

**Linear Systems Theory and Design**

**(2017 Pattern) (Semester - I) (503301)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1) a)** Determine if the following sets of vectors are linearly independent or dependent. **[4]**

i)  $v_1 = (3, 1, 6)$ ,  $v_2 = (2, 0, 4)$  and  $v_3 = (2, 1, 4)$

ii)  $v_1 = (1, 0, 3, 1)$ ,  $v_2 = (0, 1, -6, -1)$  and  $v_3 = (0, 2, 1, 0)$

b) Write properties of dot and cross product. **[5]**

**Q2) a)** Define and explain the terms variance, standard deviation and range. **[3]**

b) Find the eigen values and eigen vectors of the following **[6]**

$$A = \begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$$

**Q3) a)** Write note on standard normal distribution. **[8]**

b) What is chi square test? Explain in detail. **[8]**

**P.T.O.**

- Q4) a)** Successive masses of 1 kg each were added at the hook at the lower end of a vertically hanging wire. The position of a mark at the lower end was measured using an ordinary scale. The following results were obtained: [8]

Load x(Kg)	1	2	3	4	5	6	7	8	9	10
Position of y(cm)	6.05	6.20	6.25	6.35	6.40	6.50	6.55	6.60	6.70	6.75

Determine the equation of the best fitting straight line using

- i) Graphical Method
  - ii) Method of sequential differences
- b) For the problem statement given in Q. 4 a with the same given data determine the equation of the best fitting straight line using. [8]
- i) Method of extended differences
  - ii) Method of least squares





Total No. of Questions : 8]

SEAT No. :

PC5171

[Total No. of Pages : 2

[6355]-116

**First Year M.E. (Electrical) (Power Electronics & Drives)**  
**MODELLING AND ANALYSIS OF ELECTRICAL MACHINES**  
**(2017 Pattern) (Semester - I) (503302)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of electronic calculator is allowed.*

- Q1)** a) Discuss Kron's primitive machine along with the related equations. [5]  
b) Explain the concept of transformations. Provide details on transformations from a displaced brush axis, including the respective mathematical expressions. [4]

OR

- Q2)** a) Describe the concept of leakage flux in machines with multiple windings. Include mathematical expressions and state why speed voltage reaches its peak when the moving coil is magnetically perpendicular to the coil. [5]  
b) Discuss the transformation from a three-phase to a stationary two-phase axis using relevant mathematical expressions. [4]

- Q3)** a) Derive the transfer function for a separately excited motor using standard notations. [5]  
b) Develop the generalized mathematical model for a three-phase induction motor and provide the corresponding equations. [4]

OR

- Q4)** a) Explain the dynamics of a DC motor, considering the equation for loaded conditions. [5]  
b) State the advantages and limitations of the d-q model for three phase induction motors. [4]

*P.T.O.*

**Q5) a)** Use the impedance matrix method to derive the expression for instantaneous torque in a synchronous motor, explain the notations used. [8]

b) Discuss dq0 transformations in the context of synchronous machines. [8]

OR

**Q6) a)** Write down the dynamic equations of a synchronous machine and explain the meaning of each term. [8]

b) Write down the equations for synchronous machine modeling in the per-unit system and explain the significance of each term. [8]

**Q7) a)** Write a detailed explanation of performance prediction for induction machines while neglecting stator electrical transients. [8]

b) In case of electrical machines, write down the linearization equations for voltage and torque, explaining the notations used. [8]

OR

**Q8) a)** Enumerate the applications of linearization techniques. [8]

b) Explain displacement stability and its importance. [8]



Total No. of Questions : 6]

SEAT No. :

PC-4676

[Total No. of Pages : 2

**[6355]-117**

**M.E. Electrical (Power Electronics & Drives)**

**POWER CONVERTERS - I**

**(2017 Pattern) (Semester - I) (503303)**

*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) Use of electronic calculator is allowed.*
- 4) Assume Suitable data, if necessary.*

**Q1) a)** Explain the working details and characteristics of IGBT **[8]**

b) Explain six step voltage source inverter (120 deg mode) with necessary waveforms and derive line- line output voltage equation using Fourier series **[10]**

OR

**Q2) a)** A single phase full a wave ac voltage regulator feeds a load of  $R=10$  ohms with an input voltage of 230 V and 50 Hz. Firing angle of both the Thyristors is 30 degrees. **[10]**

b) Explain the Buck Converter with necessary wave forms **[8]**

**Q3) a)** Explain single phase bi directional controller with R load **[8]**

b) A 230 V 1kW electric heater is fed through AC voltage controller from 230V, 50Hz Ac supply. Find the load power for a firing angle delay of 70 degrees **[8]**

OR

*P.T.O.*

**Q4) a)** Explain the internal and external methods to control the output voltage of inverter [8]

b) A single phase voltage controller is employed for controlling the power flow from 230V 50Hz into a load circuit containing  $R = 4\Omega$  and  $\omega L = 3\Omega$ . Calculate [8]

1) The control range of firing angle 2) maximum value of RMS load current maximum power and power factor.

**Q5) a)** With a neat diagram and relevant waveform explain the working of a single phase to single phase step down midpoint type cycloconverter supplying RL load for discontinuous load current [8]

b) With a neat diagram and waveforms explain the working of Single phase to single phase cyclo-converters. [8]

OR

**Q6) a)** Draw the circuit diagram and explain the principle of operation of a 1 phase bridge type Cycloconverter. What is the relation between triggering angles of the thyristor of positive and negative converters. [8]

b) With a neat diagram and relevant waveform explain the working of a single phase to single phase step down midpoint type cycloconverter supplying RL load for continuous load current. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4677

[Total No. of Pages : 2

**[6355]-118**

**M.E. Electrical (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 explain the characteristics of research. [4]  
b) What are the various measures of dispersion? Explain to anyone in brief. [5]

OR

- Q2)** a) Explain various methods of data collection in research. [4]  
b) Explain the significance of the literature survey in doing research. [5]

- Q3)** a) Write a detailed note on plagiarism. [4]  
b) Explain the procedure of writing mathematical equations while using LATEX. [5]

OR

- Q4)** a) Write a detailed note on copyright form. [4]  
b) Explain the procedure of inserting figures and making tables in report writing while using LATEX. [5]

*P.T.O.*

**Q5) Write a short note on [16]**

- i) Journal Paper
- ii) Conference Paper
- iii) Survey Paper
- iv) Review Paper

**OR**

**Q6) a) Explain the different steps involved in the preparation of the research proposal. [8]**

b) Write a detailed note on different funding agencies for engineering research. [8]

**Q7) a) Compare technical report and thesis. [8]**

b) Write a short note on the use of visual aids for making an effective presentation. [8]

**OR**

**Q8) a) Write in detail the structure and components of scientific reports. [8]**

b) Explain the significance of the bibliography and write a footnote. [8]



Total No. of Questions : 6]

SEAT No. :

PC-4678

[Total No. of Pages : 2

[6355]-119

**M.E. (Electrical) (Power Electronics & Drives)**

**AC & 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Write a short note on heating and cooling of industrial drives. [6]
- b) Discuss speed control of D.C. separately excited motor fed from single phase full converter for continuous mode operation. [6]
- c) Explain with suitable diagram working principle of VSI fed induction motor. [6]

OR

- Q2)** a) Explain about different types of industrial loads [6]
- b) Explain about Steady state analysis of separately excited DC motor fed by chopper [6]
- c) Discuss various types of braking system followed in D.C. drives. [6]

- Q3)** a) Explain Direct vector control method to control the speed of the Induction Motor with neat circuit diagrams [8]
- b) Explain Indirect vector control method to control the speed of the Induction Motor with neat circuit diagrams [8]

OR

*P.T.O.*

- Q4)** a) Explain D. C. Motor analogy. How it is achieved in Induction motor. [8]  
b) Explain about Principle of operation for Sensor less vector control method to control the Induction Motor with neat circuit diagrams [8]

- Q5)** a) Explain about Principle of operation for Brushless DC motor and stepper motor with neat circuit diagrams [8]  
b) With necessary sketches explain the operation of multi-stack stepper motor. Also discuss torque Vs stepping rate characteristics. [8]

OR

- Q6)** a) Explain about Principle of operation for PMDC motor drive and draw the performance characteristics. [8]  
b) Explain about speed control strategies and performance characteristics for stepper motor with neat circuit diagrams [8]





Total No. of Questions : 6]

SEAT No. :

PC-4679

[Total No. of Pages : 2

**[6355]-120**

**M.E. (Electrical) (Power Electronics & Drives)**

**POWER CONVERTERS -II**

**(2017 Pattern) (Semester - II) (503308)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) Figures to the right 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) SPWM
- ii) Modified SPWM
- iii) Phase displacement control for inverters

**b)** Explain about the following with neat circuit diagrams **[8]**

- i) Diode Clamped 3 level inverter
- ii) Flying Capacitor based 3 level inverter

OR

**Q2) a)** Explain about Concept of basic resonant circuit and their Classification with neat circuit diagrams. **[10]**

**b)** Explain the concept of Linear power supplies with neat diagram and waveforms. **[8]**

**Q3) a)** With neat diagram explain about DC-DC Converters with electrical isolation. **[8]**

**b)** Explain about the Electrical equivalent of thermal model for heat sink and derive the necessary equations. **[8]**

OR

*P.T.O.*

**Q4)** a) Explain about the design procedure for heat sink for SCR/GTO and derive required equations. [8]

b) Explain about the Selection procedure and design procedure for Heat Sink. [8]

**Q5)** a) Explain about Thermal modelling of power switching devices with neat diagrams. [8]

b) Explain about the Need of Snubber circuit for to protect IGBT device and Types of Snubber circuits. [8]

OR

**Q6)** a) Explain about Magnetic design (inductor design and its procedure) With a neat diagram and relevant waveforms. [8]

b) Explain the working of over voltage Snubber and its design with a neat diagram and relevant waveforms. [8]



Total No. of Questions : 8]

SEAT No. :

PC4680

[Total No. of Pages : 2

[6355]-121

First Year 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) 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 calculators is allowed.

Q1) a) Explain in depth, the Zeigler-Nichol's methods for tuning of PID controller. [5]

b) What is chattering phenomenon and how it can be attenuated in sliding mode control. [4]

OR

Q2) a) A system is given by [5]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \quad y = [1 \quad 0]x$$

Design a pole placement controller to place the poles at  $-6, -6$ .

b) With respect to Sliding Mode control, explain the reaching and sliding phase. In which phase the system's is robust to uncertainties? [4]

Q3) a) Clearly state the model of nonlinear extended state observer. What is the condition for linear extended state observer? [5]

b) Explain observer based control of buck converter. [4]

OR

Q4) a) Write the mathematical model of sliding mode observer. [5]

b) Explain observer based control of boost converter. [4]

P.T.O.

**Q5) a)** A system is described by [8]

$$\dot{x}_1 = -x_1 + x_2(1 + 4x_1) \quad \dot{x}_2 = x_1(1 - x_1)$$

Find all the equilibrium points. Find the nature of any one singular point.

**b)** Describe the variable gradient method for constructing the Lyapunov's function to determine the stability of nonlinear system. [8]

OR

**Q6) a)** Discuss the various equilibrium points in non-linear control system. [8]

**b)** Discuss the following terms in the sense of Lyapunov's stability criterion: [8]

i) Asymptotic stable system

ii) Asymptotic stable in large

iii) Limit cycles

**Q7) a)** With an example explain the feedback linearization technique. [8]

**b)** Write the short note on normal form and zero dynamics in concern with the input output linearization. [8]

OR

**Q8) a)** With an example explain the Input output linearization technique. [8]

**b)** Check whether the internal dynamics is stable. What is the relative degree? [8]

$$\dot{x} = \begin{bmatrix} -x_1 & & \\ 2x_1x_2 & + & \sin x_2 \\ & 2x_2 & \end{bmatrix} + \begin{bmatrix} e^{2x_2} \\ 1/2 \\ 0 \end{bmatrix} u \quad y = x_3$$



Total No. of Questions : 8]

SEAT No. :

**PC4681**

**[6355]-122**

[Total No. of Pages : 2

**S.Y.M.E. (Electrical Engineering) (Power Electronics & Drives)**

**SPECIAL APPLICATIONS 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) Write a short note on HVDC light technology. [4]  
b) Explain with neat diagram modelling of thyristor controlled series compensation (TCSC). [5]

OR

- Q2)** a) Explain power transfer characteristics of voltage source converter (VSC). [4]  
b) What is multi terminal HVDC system. What are the types of multi terminal HVDC system and explain any one with neat diagram. [5]

OR

- Q4)** a) Explain the concept and objectives of smart city. [4]  
b) Explain the function of sensors used for signal acquisition and control in smart metering. [5]

- Q5)** a) Define term smart grid. What are its need and list out functions of it. [8]  
b) Write a short note on Wide Area Measurement System (WAMS). Draw a neat block diagram. [8]

OR

**P.T.O.**

**Q6)** a) Define term Distributed Energy Sources. List out its interconnection issues and challenges while hosting a grid. [8]

b) Explain the construction and working of phase measurement unit (PMU) with a neat diagram and write at least one application. [8]

**Q7)** a) Write a short note on Switching mode power supply (SMPS). [8]

b) Explain the working principle of Electronic ballast with neat diagram. [8]

OR

**Q8)** a) Explain the concept of Hybrid vehicle system. List out advantages and weakness of Hybrid vehicle system. [8]

b) Explain application of power electronic in heating and welding. [8]



Total No. of Questions : 6]

SEAT No. :

**PC4682**

**[6355]-123**

[Total No. of Pages : 2

**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) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) Figures to the right indicate full marks.*
- 3) Use of calculator is allowed.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Write note on optimal selection of Pumps and Fans. [9]
- b) Write Grounding definitions as per IEEE and elaborate typical Earthing System. [9]

OR

- Q2)** a) Discuss various control equipments used for motors to increase Energy efficiency. [9]
- b) Explain reasons for Grounding and various Grounding Problems. [9]

- Q3)** a) What are the various causes of voltage flicker? [8]
- b) Write detail note on Voltage sags and interruptions. [8]

OR

- Q4)** a) Enlist the different power quality monitoring standards and explain them. [8]
- b) Explain in detail power quality state estimations. [8]

**P.T.O.**

- Q5)** a) Write detail note on Power quality monitoring standards. [8]  
b) Explain the application of intelligent system in power quality monitoring. [8]

OR

- Q6)** a) Write objectives and consideration of power quality monitoring. [8]  
b) Explain the procedure to design a harmonic filter. [8]





Total No. of Questions : 3]

SEAT No. :

PC4683

[6355]-124

[Total No. of Pages :2

**M.E. - I (Electrical-Power System)**  
**COMPUTER APPLICATIONS IN POWER SYSTEMS**  
**(2017 Pattern) (Semester- I) (503201)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Solve Q1, Q2 and Q3.*
- 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 any THREE.

**[18]**

- a) Draw surface constraint diagram showing behavior and side constraints. Also indicate bounded and unbounded, acceptable and unacceptable points on surface constraint.
- b) Maximize  $f(X) = 2x_1 + x_2 + 10$  subjected to  $g(X) = x_1 + 2x_2^2 - 3 = 0$ . Use Lagrange's Method.
- c) Derive the model of converter for AC DC load flow.
- d) Derive load flow equations used in fast decoupled load flow method with assumptions.

**Q2)** Solve any TWO.

**[16]**

- a) Incremental fuel costs in rupees per MWh for plant consisting two units are  $\frac{\partial F_1}{\partial P_{g1}} = 0.20P_{g1} + 40$  and  $\frac{\partial F_2}{\partial P_{g2}} = 0.4P_{g2} + 30$  Generator limits are  $30\text{MW} \leq P_{g1} \leq 175\text{MW}$  and  $20\text{MW} \leq P_{g2} \leq 130\text{MW}$ . Determine total load and load shared by each generator if incremental cost is
  - i)  $\lambda = 50$
  - ii)  $\lambda = 75$
  - iii)  $\lambda = 77$

**P.T.O.**

- b) State economical dispatch problem
  - i) Unconstrained without loss
  - ii) Constrained without loss
  - iii) Unconstrained with loss
  - iv) Constrained with loss
- c) Explain classical economic load dispatch with algorithm considering limits.

**Q3)** Solve any TWO.

**[16]**

- a) Derive B-coefficient formula used in economic dispatch.
- b) Write short note on GSD and GSSD.
- c) Show that transmission loss formula is a function of generation and load.



Total No. of Questions : 5]

SEAT No. :

PC4684

[6355]-125

[Total No. of Pages :2

**First Year M.E. (Electrical) (Power Systems)**  
**POWER SECTOR ECONOMICS & MANAGEMENT**  
**(2017 Pattern) (Semester- I) (503202)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1)** Attempt any three from following: **[18]**

- a) Give institutional structure of Indian Power Sector during reforms.
- b) Discuss tariff setting principles..
- c) Calculate net present value for a project with following cash flows. Take discounting factor as 10%. The cash flow for consecutive five years are as follows Rs. 50000, Rs. 60000, Rs. 60000 Rs. 70000 and Rs. 60000 with initial investment of Rs. 250000.
- d) Explain performance based regulation and rate of return regulation used in power system.
- e) Explain Whole Sale Competition and Retail Competition Models used in Explain models based on contractual arrangement such as bilateral and multi-lateral trades.
- f) Discuss challenges before Indian Power Sector undergoing deregulation.

**Q2)** a) Discuss market power. Why it is present? **[8]**

b) Explain following market mechanisms. **[8]**

- i) Future Contract
- ii) Option Market

OR

**P.T.O.**

- Q3)** a) How market efficiency is estimated? Discuss factors affecting the same. [8]  
b) Discuss Zonal pricing and Spot pricing methods. [8]

- Q4)** a) What is congestion in power network? Discuss methods to avoid congestion. [8]  
b) Discuss different methods of transmission pricing. [8]

OR

- Q5)** a) Explain [8]  
i) Role of dispatch centres  
ii) ABT tariff  
b) What is arbitrage? Why does it exist? Explain with suitable examples. [8]



Total No. of Questions : 6]

SEAT No. :

PC4685

[Total No. of Pages : 2

[6355]-126

First Year 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 or Q2, Q3 or Q4, and Q5 or Q6.
- 2) Assume suitable data if necessary.
- 3) Write down all the assumptions made.
- 4) Given  $F^{abc} = [P] F^{dq0}$ , where Park's transformation.

$$[P] = \begin{bmatrix} k_d \cos \theta & k_q \sin \theta & k_0 \\ k_d \cos \left( \theta - \frac{2\pi}{3} \right) & k_q \sin \left( \theta - \frac{2\pi}{3} \right) & k_0 \\ k_d \cos \left( \theta + \frac{2\pi}{3} \right) & k_q \sin \left( \theta + \frac{2\pi}{3} \right) & k_0 \end{bmatrix}$$

(where,  $K_d = K_q = \sqrt{2/3}$  and  $K_0 = \sqrt{1/3}$ )

**Q1)** Derive the model 'pi' circuit medium transmission line. Write down assumptions involved in it if any. Compare it with nominal 'T' circuit and Long Transmission line model. [18]

OR

**Q2)** Explain working of the excitation system with the help of functional block diagram. Elaborate it's need in power system. [18]

P.T.O.

**Q3)** Draw the block diagram of self-excited dc exciter. Taking help of equivalent circuit diagram, Develop the mathematical model of self-excited dc exciter. [16]

OR

**Q4)** Discuss with the help of suitable diagram working of Static excitation control scheme of alternator. [16]

**Q5)** Develop the model of long transmission line with the help of appropriate transformation using  $\alpha$ - $\beta$  variables. Discuss about the assumptions and approximations involved in it. [16]

OR

**Q6)** Discuss in details static and dynamic load modeling in power system? Write about the assumptions and approximations involved in it. [16]



Total No. of Questions : 6]

SEAT No. :

**PC4686**

[Total No. of Pages : 2

**[6355]-127**

**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) *Answer any one question from each pair of questions: Q.1 & Q.2, Q.3 & Q.4, Q.5 & Q.6.*
- 2) *Figures to the right side indicate full marks.*

- Q1)** a) Explain the different types of reports in research writing. [4]  
b) Compare research methods and research methodology. [4]  
c) Explain the important highlights of the patent law. [5]  
d) Define optimization and state the various applications of optimization. [5]

OR

- Q2)** a) Explain the importance of research funding in research. [4]  
b) Provide a comparison of descriptive and analytical research and applied and fundamental research. [4]  
c) Explain the terms citation index, science citation index, i10 index. and H-index. [5]  
d) State the statement of an optimization problem with mathematical terms and equations. [5]

OR

- Q3)** a) Describe the characteristics of a Constrained Problem. [8]  
b) Describe the convex programming problem with a diagram. [8]

- Q4)** a) Provide a classification of constraint optimization techniques. [8]  
b) Explain the basic approach of the penalt function method. [8]

*P.T.O.*

- Q5)** a) Give a comparison of the genetic algorithm and simulated annealing optimization techniques. [8]  
b) Elaborate on the ant colony optimization algorithm with an example. [8]

OR

- Q6)** a) Describe Particle swarm optimization with an example. [8]  
b) Define linear regression. Explain using mathematical expressions. [8]





Total No. of Questions : 6]

SEAT No. :

**PC4687**

[Total No. of Pages : 2

**[6355]-128**

**First Year M.E. (Electrical) (Power System)**

**POWER SYSTEM DYNAMICS**

**(2017 Pattern) (Semester - II) (503207)**

*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.*
- 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)** Describe classical model of multi machine system useful for transient stability analysis. **[6]**

b) Draw the block diagram of states of operation of power system and security as per the classification proposed by Liacoo, Fink and Carlson & explain. **[12]**

OR

**Q2) a)** Draw the block diagram of states of power system & explain each state in brief. **[6]**

b) Explain, the power system stabilizer with the help of suitable block diagram. State the guidelines for the selection of parameters of individual blocks. **[12]**

**Q3) a)** Derive the stator equivalent circuit model (2.2) using stator flux equations. **[6]**

b) Show the synchronous machine model as a two port network & Derive the stator voltage equations of synchronous machine model. **[10]**

OR

**Q4) a)** Obtain the electrical torque equation of model 2.1 **[6]**

b) Derive the rotor mechanical equations of synchronous machine model. State the assumptions made. **[10]**

**P.T.O.**

- Q5)** a) Draw the block diagram of system representation using rotor swing equations, flux decay and excitation system. [6]
- b) Derive the stator voltage equations with excitation system for a small signal machine model. Draw the block diagram of excitation system. [10]

OR

- Q6)** a) Analyze the concepts of synchronizing and damping torques of a system. [6]
- b) State the Heffron-Phillips constants & their significance to maintain system stability for the SIMB system. Draw its overall block diagram. [10]



Total No. of Questions : 6]

SEAT No. :

PC-5103

[Total No. of Pages : 2

**[6355]-129**

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

- Q1)** a) Explain weather sensitive forecasting in details. [6]
- b) Explain Markov process in details for reliability evaluation. [6]
- c) Write short note on reliability cost. [6]

OR

- Q2)** a) Explain co-relation method of load forecasting. [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 steepest descent method for reliability evaluation. [6]

- Q3)** a) Explain load point indices in a transmission line. [8]
- b) Explain the role of construction monitoring of transmission line projects.[8]

OR

- Q4)** a) Explain causes of failure of transmission line in details. [8]
- b) Explain goals of short term transmission planning in details. [8]

*P.T.O.*

- Q5)** a) Explain effects of dis-connectors, circuit breakers and isolators on distribution systems. [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 distribution system reliability indices in details. [8]



Total No. of Questions : 5]

SEAT No. :

**PC4688**

[Total No. of Pages : 2

**[6355]-130**

**First Year M.E. (Electrical) (Power System)  
HVDC AND FLEXIBLE AC 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 indicates full marks.*
- 4) *Use of calculators is allowed.*

**Q1)** Attempt any three of the following:

**[18]**

- a) Compare HVDC light (VSC) with HVDC classic (LCC) with advantages & disadvantages.
- b) Describe the harmonics in HVDC Systems.
- c) Explain the term angle of advance and its significance in inverter control.
- d) Explain 12- pulse converter operation in HVDC system.
- e) Describe the difference between EHVAC and HVDC transmission.
- f) What is FACTS? Explain their controller types.

**Q2)** a) Prove that SVC can be used to enhance the power transfer capacity of a transmission line. **[8]**

- b) Explain working principle, V-I characteristics & control schemes of STATCOM. **[8]**

**OR**

**Q3)** a) Explain working principle of static synchronous series compensator (SSSC). **[8]**

- b) With the help of power angle curve explain how transient stability is improved with the help of series controllers. **[8]**

**P.T.O.**

- Q4)** a) How series FACTS devices respond to the problem of Sub-Synchronous Resonance? [8]
- b) What are the different modes of operation of UPFC? Give the details of working in each mode. [8]

OR

- Q5)** a) Explain how a UPFC is different than a simple VSC. [8]
- b) Explain working principle, V-I Characteristics & Control Scheme of TCSC. [8]



Total No. of Questions : 3]

SEAT No. :

PC-4689

[Total No. of Pages : 2

**[6355]-131**

**M.E. (Electrical) (Power System)**

**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) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of non-programmable scientific calculator is allowed.*
- 5) Assume suitable data, wherever necessary.*

**Q1)** Attempt any three:

- a) Draw and explain in detail equivalent circuit of protection CT. [6]
- b) Elaborate how injection of sub-synchronous component can protect a synchronous generator digitally. [6]
- c) Elaborate various types of faults in power systems. [6]
- d) Assume that secondary burden of a 300:5 class 'C' CT is  $5\Omega$ . The relay setting is 2A and the CT ratio is 300/5, secondary resistance  $0.15\Omega$  & corresponding exciting current is 0.04A. Calculate the primary current required to operate the relay? [6]
- e) Draw and explain block diagram of numerical relay. State function of each block. [6]

**Q2)** Attempt any two:

- a) With a neat block diagram explain the hardware design of digital protection of transmission line. [8]
- b) Explain amplitude comparison travelling wave relay scheme; how it is useful for protection of forward as well as reverse faults in transmission line. [8]
- c) Why overcurrent relays are replaced by digital distance relays for protection of transmission lines. [8]

*P.T.O.*

**Q3)** Attempt any two :

- a) Elaborate on integrated operation of national power system. [8]
- b) Describe under reach and over reach phenomenon in over current protection of transmission line. [8]
- c) With help of line diagram explain multi zone protection scheme using distance relay. [8]





Total No. of Questions : 3]

SEAT No. :

PC-4690

[Total No. of Pages : 2

**[6355]-132**

**M.E. (Electrical) (Power Systems)**

**POWER QUALITY ASSESSMENT AND MITIGATION**

**(2017 Pattern) (Semester - III) (603202)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) All questions are compulsory.*
- 2) Neat diagram must be drawn wherever necessary.*
- 3) Figures to the right indicates full marks.*
- 4) Use of non-programmable scientific calculator is allowed.*
- 5) Assume suitable data, wherever necessary.*

**Q1) Attempt any three :**

- a) Does power quality issues get aggravated due earthing? Explain method of earthing for sensitive and critical loads. **[6]**
- b) How power quality events are classified. **[6]**
- c) Explain detrimental impacts of harmonics on power system components. **[6]**
- d) Explain term distortion power, displacement and distortion powerfactor, total demand distortion. **[6]**
- e) Explain effect of type of fault, fault level and location of fault on voltage sag. **[6]**

**Q2) Attempt any two :**

- a) Explain the role of computer tools in harmonic analysis. Also explain study procedure for harmonic studies. **[8]**
- b) Explain principle of active filtering. With suitable example/diagram explain shunt active filter. **[8]**
- c) Explain different passive filters used for harmonic control. **[8]**

**P.T.O.**

**Q3) Attempt any two :**

- a) Discuss selection of transducers used for power quality monitoring. Explain special requirements for harmonic and transient event monitoring. [8]
- b) Explain role of custom power devices for power quality mitigation. Explain with suitable example. [8]
- c) Discuss the process of flicker monitoring. [8]



Total No. of Questions : 6]

SEAT No. :

PC-4691

[Total No. of Pages : 2

**[6355]-133**

**M.E. (Computer/Cyber Security/AIDS Engg.)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester - I) (510101)**

*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) a)** Describe in detail the steps of research process? What are the techniques involved in defining a research problem and research objectives? **[9]**

OR

b) What is the significance of code of ethics in engineering research? State the IEEE and ACM Code of ethics in engineering research? **[9]**

**Q2) a)** What is the significance of following in research methodology? **[8]**

- i) Journal papers as a type of research publication
- ii) Literature survey
- iii) H-index
- iv) Paraphrasing

OR

b) What is Literature Survey? What is the bibliometric survey? How to identify the research gap from literature survey? **[8]**

**P.T.O.**

- Q3) a)** State the use of the following tools [8]
- i) SOFA
  - ii) t-test
  - iii) ANOVA
  - iv) CAT

OR

- b) What is the hypothesis and the alternate hypothesis? How statistical analysis helps in validation of the hypothesis? [8]

- Q4) a)** State the importance of optimization in engineering research? With the help of an example, explain what Monte Carlo optimization is? [8]

OR

- b) State the gradient optimization steps? What are constraints and cost function? State the similarity and differences in Monte Carlo and gradient methods of optimization? [8]

- Q5) a)** What are the guidelines for conducting surveys? How are respondents identified? What are the human factors associated with surveys conducted for research? [8]

OR

- b) What do you understand by the research proposal? What is an outline of a research proposal? What are the criteria for evaluating the research proposal? [8]

- Q6) a)** What is the significance of References and Citations in Thesis? What are the characteristics of a good thesis, and What are the cautions in Thesis writing? [9]

OR

- b) State the significance of the following with the context of IPR [9]
- i) Copyright
  - ii) Trademark
  - iii) [ipindia.gov.in](http://ipindia.gov.in)
  - iv) Journal Papers



Total No. of Questions : 8]

SEAT No. :

PC-4692

[Total No. of Pages : 2

**[6355]-134**

**M.E. (Computer Engineering)**

**BIO-INSPIRED OPTIMIZATION ALGORITHMS**

**(2017 Pattern) (Semester- I) (510102)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Solve any FIVE full 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 Algorithm for Evolutionary Strategies. [6]

b) Discuss Simulated Annealing technique by giving pseudocode. [4]

**Q2)** a) Discuss algorithm of cuckoo search. [5]

b) Discuss firefly algorithm. [5]

**Q3)** a) Explain Particle swarm optimization algorithm. [4]

b) Give significant conceptual differences between Experiment and Realization. [6]

**Q4)** a) Define by giving suitable example/scenario. Stigmergy; Feedback; Local and Global optima. [6]

b) Explain philosophy of Natural Computing. [4]

**P.T.O.**

- Q5)** a) Explain Roulette wheel selection with suitable example. [6]  
b) Write pseudocode of evolutionary algorithm. [4]
- Q6)** a) Discuss Bone marrow, Negative selection, Clonal selection. [4]  
b) Explain AIBO robot, Turtles, termites, and traffic jams, framsticks, Scope of artificial life. [6]
- Q7)** a) Differentiate and discuss Continuous immune network models and Discrete immune network models. [5]  
b) Give significant conceptual differences between Simulation and Emulation. [5]
- Q8)** a) Discuss Hill-Climbing technique by giving any one application you find suitable. [5]  
b) Explain the features of Evolutionary system. [5]



Total No. of Questions : 10]

SEAT No. :

PC-4693

[Total No. of Pages : 2

[6355]-135

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

**Q1)** With the help of suitable figure Explain various viewpoint of design model & also explain design strategies. [9]

OR

**Q2)** Explain the Incremental and Object based software development process.[9]

**Q3)** Explain in short : [8]

- a) Hierarchical architecture
- b) Distributed Architecture,
- c) Heterogeneous Architecture and
- d) Product Line Architecture.

OR

**Q4)** Explain Architecting in Cloud Environment for Multi-tenancy. [8]

**Q5)** a) Explain how quality of processes is improved by system virtualization. [8]

- b) Explain environment configuration control using goals, principles and importance ,release management, deployment. [8]

**P.T.O.**

OR

**Q6)** a) Explain the architecture reconstruction process. What guidelines would you follow for reconstruction of software architecture? [8]

b) Explain configuration management driven development, compliance, standards and frameworks. [8]

**Q7)** How can we improve quality of processes by system virtualization. [9]

OR

**Q8)** Explain the types of version control systems in detail. [9]

**Q9)** Explain any 4 Software version control tools in brief. [8]

OR

**Q10)** Write short note on: [8]

a) Mercurial

b) Bazaar





Total No. of Questions : 12]

SEAT No. :

PC-4694

[Total No. of Pages : 2

**[6355]-136**

**M.E. (Computer Engineering)**

**EMBEDDED AND REAL-TIME OPERATING SYSTEM**

**(2017 Pattern) (Semester - I) (510104)**

*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) *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 challenges in the design of embedded system? **[5]**

b) What is the use of Reset unit in embedded system? **[3]**

OR

**Q2) a)** Explain the usage of Software Development tools in embedded system design. **[5]**

b) What are the characteristics of embedded systems. **[3]**

**Q3) a)** Give examples of small scale embedded systems. Which processors are used in development of small scale systems? **[4]**

b) What are the common structural units of the processors? **[5]**

OR

**Q4) a)** Give examples of Large scale embedded systems. Which processors are used in development of Large scale systems? **[5]**

b) Differentiate between Small Scale and Large Scale embedded systems **[4]**

**Q5) a)** Give the brief description of SPI and SCI. **[4]**

b) Describe serial communication devices used in application development **[4]**

OR

**Q6) a)** Give the features of SHARC and TigerSHARC processors. **[4]**

b) Explain the working of CAN Bus and its applications. **[4]**

*P.T.O.*

**Q7)** Explain the Earliest Deadline First EDF algorithm with example. [8]

OR

**Q8)** Explain the Least Slack Time (LST) algorithm with example. [8]

**Q9)** Write Short Notes on [9]

- a) RTOS Services
- b) Shared data Problem
- c) Semaphores

OR

**Q10)** What are the ways to enforce mutual exclusion? Explain with example. [9]

**Q11)** Explain the multiprocessor scheduling and synchronization in Real time operating system. [8]

OR

**Q12)** Explain Embedded software development tools and Debugging techniques [8]



Total No. of Questions : 7]

SEAT No. :

PC-4695

[Total No. of Pages : 2

[6355]-137

M.E. (Computer Engineering)

OPERATION RESEARCH

(2017 Pattern) (Semester - II) (510108)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

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

**Q1)** A company owns two flour mills viz. A and B, which have different production capacities for high, medium and low quality flour. The company has entered a contract to supply flour to a firm every month with at least 8, 12 and 24 quintals of high, medium and low quality respectively. It costs the company Rs.2000 and Rs.1500 per day to run mill A and B respectively. On a day, Mill A produces 6, 2 and 4 quintals of high, medium and low quality flour, Mill B produces 2, 4 and 12 quintals of high, medium and low quality flour respectively. How many days per month should each mill be operated in order to meet the contract order most economically. Formulate above problem as the Linear Programming, model. [5]

**Q2)** Explain the steps of the Dual Simplex Method for problem solving. [8]

**Q3)** A project has the following time-cost information [12]

Activities	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Duration (in days)	4	1	1	1	6	5	4	8	1	2	5	7

- a) Construct a network diagram and find the critical path and total project duration.
- b) Find total float and free float for each activity.

P.T.O.

**Q4)** Check whether the following game has a saddle point and Solve the same with the following pay-off matrix. [8]

		Player B strategies				
Player A strategies		I	II	III	IV	V
	1	-2	5	-3	6	7
	2	4	6	8	-1	6
	3	8	2	3	5	4
	4	15	14	18	12	20

**Q5)** Illustrate the North West Corner Method of determining basic feasible solution for the following specification. [5]

	Retail Agencies					
Factories	1	2	3	4	5	Capacity
1	1	9	13	36	51	50
2	24	12	16	20	1	100
3	14	33	1	23	26	150
Requirement	100	60	50	50	40	300

**Q6)** A businessman has three alternatives, X, Y and Z, each of which gives rise to four possible events A, B, C and D. The pay-off (in Rs.) is given below. [6]

Alternative actions	Pay off			
	A	B	C	D
X	8	0	-10	6
Y	-4	12	18	-2
Z	14	6	0	8

Find the best possible alternative using

- Maximin criterion
- Maximax criterion

**Q7)** Describe the significance of decision making with reference to Certainty, Uncertainty and Risk. [6]



Total No. of Questions : 12]

SEAT No. :

PC-4696

[Total No. of Pages : 2

[6355]-138

M.E. (Computer Engineering)

SYSTEM SIMULATION AND MODELING

(2017 Pattern) (Semester - II) (510109)

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

Q1) a) Give the characteristics of simulation models. [4]

b) Describe the different system properties. [4]

OR

Q2) a) What are basic components of System? [3]

b) Explain the Tylor method with an example. [5]

Q3) a) Explain Superposition Principle with example. [4]

b) Describe the random walk and derive its Mean. [4]

OR

Q4) a) Explain Moving Average (MA) Processes. [4]

b) Give the properties of white noise. [4]

Q5) a) With the help of a diagram describe exogenous and endogenous signals.[5]

b) Explain Constraint Propagation. [3]

OR

P.T.O.

- Q6)** a) What is Petri Nets? Discuss on Standard Petri Net nomenclature. [5]  
b) What are different varieties of exogenous signals? [3]

**Q7)** Describe M/M/1 or M/M/2 queuing model in brief. [8]

OR

**Q8)** With an illustrative Example explain the simulation of queuing System. [8]

**Q9)** Explain types of simulation with respect to output analysis. [9]

OR

**Q10)**a) Briefly explain measures of performance for simulation system. [5]

b) Explain the problem of initial transient. [4]

**Q11)** Explain the importance of modeling machine down time correctly with the help of suitable example. [9]

OR

**Q12)** Write short notes [9]

- a) Simulation tools.  
b) Verification and Validation of model building.



Total No. of Questions : 12]

SEAT No. :

PC-4697

[Total No. of Pages : 2

[6355]-139

M.E. (Computer Engineering)

MACHINE LEARNING

(2017 Pattern) (Semester - II) (510110)

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, 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 side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

**Q1)** a) Illustrate the following machine learning models. [5]

- i) Logical Models
- ii) Probabilistic Models

b) Compare and contrast predictive and descriptive machine learning approaches. [4]

OR

**Q2)** a) State the term machine learning. Give 4 real-world applications with a short explanation. [5]

b) What is Reinforcement learning? Explain it with an example. [4]

**Q3)** a) Describe Internal Disjunction using a suitable example. [4]

b) Explain Probably Approximately Correct (PAC) learning with examples. [4]

OR

**Q4)** Describe Model Evaluation and Selection using a suitable use case. [8]

**Q5)** a) Write the K-nearest neighbor algorithm. Explain with a suitable example. [4]

b) Explain the operation of a perceptron along with an illustrative diagram. [5]

OR

P.T.O.

- Q6)** a) Discuss the Support Vector machine with a suitable example. [5]  
b) What is regression? Describe linear and nonlinear regression. [4]

**Q7)** Write your views on Rule learning for subgroup discovery along with an example. [8]

OR

**Q8)** Write short note on Ensemble methods: Bagging and Boosting. [8]

**Q9)** Discuss Gaussian Mixtures and Compression based models. [8]

OR

**Q10)** Explain Discriminative learning with maximum likelihood. [8]

**Q11)** Write a short note on : [8]

- a) Learning to rate vulnerabilities and predict exploits
- b) Credit or Debit card fraud detection

OR

**Q12)** Write a short note on : [8]

- a) Detecting malicious websites in adversarial classification
- b) Prediction and forecasting





Total No. of Questions : 12]

SEAT No. :

PC-4698

[Total No. of Pages : 3

[6355]-140

**M.E. (Computer Engineering)**  
**INFORMATION RETRIEVAL**  
**(2017 Pattern) (Semester - III) (610102)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

- Q1)** a) Explain the difference between data retrieval and information retrieval.[5]  
b) Explain permutern indexes for wild card query generation. [4]

OR

- Q2)** a) Explain the need and methods for Context sensitive spelling correction.[5]  
b) Compute the edit distance between pairs and alice. [4]

- Q3)** What is the need of inverted index compression? Explain variable length compression method using example. [8]

OR

- Q4)** a) Explain the statistical properties of terms in information retrieval. Explain with example. [4]  
b) Explain Blocked sort - based indexing method for index construction.[4]

- Q5)**a) State the statistical properties of terms in information retrieval and explain it with suitable example. [6]  
b) Define the following: [3]  
i) Field  
ii) Zone  
iii) Term - document matrix.

OR

*P.T.O.*

- Q6)** a) Explain vector space model for ranking the documents. [4]  
 b) Consider the following training example. [5]

Example	Doc ID	Query	ST	SB	Judgment
1	34	Linux	1	1	R
2	32	Penguin	0	1	R
3	35	System	0	1	R
4	36	Mining	0	0	N
5	87	Training	1	1	R
6	54	Database	0	1	R
7	7	Linux	1	0	N

Computer weighted zone score for each (query, document) example.

- Q7)** a) Explain the difference between text centric and Data centric XML retrieval. [4]  
 b) Explain the challenges in XML retrieval. [4]

OR

- Q8)** a) How the XML queries and documents are represented using vectors by constructing lexicalized subtrees? Explain with suitable examples. [4]  
 b) What are the challenges to evaluate the XML retrieval? Explain the four cases of evaluation. [4]

- Q9)** a) Suppose we have collection that consists of the four documents given in the table below. [4]

Doc Id	Document Text
1	Click go the shears boys click click click
2	Click click
3	Mental here
4	Mental shears click here

Build a query likelihood language model (unigram model) for this document collection for the query 'click shears' and rank the documents.

- b) How Multinomial distributions over words are calculated? Explain with example. [4]

OR

- Q10)**a) Explain the query likelihood model with suitable example. [4]  
b) Explain the types of language model. [4]

- Q11)**a) Write the mathematical model of text classification model. [4]  
b) Explain single - link and complete- link clustering with suitable example.[4]

OR

- Q12)**a) Explain k nearest classification methods by using suitable example. [4]  
b) Explain the clustering method performance metrics. [4]



Total No. of Questions : 12]

SEAT No. :

**PC4699**

**[6355]-141**

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

**S.Y.M.E. (Computer Engineering)**

**FAULT TOLERANT SYSTEMS**

**(2017 Pattern) (Semester-III) (610101)**

*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 indicate full marks.*

**Q1)** Explain Software Redundancy, and Information Redundancy, in detail with examples? **[9]**

OR

**Q2)** What is Combinatorial Model? Explain Combinatorial (Continuous) Model in detail with suitable example? **[9]**

**Q3)** Write short notes on Serial Fault Simulation Algorithm and Parallel Fault Simulation? **[9]**

OR

**Q4)** Explain in detail about Sequential Fault Diagnosis Methods? **[9]**

**Q5)** Explain with advantages and disadvantages 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)** Explain HCN (2, 2) network in detail with diagram and one suitable application? **[8]**

OR

**P.T.O.**

**Q8)** Explain in detail about degree and diameters in Hierarchical cubic networks? [8]

**Q9)** Explain The Hyper-Torus Network (HTN) and Hierarchical Cubic Network (HCN) [8]

OR

**Q10)** What is token ring network and bypass switch network? Explain how reliability calculates in both networks? [8]

**Q11)** Explain Message Logging Based Checkpoints in detail? [8]

OR

**Q12)** Explain the Architecture-Dependent Fault Tolerance in detail. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4700**

**[6355]-142**

[Total No. of Pages :2

**M.E. - I (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) What is lambda parameter? Explore various layout rules in terms of lambda. [5]

b) Explain n well process in detail. [5]

**Q2)** a) Derive the expression for power delay product. [5]

b) Write note on propagation delay of logic ckt. [5]

**Q3)** a) Explain the importance of interconnects in layout. Mention various parameters to be taken care while design. [4]

b) Explore SPICE in detail. [4]

c) Write note on transient response. [2]

**Q4)** a) Explain delay estimation techniques. [4]

b) Explore logical efforts in design. [4]

c) Give the expression for fan out. Explain in brief. [2]

**Q5)** a) Design 4:1 Mux using transmission gates. [4]

b) Design CMOS logic for  $F = AB + CDE + G$ . [4]

c) Write note on Tristates. [2]

**P.T.O.**

- Q6)** a) Explain dynamic hazards and solutions to it. [4]  
b) What are solutions to metastability? [4]  
c) Explain design of combinational logic. [2]
- Q7)** a) With the help of ckt diagram and necessary waveforms, explain Cascode Voltage Switch Logic. [4]  
b) Explain differential circuits and its merits. [4]  
c) Write note on high speed ckt. [2]
- Q8)** a) What is race condition? Explain NORA logic in brief. [4]  
b) Draw the ckt and waveforms for dynamic logic. [4]  
c) How does sense amplifier help to recover the logic voltage levels? [2]



Total No. of Questions : 8]

SEAT No. :

**PC5172**

[Total No. of Pages : 2

**[6355]-143**

**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 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 wherever necessary.*
- 5) Use of Calculator is allowed.*

**Q1)** a) Compare and contrast general-purpose processors and domain-specific processors. [5]

b) Define the terms : Specialization, reconfiguration and runtime. [5]

**Q2)** a) Explain the flow of program execution in Von Neumann architecture. [5]

b) Describe the role of DSP processors in domain-specific applications with examples. [5]

**Q3)** a) Draw and elaborate on the Garp's non-symmetrical RPF as a fine-grained architecture. [5]

b) Explain the design flow of FPGA in reconfigurable computing. [5]

**Q4)** a) Discuss non-frequently reconfigurable systems and their applications. [5]

b) Explain the utility of adaptive controllers in complex systems. [5]

**Q5)** a) Describe the architecture of DPGA and its relevance in reconfigurable systems. [5]

b) Explain instruction-level parallelism and its impact on computational efficiency. [5]

**P.T.O.**



- Q6)** a) Write a note on run-time reconfiguration with examples. [5]  
b) Describe J-Bit reconfiguration project design approach. [5]
- Q7)** a) Elaborate on pattern matching using automation for text searching. [5]  
b) Explain FPGA's role in high-performance computing with examples. [5]
- Q8)** a) Discuss software-defined radio in the context of reconfigurable computing. [5]  
b) Write short notes on relocation and defragmentation. [5]



Total No. of Questions: 8]

SEAT No. :

**PC4701**

[Total No. of Pages : 2

**[6355]-144**

**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 5 questions out of 8.*
- 2) *All questions carry equal marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**Q1) a)** What are embedded system design metrics explain Time-to-prototype and Time-to-market in short. **[5]**

b) Enlist any four development tools used in embedded system with their purpose. **[5]**

**Q2) a)** Draw and explain Embedded system architecture. Enlist different categories of an embedded System. **[5]**

b) What are the features of Raspberri Pi. Discuss its IDE in details. **[5]**

**Q3) a)** Explain the ARM CORTEX series features. Explain improvement of ARM CORTEX series over classical series. **[5]**

b) Draw and explain the block diagram of LPC 1768 in detail. **[5]**

**Q4) a)** What are the roles of CPSR and SPSR Register in ARM Processor. **[5]**

b) Explain the CAN protocol with suitable diagram with reference to ARM CORTEX M3 microcontroller. **[5]**

**Q5) a)** What is Linux Kernal Configuration? Enlist different steps for Linux Kernel configuration. **[5]**

b) Explain the process of boot loading and kernal initialization. **[5]**

**P.T.O.**

- Q6)** a) How the space initialization is carried out in Embedded Linux. [5]  
b) Explain Flash File System in the Embedded Linux System. [5]
- Q7)** a) Elaborate case study of Automated Meter Reading with respect to Embedded System design. [5]  
b) What is EMI/RFI analysis? Discuss steps involved in certification and documentation of EMI/RFI. [5]
- Q8)** a) Discuss an Automated Meter Reading (AMR) as embedded system case with Block diagram, Design considerations and Algorithm/flowchart. [5]  
b) Discuss methods of testing, Reliability and Failure analysis. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4702**

[Total No. of Pages : 2

**[6355]-145**

**First Year M.E. (Electronics and Telecommunication)**

**(Communication Networks) (All Branches)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester - I) (504504)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any five questions.*
- 2) *Support your answer with neat diagram if necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) What are the functions of literature review in research? [5]  
b) Explain Steps in Setting up a computer model to predict performance of experimental system. [5]
- Q2)** a) Explain the characteristics of static and dynamic instrumentation? What is the role of instrument in research? [5]  
b) Define research? What are various research applications in engineering?[5]
- Q3)** a) Explain basic instrumentation scheme with example for experimental research. [5]  
b) Explain regression analysis with suitable example. [5]
- Q4)** a) Explain the meaning of ANOVA and explain eight steps of 'ONEWAY ANOVA'. [5]  
b) Write short notes on Principal component analysis. [5]
- Q5)** a) Write significance of research report and give the various steps in writing research report. [5]  
b) Describe in brief Bibliography and its importance in context of research report. [5]

**P.T.O.**

- Q6)** a) Explain state vector machine and uncertainty analysis. [5]  
b) Describe the different measurement scale used in process system. [5]
- Q7)** a) Write a short note on 'Documentation' in the context of a research report. [5]  
b) What are the measures of evaluating the research outcome? [5]
- Q8)** a) Explain the ethics and plagiarism check of the research article. Also, mention the tools available. [5]  
b) Describe the different steps involved in writing a good research proposal. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4703**

**[6355]-146**

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

**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) Attempt any five questions.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*

**Q1) a)** Explain how MOSFET can work as a switch, Diode and active Resistor.[5]

b) Explain small signal high frequency model for Mos transistor with the help of diagram. Also draw large signal model. [5]

**Q2) a)** With suitable diagram explain two stage op-amp with slea enhancement.[5]

b) Draw a circuit diagram of cascade current mirror source and derive expression for its output resistance. [5]

**Q3) a)** Compare various types of inverting CMOS amplifiers on the basis of voltage gain and output resistance. [5]

b) What is the use of micro power opamp? Explain the techniques used in micro power opamp. [5]

**Q4) a)** What are the different types of mixers. Explain square law MOSFET mixer with neat circuit diagram. [5]

b) Explain need of frequency compensation. State various techniques of frequency compensation. [5]

**P.T.O.**

**Q5) a) Write a short note : (Any Two) [5]**

i) Folded casade amplifier

ii) CMOS Differential amplifiers

iii) Explore Neutralisation and Unilaterisation

b) Which are dominant noises in CMOS op-amp? Explain the techniques to reduce this noise. [5]

**Q6) a) What is need of compensation in multistage amplifiers. Explain Miller Compensation in two stage CMOS op-amp. [5]**

b) Write a note on stability of Op-amp and its effect on slew rate. What are different ways to improve stability? [5]

**Q7) a) Explain bandwidth estimation techniques in detail. [5]**

b) Draw a schematic of single ended low noise amplifier (LNA). What are its drawbacks and how these are overcome in differential LNA. [5]

**Q8) a) Draw a comparator and discuss its static and dynamic characteristics. What is typical application of comparator. [5]**

b) Explain in brief the design considerations for RF chip design. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4704**

[Total No. of Pages : 2

**[6355]-147**

**First Year M.E. (E&TC) (VLSI & Embedded System)**

**SYSTEM ON CHIP**

**(2017 Pattern) (Semester - II) (504208)**

*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)** Enlist the various limitations of Data flow Models? **[4]**

b) How to determine the hardware implementation of an FSMD? **[6]**

**Q2) a)** Enlist the various limitations of Control. Flow models? **[4]**

b) Explain in detail RTL based chip Design flow. **[6]**

**Q3) a)** Explain time multiplexing of two hardware-Module ports over a single control shell. **[4]**

b) Write a brief overview on control Hazards in association with RISC Pipeline. **[6]**

**Q4) a)** Write a note on Simulation - Synthesis Mismatch. **[4]**

b) Which are the factors affecting Delay & Slew? **[6]**

**Q5) a)** Write a short note on:- Timing Parameters of digital Logic. **[4]**

b) What are causes of power dissipation? **[6]**

**P.T.O.**



- Q6)** a) What is Hybrid Power Management Technique? [4]  
b) What is the need of memory optimization and management in SoC? [6]
- Q7)** a) Write a note on “A SoC Controller for Digital Still Camera”. [4]  
b) Enumerate on Energy Management techniques for SoC. [6]
- Q8)** a) Explain the Important Issues for Embedded compilers. [4]  
b) What are the design Issues & Techniques for image codes? [6]



Total No. of Questions : 8]

SEAT No. :

PC-5107

[Total No. of Pages : 2

[6355]-148

**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) Figure to the right side indicates full marks.*
- 4) Assume suitable data, if necessary.*

**Q1)** a) Draw & explain general electric vehicle layout. [6]

b) Briefly explain the working of spark plug with suitable diagram. [4]

**Q2)** a) Describe with the help of sketches the different ways in which a hybrid vehicle can be laid out. [6]

b) Discuss different Dashboard instruments. [4]

**Q3)** a) What is Lambda sensor? Explain the construction and working of Lambda sensor. [6]

b) Explain with the aid of a labeled sketch the operation of a wheel speed sensor. [4]

**Q4)** a) What is an EGO sensor? What are the desirable EGO characteristics? Explain its switching characteristics. [6]

b) Explain working Principle of Proximity Distance Sensors. [4]

**Q5)** a) Draw & explain electronic fuel control and electronic ignition system configuration. [6]

b) Draw & explain anti-lock braking system. [4]

**P.T.O.**

- Q6)** a) Outline & Explain components of an electronically controlled engine with suitable diagram. [6]  
b) Compare analog & digital cruise control system. [4]
- Q7)** a) Enlist various types of automotive buses. Compare any two types of automotive buses. [6]  
b) Draw & explain electrical diagnosis procedure in detail. [4]
- Q8)** a) Draw & explain architecture of AUTOSAR. Also state AUTOSAR libraries. [6]  
b) Explain Protocol wakeup & startup with respect to Flex Ray protocol.[4]



Total No. of Questions : 8]

SEAT No. :

**PC4705**

**[6355]-149**

[Total No. of Pages : 2

**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) Explain VLSI Test economics & product quality indicators. [5]  
b) Differentiate between VLSI verification and VLSI testing. [5]
- Q2)** a) Enlist the prominent Analytical & Formal Test approaches. [5]  
b) What is the need of fault Simulation? Contrast fault simulation and logic simulation? [5]
- Q3)** a) What are Analog Test bus standards? [5]  
b) Write a short note on : VLSI Test equipment. [5]
- Q4)** a) Explain any one algorithm used for True Value simulation. [5]  
b) Explain any one algorithm used for Fault simulation. [5]
- Q5)** a) Explain statistical methods for fault simulation. [5]  
b) How is combinational circuit test generation different from sequential circuit test generation? [5]
- Q6)** a) Explain in brief the various aspects of Memory Testing. [5]  
b) Write a short note on: Current based testing. [5]

**P.T.O.**

- Q7)** a) How do you model circuits for simulation? [5]  
b) Write a short note on : A.T.P.G. [5]

- Q8)** a) What is Timing Verification ? Explain with a suitable example. [5]  
b) Write a short note on: Hardware Emulation. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4706**

**[6355]-150**

[Total No. of Pages : 2

**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) Explain different ASIC technologies. [5]

b) Explain steps in ASIC design flow with net flow chart. [5]

**Q2)** a) Explain logic level optimization. [5]

b) Write a VHDL code and test bench for half adder. [5]

**Q3)** a) Explain with example how to reuse any ASIC design. [5]

b) Explain different CAD tools used in ASIC Design. [5]

**Q4)** a) Differentiate floor planning and placement in ASIC design. [5]

b) With neat diagram explain clock distribution technique in ASIC. [5]

**Q5)** a) Write short note on static timing analysis. [4]

b) Explain different SI issues in ASIC design. [4]

c) What are the time related constraints? Explain with one example. [2]

**P.T.O.**

- Q6)** a) Explain the concept mixed mode design. [4]  
b) How false path detection is carried out in ASIC. [4]  
c) Which design tool is more preferable to solve the SI Problem? [2]
- Q7)** a) What are the different testing approaches for mixed signal analog and digital Circuits? [4]  
b) Draw and explain linear feedback shift register (LFSR) in detail. [4]  
c) Compare scan test & partial test? [2]
- Q8)** a) Write short note on any 2: [8]  
i) JTAG  
ii) BILBO  
iii) Fault Models  
b) What is need of DFT? [2]



Total No. of Questions : 8]

SEAT No. :

PC4707

[6355]-159

[Total No. of Pages :2

**M.E. - I (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) What are the three different modes of MOSFET operation? Explain with proper diagrams. [6]

b) Draw the MOSFET parasitic model due to internal capacitances. Explain how to calculate total parasitics? [4]

**Q2)** a) What are the steps to define the gate, source and drain in a self aligned polysilicon gate? Explain with proper diagrams. [5]

b) Sketch the stick diagram for a CMOS gate computing the function: [5]

$$Y = (A + B + C) \cdot D$$

and estimate the cell width, height and area.

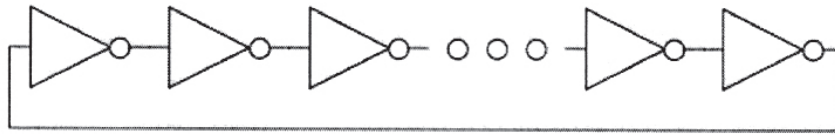
**Q3)** a) Discuss the sources of power dissipation in CMOS circuits. How to calculate total power dissipation? [6]

b) A digital system-on-chip in a 1 V 65 nm process (with 50 nm drawn channel lengths and  $\lambda = 25$  nm) has 1 billion transistors, of which 50 million are in logic gates and the remainder in memory arrays. The average logic transistor width is  $12\lambda$  and the average memory transistor width is  $4\lambda$ . The memory arrays are divided into banks and only the necessary bank is activated so the memory activity factor is 0.02. The static CMOS logic gates have an average activity factor of 0.1. Assume each transistor contributes  $1 \text{ fF}/\mu\text{m}$  of gate capacitance and  $0.8 \text{ fF}/\mu\text{m}$  of diffusion capacitance. Neglect wire capacitance. Estimate the switching power when operating at 1 GHz. [4]

**P.T.O.**



- Q4)** a) Write the short note on parasitic delays of MOSFET Gate. Give one example with an illustration to calculate the parasitic delay. [7]  
 b) A ring oscillator is constructed from an odd number of inverters, as shown in Figure. Estimate the frequency of an N - stage ring oscillator. [3]



- Q5)** a) Write short note on MOSFET as a Switch. [5]  
 b) Explain with circuit diagram; how to use CMOS Inverter as an Amplifier? [5]
- Q6)** a) Write short note on MOSFET Current Source and Current Sink. [6]  
 b) Explain how to use CMOS as a Diode. [4]
- Q7)** a) What do you understand about BICMOS Circuits? Explain the need of these circuits with example applications. [5]  
 b) Implement two input NAND and NOR gates using MOFETs. Calculate logical efforts and delays for both implementations. Write the reasons why NAND is preferred over NOR in logic designs? [5]
- Q8)** a) Draw the circuit for CMOSTG and explain. Is it a non - restoring or restoring logic? Justify your answer. [5]  
 b) Write short note on : Rationed circuits. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4708**

**[6355]-160**

[Total No. of Pages :2

**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) Explain bilinear transform method for IIR filter design. [5]

b) Write short note on multistage filter design. [5]

**Q2)** a) State steps of FIR filter design using Kaiser's approach. [5]

b) Explain decimation and interpolation process with suitable example. [5]

**Q3)** a) Explain the term polyphase filters and list its characteristics. [5]

b) Explain the process of designing DFT filter bank. [5]

**Q4)** a) Explain the application of multirate DSP for sampling rate conversion of speech signal. [5]

b) Write equations of 1-level Haar wavelet and list two properties of Haar Transform. [5]

**Q5)** a) Write equation of discrete Cosine transform and list its applications. [4]

b) Explain the term adaptive filters. Compare it with digital filters and list different kinds of adaptive filter algorithms. [6]

**P.T.O.**

- Q6)** a) Draw block diagram and explain sub-band coding system. [5]  
b) Explain Newton steepest descent algorithm. [5]
- Q7)** a) Explain the application of adaptive filters such as adaptive noise cancellation. [5]  
b) Describe the process of image compression using DWT. [5]
- Q8)** a) Explain the term Short Time Fourier Transform and list the associated equations. [5]  
b) Write short note on Multi resolution analysis. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4709

[Total No. of Pages : 2

[6355]-161

**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)** How the design metrics of embedded systems are tightly constrained? Justify it. **[4]**

b) Explain integrated development environment (IDE) used for Arduino, Beaglebone, Raspberry pi, and intel Galileo Gen 2. Also describe their applications. **[4]**

c) Describe features of ARM-cortex series. **[2]**

**Q2) a)** Draw and explain the architecture of LPC1768 ARM-cortex M3 based Microcontroller. **[4]**

b) Which ARM cortex core is right for your application: A,R or M? Explain with reason. **[4]**

c) Describe significance of CMSIS standard in ARM cortex. **[2]**

**Q3) a)** Explain the basic services provided by a Real-Time operating system kernel. **[4]**

b) Compare  $V_x$  works and Micro-C/OS-II **[4]**

c) Write features of Micro-C/OS-II **[2]**

**P.T.O.**

- Q4)** a) Describe the structure of Android applications. [4]
- b) Explain task creation and management in RTOs. [4]
- c) Explain the method of task synchronization in RTOs. [2]
- Q5)** a) What are the steps to implement device driver for blinking of LED. [4]
- b) Explain Linux kernel construction. [4]
- c) What are the advantages of Embedded linux. [2]
- Q6)** a) Explain device driver and it's types. [4]
- b) What are the steps to implement device driver for LCD. [4]
- c) Explain the procedure for Porting Linux on ARM. [2]
- Q7)** a) Explain importance of EMI/RFI certification in Embedded product. [6]
- b) Explain design of Digital camera. [4]
- Q8)** a) Discuss on automated meter reading (AMR) as case study with respect to following points  
i) Design considerations & ii) O.S. [6]
- b) Explain the testing and Failure analysis of Embedded products. [4]



Total No. of Questions : 8]

SEAT No. :

PC-4710

[Total No. of Pages : 2

**[6355]-162**

**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 Fixed point and Floating point formats used for number representation in DSP. [5]

b) Explain MAC unit and Barrel Shifters used in DSP Processors. [5]

**Q2)** a) Describe Multiplier/ Adder Unit of TMS320C54XX Processor with block diagram. [5]

b) Discuss briefly Direct and Indirect Addressing modes 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]

**Q5)** a) Draw and explain architecture of blackfin processor. [5]

b) Explain the features of Visual DSP++. [5]

*P.T.O.*

- Q6)** a) Compare Blackfin Processor with TMS320C6713. [5]  
b) Discuss Selection Criteria of Digital Signal Processor. [5]
- Q7)** a) What is the role of Compiler, Assembler, Linker, Simulator and Emulator? [5]  
b) Describe Power Consumption and Management Aspects of a DSP Processor. [5]
- Q8)** a) Explain the steps for creating a new Project in code Composer Studio. [5]  
b) Explain Coder and Decoder in DSP Processors. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4711

[Total No. of Pages : 2

**[6355]-163**

**F.Y.M.E. (Electronics) (Digital Systems)**

**PLD'S & ASIC DESIGN**

**(2017 Pattern) (Semester - II) (504108)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Answer any five questions from the following.*
- 2) Figures to the right side indicates full marks.*
- 3) Draw neat diagram wherever necessary.*
- 4) Assume suitable data, if necessary.*

**Q1) a)** Explain Top Down Approach to System Design. **[5]**

b) Explain resource sharing in system design with suitable example. **[5]**

**Q2) a)** What is System on Chip? What are advantages and Disadvantages of SOC? **[5]**

b) Differentiate between functions and procedures in VHDL? **[5]**

**Q3) a)** Explain the architecture and functional block of CPLD XC95XX architecture. **[5]**

b) Explain the sequential and concurrent statements in VHDL Programming with suitable example. **[5]**

**Q4) a)** Explain the architecture and functional block of general CPLD. **[5]**

b) Explain the Structural and Behavioral VHDL modeling techniques with example. **[5]**

**Q5) a)** Explain the architecture of FPGA with block diagram. **[5]**

b) Explain different library used in VHDL. **[5]**

**P.T.O.**



- Q6)** a) Explain the architecture of Xilinx Spartan II. [5]  
b) Draw the basic cell of boundary scan register and describe different modes of its operation. [5]
- Q7)** a) Write short note on IP Cores in ASIC. [5]  
b) What does EDA tool refer to? Explain different EDA tools used in ASIC. [5]
- Q8)** a) Explain different programming technologies in ASIC. [5]  
b) What is Custom IC? Explain Custom IC Design Flow. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4712

[Total No. of Pages : 2

**[6355]-164**

**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 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 different types of histogram equalization techniques and draw Histogram for high contrast image. [5]  
b) Explain DCT Image transforms. [5]
- Q2)** a) Explain in detail Morphological operations opening and closing. [5]  
b) Explain Hough transform in detail. [5]
- Q3)** a) Explain Segmentation in RGB Vector Space. [5]  
b) Explain color image compression in detail. [5]
- Q4)** a) Write short note on Pseudocolor Image Processing. [5]  
b) How color edges are detected explain in detail. [5]
- Q5)** a) Explain Operational goal of registration, and Classification of registration methods. [5]  
b) Explain Head and hat algorithm. [5]

*P.T.O.*

- Q6)** a) What is image rectification and how it is done? [5]  
b) Explain any one point based method is used in image registration. [5]
- Q7)** a) Explain in detail Stereo-based head tracking. [5]  
b) Write short note on 3D reconstruction. [5]
- Q8)** a) Explain in detail how facial animation is implemented using 3D head modeling. [5]  
b) Write short note on 3D photography. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4713

[Total No. of Pages : 2

**[6355]-165**

**M.E. (DS) (Electronics)**

**SYSTEM ON CHIP DESIGN**

**(2017 Pattern) (Semester - III) (604101)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Solve any five questions.*
- 2) Assume suitable data, if necessary.*

**Q1)** a) Explain SOC architecture. [5]

b) Explain Barrel Shifter. [5]

**Q2)** a) Explain on chip peripheral bus. [6]

b) Explain advantages & disadvantages of reconfiguration. [4]

**Q3)** a) Explain bus model. [6]

b) Explain bus transactions. [4]

**Q4)** a) Explain reconfigurable logic. [5]

b) Explain SOC interconnect architecture. [5]

**Q5)** a) Explain FIFO. [5]

b) Explain synthesis flow. [5]

**Q6)** a) Explain SOC design flow. [5]

b) Explain DPM policies. [5]

*P.T.O.*

**Q7)** a) Explain sequential arce. [5]

b) Explain transition time. [5]

**Q8)** a) Explain slack time. [5]

b) Explain low-power bus. [5]



Total No. of Questions : 8]

SEAT No. :

PC-5112

[Total No. of Pages : 2

**[6355]-166**

**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) What are the challenges for Wireless Sensor Networks? Explain it in detail.[5]  
b) Explain single-hop and multi-hop networks in sensor network scenarios.[5]
- Q2)** a) Draw and explain main sensor node hardware components with suitable diagram. [5]  
b) Explain the example of any two sensor nodes. [5]
- Q3)** a) Enlist the requirements and design constraints of wireless MAC protocols.[5]  
b) How do clusters communicate? Explain in detail. [5]
- Q4)** a) Explain the IEEE 802.15.4 MAC protocol. [5]  
b) Explain Bluetooth protocol for WSN. [5]
- Q5)** a) State and explain any five challenges of IoT. [5]  
b) Distinguish between IPv6 and IPv4. [5]

*P.T.O.*

- Q6)** a) What is Big data? Explain in detail. [5]  
b) Define Low Power and Lossy Networks (LLN) [5]
- Q7)** a) Explain the reference IoT architecture with the function of each layer.[5]  
b) Explain MQTT protocol with suitable diagram. [5]
- Q8)** a) Explain Open Trust Protocol (OTrP). [5]  
b) Explain any one real-time application of IoT in detail [5]



Total No. of Questions : 8]

SEAT No. :

PC-4714

[Total No. of Pages : 2

**[6355]-176**

**M.E. (E&TC) (Communication Networks)**

**MODELING 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) *Neat Diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicates marks.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of electronic pocket calculator is allowed.*

- Q1)** a) What is up-sampling and down-sampling? Illustrate these concepts with reference to simulation of communication network [4]
- b) What are PN sequence generators? What are the properties of PN sequence generators. Explain there need in simulating communication systems. [4]
- c) Explain the role of simulation in communication system. [2]
- Q2)** a) What are the different methods to map uniform random variables to an arbitrary pdf? [4]
- b) Explain the graphical technique for post processing. [4]
- c) What are the various specifications to be considered while simulating a radio channel? [2]
- Q3)** a) What are the parameters of performance estimation in simulation? [4]
- b) What are correlated Gaussian numbers? Why do we need them? Explain any two techniques to generate correlated Gaussian number in detail. [4]
- c) What is direct component and quadrature component of a signal? [2]

*P.T.O.*



- Q4)** a) State the estimation model for band pass signal with an example. [4]  
b) Explain the principle of multicarrier modulation OFDM in detail with neat diagram. [4]  
c) What are the steps in simulation and model building. [2]
- Q5)** a) Explain Monte Carlo Estimation with an example. [4]  
b) What are the various specifications that must be considered while simulating radio channel? [4]  
c) What is discrete memory less channel model? [2]
- Q6)** a) Compare and contrast pure Monte Carlo approach and semi-analytic approach to performance estimation of a communication system. [4]  
b) Explain two state Markov model for discrete channels With memory. [4]  
c) Explain simulation model for simple communication (assume any communication system.) [2]
- Q7)** a) Explain Poisson's modeling. [4]  
b) Describe tapped delay line model for LTV system. [4]  
c) Explain valid and invalid use of tail extrapolation. [2]
- Q8)** a) State the categories of communication channel Explain multipath fading in wireless communication channel. [4]  
b) Explain random process model with reference to time varying system. [4]  
c) Why is semi analytic simulation technique used in network analysis? [2]



Total No. of Questions : 6]

SEAT No. :

PC-4715

[Total No. of Pages : 2

**[6355]-177**

**M.E.(E&TC)(Communication Networks)  
HIGH SPEED COMMUNICATION NETWORKS  
(2017 Pattern) (Semester - I) (504502)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) All questions carry equal marks.*
- 2) Answer any 5 questions out of 6.*
- 3) Neat labelled diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

**Q1) a)** Discuss two ATM protocols. **[5]**

b) Differentiate between fast Ethernet and Gigabit Ethernet. **[5]**

**Q2) a)** What are the various mechanism of congestion control? **[5]**

b) Explain the concept of congestion control in packet switching network. **[5]**

**Q3) a)** Explain in detail performance of TCP over ATM. **[5]**

b) What is exponential RTO back-off? Explain with suitable example. **[5]**

**Q4) a)** Enlist the difference between AAR traffic management and GFR traffic management. **[5]**

b) What are different attributes required for congestion control in ATM **[5]**

**P.T.O.**

**Q5) a)** Explain Karn's algorithm. **[5]**

b) Highlight on cell delay variation to performance of congestion control in ATM network. **[5]**

**Q6) a)** What is AAL? How does it play a role? **[5]**

b) What do you mean by high speed network architecture? Explain in detail. **[5]**



Total No. of Questions : 8]

SEAT No. :

PC-4716

[Total No. of Pages : 2

[6355]-178

**F.Y.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 Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6 and Q. No. 7 or 8.*
- 2) Neat Diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicates marks.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Explain the Key distribution centre (KDC) in Private Key cryptography.[6]  
b) Briefly explain the Access Control system and Intrusion Detection system with Suitable examples. [6]

OR

- Q2)** a) Draw and Explain RSA algorithm with Suitable example. [6]  
b) Write a short note on Security Technologies and Protocols used for the same [6]

- Q3)** a) How HMAC System works? Explain with Neat Block Diagram. [7]  
b) Draw and explain Network Security Architecture in detail. [6]

OR

- Q4)** a) Explain round operation in detail used in DES algorithm. [7]  
b) What is Operating System Security or Explain OS Hardening in detail.[6]

*P.T.O.*

- Q5)** a) Explain PGP or S/MIME in detail [6]  
b) Explain the need of cyber-security for wired and wireless networks. [6]

OR

- Q6)** a) Explain Transport Layer Security in detail [6]  
b) Explain the role of cyber security for VoIP Applications. [6]

- Q7)** a) How Secure Electronic Transaction used for E-Commerce Applications? [7]  
b) Explain the role of cyber security for Bluetooth Data Communication.[6]

OR

- Q8)** a) Draw and explain IP<sub>SEC</sub> modes in detail. [7]  
b) Write the Threats, Solutions and role of cyber security for Social Networking applications. [6]



Total No. of Questions : 8]

SEAT No. :

PC-4717

[Total No. of Pages : 2

**[6355]-179**

**FY.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 any five questions.*
- 2) Figures to the right side indicate full mark.*
- 3) Draw neat diagram wherever necessary.*
- 4) Assume suitable data, if necessary.*
- 5) Use of electronic pocket calculator is allowed.*

**Q1)** a) Explain the concept of managed objects for Internet perspective and OSI perspective point of view. [5]

b) Explain SNMP network management architecture in detail. [5]

**Q2)** a) Write a short note on MPLS traffic engineering. [5]

b) Define MAN. Explain SONET-based MAN. [5]

**Q3)** a) Describe network management functional model in detail. [5]

b) Explain SNMP in detail. [5]

**Q4)** a) Explain the TMN Conceptual Model. [5]

b) List out the TMN management services and management functional areas. [5]

*P.T.O.*

- Q5)** a) What are the important parameters that characterize data traffic flow. [5]  
b) Explain 802.5 token ring technology in High-Speed LANs. [5]
- Q6)** a) Explain the comparison between link level flow and error control. [5]  
b) Explain traffic control and congestion control in ATM networks. [5]
- Q7)** a) Explain the utility and application area of high-speed LANs. [5]  
b) Explain the requirements of Higher speed LANs. [5]
- Q8)** a) What are the key performance issues in cell delay variation? [5]  
b) What are the types of Network Traffic? Explain in brief. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4718

[Total No. of Pages : 2

**[6355]-180**

**M.E. (E&TC) (Communication Networks)**

**BROADBAND WIRELESS TECHNOLOGIES**

**(2017 Pattern) (Semester - II) (504508) (Theory)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

**Q1) a)** Draw and explain block diagram of OFDM. **[5]**

**b)** Compare FDMA Vs CDMA. **[5]**

**Q2) a)** Draw & Explain MIMO system model **[5]**

**b)** Discuss in details about SVD based Eigen beam forming techniques in ultra wideband system. **[5]**

**Q3) a)** Explain Carrier sense multiple access with collision avoidance MAC in details. **[5]**

**b)** Short note on Multiple Access Control. **[5]**

**Q4) a)** Explain Direct sequence UWB. **[5]**

**b)** Explain ALOHA and slotted Aloha protocols in Media Access Control. **[5]**

**Q5) a)** Draw and explain DS-CDMA system. **[5]**

**b)** Explain the classification of Routing Protocols. Also explain any one. **[5]**

*P.T.O.*



- Q6)** a) Explain dynamic BW allocation algorithm(DBA) for WiMax [5]  
b) Explain point-multi point WiMax networks. [5]
- Q7)** a) Draw and explain BW management for multichannel EPONS. [5]  
b) Compare Passive and Active optical network. [5]
- Q8)** a) Write a short note on Scalable broadband access network. [5]  
b) Write a short note on Fault tolerance and self-healing. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4719**

[Total No. of Pages : 2

**[6355]-181**

**First Year M.E. (E&TC) (Communication Networks)**

**SDR AND COGNITIVE RADIO**

**(2017 Pattern) (Semester - II) (504509)**

*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 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)** Describe requirements and system architecture of Cognitive Radios. **[7]**

b) Give an overview of benefits of Cognitive Radio. **[6]**

OR

**Q2) a)** Explain the history of Cognitive Radio and its evolution. **[7]**

b) What is the future scope of Software Defined Radio'? **[6]**

**Q3) a)** Write on different layer wise architecture of Cognitive Radio. **[6]**

b) How is end to end communication accomplished in the case of Cognitive Radio'? **[6]**

OR

**Q4) a)** Give an account on various worldwide frequency plans available. **[6]**

b) Write on different layer wise architecture of Cognitive Radio. **[6]**

**Q5) a)** Write short note on Real Time Operating Systems. **[6]**

b) What are the requirements of CORBA? **[6]**

OR

*P.T.O.*

- Q6)** a) What are the aims and requirements of SCA? [6]  
b) Explain the compliance between SCA and JTRS. [6]

- Q7)** a) How is baseband signal processing achieved in Cognitive Radio systems? [7]  
b) Describe in detail smart antenna architecture. [6]

OR

- Q8)** a) How is cognitive radio system principles applied to smart antenna systems? [7]  
b) How are adaptive techniques applied to antennas? [6]



Total No. of Questions : 8]

SEAT No. :

**PC4720**

**[6355]-182**

[Total No. of Pages : 2

**S.Y.M.E. (E & TC)/(Communication Network)**

**4GLTE CELLULAR SYSTEMS**

**(2017 Pattern) (Semester-III) (604501)**

*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) *Use of a calculator is allowed.*
- 5) *Assume suitable data if necessary.*

**Q1)** a) What is LTE? Write on system architecture evolution of LTE. [7]

b) Write on the different protocol stacks in standardization of LTE. [6]

OR

**Q2)** a) Describe in detail Packet Data Convergence Protocol in LTE. [7]

b) Describe in detail LTE advanced E-UTRAN architecture. [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 spectrum 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 are MIMO adaptive switching schemes? [6]

OR

**P.T.O.**

- Q6)** a) Explain downlink and uplink MIMO. [6]  
b) Explain the Advanced precoding concept. [6]

- Q7)** a) Discuss the backhaul design for in-band relaying. [7]  
b) Explain mixed architecture of CoMP. [6]

OR

- Q8)** a) Write short note on Wi-Max standards and its features. [7]  
b) Discuss the relay basic schemes in CoMP. [6]



Total No. of Questions : 8]

SEAT No. :

**PC4721**

**[6355]-183**

[Total No. of Pages : 2

**S.Y.M.E. (E & TC) (Communication Networks)**  
**MODERN COMMUNICATION RECEIVER DESIGN &**  
**TECHNOLOGY**  
**(2017 Pattern) (Semester-III) (604502)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

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

**Q1)** a) With the help of suitable block diagram , explain the implementation of double conversion receiver. **[5]**

b) Enlist the various types of image reject mixers used in direct conversion receiver. **[5]**

**Q2)** a) With the help of suitable block diagram, explain the ideal receiver. **[5]**

b) Explain Drift-Canceling Loops and the Barlow-Wadley Receiver with suitable diagram. **[5]**

**Q3)** a) Explain the design of Automatically Switched Half-Octave Filter Banks for HF transceiver. **[5]**

b) Explain the system composite noise figure with block diagram. **[5]**

**Q4)** a) Define Dynamic Range of receiver. Define Two-Tone Dynamic Range receiver. **[5]**

b) Define the following terms in brief w.r.t. dynamic range **[5]**

i) Linear composite dynamic range (LCDR):

ii) Spurious-free second-order dynamic range (IP2SFDR)

**P.T.O.**

- Q5)** a) Explain the brute force, direct, coherent mixer synthesizer with suitable diagram. [5]  
b) Explain the Gilbert Cell Mixers with suitable diagram. [5]
- Q6)** a) Explain the Double-Balanced Mixer with its performance characteristics [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 IFs [5]  
b) What is the significance of Automatic Gain Control (AGC) in Receivers? [5]
- Q8)** a) Enlist different Noise Blanker & state the importance of Noise Blanker in IF receiver. [5]  
b) What are design considerations for Audio and Baseband Amplifier of receiver? [5]



Total No. of Questions : 8]

SEAT No. :

**PC4722**

[Total No. of Pages : 1

**[6355]-186**

**F.Y. M.E. (E & TC) (IoT and Sensor System)  
WIRELESS SENSOR NETWORK FOR IOT  
(2017 Pattern) (Semester - I) (504603)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Attempt to any five questions out of Eight.*
- 2) Neat diagram must be drawn whenever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume the suitable data, if necessary.*

- Q1)** a) Explain the personal area network. [5]  
b) Explain the Wifi. [5]
- Q2)** a) Distinguish between RS232 and RS485 protocols. [5]  
b) With neat block diagram explain the Ultra-Wide Band. [5]
- Q3)** a) Explain the transceiver design considerations in WSNs. [5]  
b) Write short note on IEEE 802.15.4 MAC protocol. [5]
- Q4)** a) Write short note on MAC protocols. [5]  
b) Explain the characteristic and challenges Wireless Sensor Network. [5]
- Q5)** a) Explain Design Principle of Gateway Protocols. [5]  
b) Write short note on internet communication in WSN. [5]
- Q6)** a) Briefly explain the Goals and Figures of Merit in sensors. [5]  
b) With neat block diagram explain the WSN architecture. [5]
- Q7)** a) Explain 6LoWPAN. [5]  
b) Explain M2M communication. [5]
- Q8)** a) Compare IPv4 & IPv6. [5]  
b) Explain 6LoWPAN based WSN. [5]





Total No. of Questions : 8]

SEAT No. :

**PC4723**

[Total No. of Pages : 2

**[6355]-187**

**F.Y.M.E. (E&TC) (IoT & Sensor System)**

**EMBEDDED SYSTEM DESIGN**

**(2017 Pattern) (Semester - II) (504608)**

*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 of questions indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**Q1) a)** What is main role or need of embedded system and design challenges. **[5]**

**b)** What are the specification need for hardware and software. **[5]**

**Q2) a)** Explain in brief system overview of embedded system. **[5]**

**b)** What is the specification of embedded system. **[5]**

**Q3) a)** Explain different process technology. **[5]**

**b)** Difference between IC technology and design technology. **[5]**

**Q4) a)** Explain design models and techniques, any one. **[5]**

**b)** Short note on IC technology and design technology. **[5]**

**Q5) a)** Explain the concept of validation and development of hardware and software. **[5]**

**b)** What are different tools of testing and their selection criteria. **[5]**

**Q6) a)** Explain integration of the hardware and software components. **[5]**

**b)** What are different tools of testing and their selection criteria. **[5]**

**P.T.O.**

- Q7)** a) Explain any two real life embedded products. [5]  
b) Why EMI/RFI certification is important for embedded system. [5]
- Q8)** a) Define embedded product area of technology. [5]  
b) Explain aspect of Mechanical packing and testing. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4724**

[Total No. of Pages : 2

**[6355]-188**

**F.Y.M.E. (E&TC) (IoT & Sensor System)  
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 of questions indicate full marks.*
- 4) Assume suitable data, if necessary.*

**Q1) a)** Describe essential characteristics of cloud computing in context of: **[5]**

- i) On-demand self-service
  - ii) Broad network access
  - iii) Location independent resource pooling
  - iv) Rapid elasticity
  - v) Measured service
- b) Highlight a brief history of cloud computing with all necessary timelines. **[5]**

**Q2) a)** Highlight the advantages, disadvantages and applications of cloud computing. **[5]**

b) Explain the essential components of cloud computing. **[5]**

**Q3) a)** Write short note on high performance computing and how it is different from cloud computing. **[5]**

b) Explain the limitations for cloud scenarios in terms of sensitive information and application development. **[5]**

**Q4) a)** Describe architectural considerations for collecting data in cloud-based systems. **[5]**

b) Explain utility Grid Computing and enterprise Grid Computing. **[5]**

**P.T.O.**

- Q5)** a) Compare IaaS, SaaS and PaaS in terms of advantages, disadvantages and applications. [5]
- b) Explain the key components of cloud architecture including infrastructure, platform and services. [5]
- Q6)** a) Give a detailed analysis of challenges and risks in cloud adoption. [5]
- b) Compare and contrast cloud deployment models. [5]
- Q7)** a) Highlight the key features of VMware Workstation and how does it facilitate the development. [5]
- b) What is green cloud computing and how it differs from traditional cloud computing in terms of environmental impact and sustainability. [5]
- Q8)** a) What are virtual machines. Explain the process of creating a virtual machine. [5]
- b) Write short note on virtualization. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4725**

[Total No. of Pages : 2

**[6355]-189**

**F.Y.M.E. (Electronics & Telecommunications-IoT & Sensor System)**

**IOT ARCHITECTURE AND PROTOCOLS**

**(2017 Pattern) (Semester - II) (504610)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer 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 the IoT devices and Gateways and throw the lights on wide area network. [5]

b) Explain the data management related to the IoT architectural fundamental. [5]

**Q2)** a) Explain other relevant architectural views of IoT other than reference architecture. [5]

b) Explain deployment and operational view of IoT reference architecture.[5]

**Q3)** a) Explain the difference between Bluetooth Low Energy and Zigbee Smart Energy. [5]

b) Explain the most versatile protocols IPv4 and IPv6 related to IoT. [5]

**Q4)** a) What is a TCP? And how does it work? [5]

b) What do you understand by HTTP? Why it is used? [5]

**Q5)** a) What is DCCP? List two main functions of DCCP. [5]

b) What is AMQP? List two main features of AMQP. [5]

**P.T.O.**

- Q6)** a) List the comparison between IEEE 802.11 and IEEE 802.15. [5]  
b) Explain about network layer protocol 6LoWPAN. [5]
- Q7)** a) What are Grafana and Kibana tools? And for what purpose are they used in IoT? [5]  
b) Which tool is used for Real-Time Data Visualization in IoT? How it works. [5]
- Q8)** a) Why Edge and Fog concepts were introduced in IoT? [5]  
b) Explain various Sensors and Actuators used in IoT. [5]



Total No. of Questions : 8]

SEAT No. :

PC-5113

[Total No. of Pages : 2

**[6355]-190**

**M.E. (Electronics & Telecommunications - IoT and Sensor System)**

**MICRO SYSTEM FABRICATION**

**(2017 Pattern) (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 wafer preparation and silicon shaping with suitable diagram.[5]

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

i) Photolithography

ii) Thin film deposition

**Q2) a)** What is micro-machining? Why is it needed? [5]

**b)** Briefly explain the two specific processes involved in MEMS. [5]

**Q3) a)** What is touch sensor? Explain any one touch sensor. [5]

**b)** What is electric field sensor? Explain any one electric field sensor. [5]

**Q4) a)** What is epitaxy and how does it work? [5]

**b)** What is Ion? Explain the types of impurities in ICs manufacturing? [5]

**Q5) a)** Explain the differences between bulk and surface micromachining. [5]

**b)** What is EGS? Draw a CVD reactor used for EGS production. [5]

*P.T.O.*

- Q6)** a) Write five applications related to MEMS. [5]  
b) Write the five applications related to ICs. [5]
- Q7)** a) What is the thermal stress factor? Give expression. [5]  
b) What is very large scale integration? Explain the IC packaging. [5]
- Q8)** a) What is the CVD? Why is it needed? [5]  
b) What is the MBE? Why is it needed? [5]





Total No. of Questions : 8]

SEAT No. :

PC-5114

[Total No. of Pages : 2

**[6355]-191**

**M.E. (Electronics & Telecommunication - IoT and Sensor System)**

**IoT APPLICATIONS & WEB DEVELOPMENT**

**(2020 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)** Explain the basic structure of an HTML documents. **[5]**

b) What is mark-up language and why it is used. **[5]**

**Q2) a)** How will GUI objects handler error or expectations. **[5]**

b) Explain the Android development environments. **[5]**

**Q3) a)** What are advantage of using SQLITE as a local database in IoT device. **[5]**

b) Explain differences between SQL & SQLITE. **[5]**

**Q4) a)** What are the challenges in implementing RT monitoring systems for smart cities? **[5]**

b) How do IoT devices contribute to real time energy consumption monitoring? **[5]**

**P.T.O.**

- Q5)** a) Describe the IoT enable smart grid and solar energy harvesting. [5]  
b) How can IoT enhance operational efficiency in manufacturing industries? [5]
- Q6)** a) What is an event handler and how does it work in Java script. [5]  
b) How does CSS interact with HTML? [5]
- Q7)** a) What data types does SQLITE support? [5]  
b) How can you use SQLITE in mobile or web development? [5]
- Q8)** a) How do you delete records from an SQLITE database? [5]  
b) What is GUI (Graphical user interface)? [5]



Total No. of Questions : 8]

SEAT No. :

PC4726

[6355]-192

[Total No. of Pages :2

**First Year M.E. (E & TC) (Microwave)**  
**ELECTROMAGNETICS AND ANTENNA THEORY**  
**(2017 Pattern) (Semester- I) (504301)**

*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 the feeding methods for microstrip antenna with illustrative diagrams stating the advantages and disadvantages of each. [4]  
b) Design Yagi Uda antenna of 6 elements to provide a gain of 12dB, if the operating frequency is 200MHz. [4]  
c) Write the salient features and applications of Microstrip Antenna. [2]

- Q2)** a) Write the Maxwell's equation in Phasor form and derive the wave equation and solve it for TEM Uniform plane wave in free space and explain the propagation constant, attenuation constant, and phase constant. [7]  
b) Explain the continuity equation and its physical significance. [3]

- Q3)** In a nonmagnetic medium  $\vec{E} = 10\sin(2\pi \times 10^7 t - 0.5x)\hat{a}_z$  V / m. [10]

Find

- a)  $\epsilon_r, \eta$
- b) The time average power carried by the wave
- c) The total power crossing 100 cm<sup>2</sup> of plane  $2x + y = 5$

- Q4)** a) What is the difference between the analysis of wire antenna and aperture antennas? Illustrate the procedure for analyzing the aperture antennas with the help of mathematical expressions and relevant examples. [6]  
b) Explain the terms reflection, refraction, reflection coefficient, VSWR with reference to Uniform plane wave. What is the significance of these parameters? [4]

**P.T.O.**

- Q5)** a) The aperture dimensions of a pyramidal horn are  $10 \times 4$  cm. It is operating at a frequency 8 GHz. Find beam width, directivity and power gain. [6]
- b) Derive an expression for boundary conditions for boundary between two different magnetic materials. [4]
- Q6)** a) Derive an expression for total electric field for 2 - element linear array and Explain the Principle of Pattern Multiplication with reference to the antenna array. [6]
- b) Explain the circular array with its array factor and explain the applications and advantages. [4]
- Q7)** a) Design the antenna array using Dolph-Tschebyscheff's procedure for 6 elements and side lobe level to be below 20 dB. Assume the antenna elements are equispaced and half wave length spacing between the elements. [6]
- b) Derive the attenuation constant and phase constant for good conductor and explain the significance of the skin depth. [4]
- Q8)** Write short notes on - [10]
- a) Circular Patch
  - b) E - plane Horn
  - c) H - plane Horn
  - d) Pyramidal Horn



Total No. of Questions : 6]

SEAT No. :

**PC4727**

**[6355]-193**

[Total No. of Pages :2

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

**Q1)** a) Write a note on dynamic range and sources of noise in microwave circuits. [6]

b) Derive the equation of scattering matrix for two hole directional coupler. [4]

**Q2)** a) How inter symbol interference affects on wireless communication? Derive expression for roll of factor. [6]

b) Write short note on conversion gain and distortion. [4]

**Q3)** a) Derive the expressions for propagation constant, impedance, and power flow for the lossless coaxial line. [5]

b) For an arbitrary N port microwave device, derive the relationship between transmission (ABCD) matrix and impedance matrix. [5]

**Q4)** a) Explain with working of following microwave components using proper diagrams: [6]

i) Wilkinson Power divider

ii) Two hole Coupler

b) Explain working of two hole directional coupler. [4]

**P.T.O.**

- Q5)** a) How RF diode differs from conventional semiconductor diode? Explain construction and working of Schottky diode with related parametric derivation. [6]
- b) Explain operating principle of Tunnel diode. [4]
- Q6)** a) Describe in detail construction and operating principal of PIN diode.[6]
- b) Explain MESFET in terms of Construction, Working & frequency response. [4]



Total No. of Questions: 6]

SEAT No. :

**PC4728**

[Total No. of Pages : 1

**[6355]-194**

**First Year M.E. (E & TC) (Microwave)**

**MICROWAVE MEASUREMENTS**

**(2017 Pattern) (Semester - I) (504303)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Attempt any Five questions.*
- 2) *Assume suitable data, if necessary.*

**Q1)** a) What is uncertainty and confidence in measurement. Explain with suitable Example. [5]

b) State the properties of Transmission lines and Explain any one. [5]

**Q2)** a) What is attenuation? Explain How to reduce Attenuation? [5]

b) Draw and Explain the set-up used for reduction of Noise in measurement. [5]

**Q3)** a) Draw and Explain the practical set-up for calibration of Network Analyzer. [5]

b) Give the advantages of power sensors in. Microwave Measurement. [5]

**Q4)** What are the different methods to reduce noise. Which factors are considered to calculate signal to Noise ratio. [10]

**Q5)** Explain the different parameters to be considered for attenuation measurement. Draw a practical circuit to measure attenuation, with graph. [10]

**Q6)** Write short notes on :

a) MMIC Measurement Techniques. [5]

b) Inductive voltage divider. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4729**

**[6355]-195**

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

**First Year M.E. (E & TC) (Microwave)**  
**COMPUTATIONAL ELECTROMAGNETICS**  
**(2017 Pattern) (Semester-II) (504307)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1) a)** List and Explain various mathematical models for solving EM problems. **[5]**

b) Explain in detail Green's function. **[5]**

**Q2)** State and explain the significance of finite difference analysis for guiding structures. **[10]**

**Q3) a)** Explain FDTD analysis with its significance. **[5]**

b) Explain advances in FDTD. **[5]**

**Q4)** Write short note on following techniques. **[10]**

i) Method of Weighted Residual

ii) Ritz Variational method

**Q5)** Explain iteration and band matrix method in the context of FDM. **[10]**

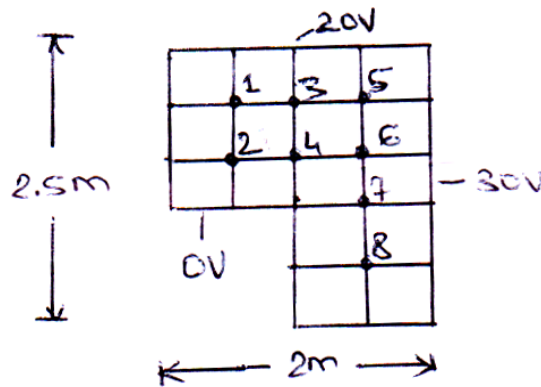
**P.T.O.**



Q6) a) Compare FEM and MOM with their significance. [5]

b) Compare FDM and FDTP with their significance. [5]

Q7) Determine the potential at the free nodes in potential system using FDM. [10]



Q8) a) State and explain the significance of MOM technique. [5]

b) Explain Galerkin's method. [5]



Total No. of Questions : 6]

SEAT No. :

**PC4730**

[Total No. of Pages : 1

**[6355]-196**

**First Year M.E. (E&TC) (Microwave)  
RF & MMIC TECHNOLOGY  
(2017 Pattern) (Semester - II) (504308)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

- Q1)** a) Explain fabrication process of MMIC technology. [6]  
b) Write a note on multi chip module technology. [4]
- Q2)** a) Explain fabrication technology used for design of FET device. [6]  
b) Explain the structure of micro strip coupler. [4]
- Q3)** a) Explain thin film and multi-layer directional couplers. [5]  
b) What is difference between Micro strip couplers and splitters. [5]
- Q4)** a) Explain Synthesis techniques of Linear and non Linear MMIC. [5]  
b) Explain network matrix decomposition. [5]
- Q5)** a) Explain harmonic balance method used in microwave circuit. [6]  
b) Explain any one CAD Techniques used for MMIC Design. [4]
- Q6)** a) How digital modulator is designed by MMIC technology? Explain. [6]  
b) Write short note on future trend in MMIC technology. [4]



Total No. of Questions : 8]

SEAT No. :

PC-4731

[Total No. of Pages : 3

[6355]-200

**M.E. (Electronics and Telecommunications) (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) Find the moment about a line through the origin having direction  $2i + 2j + k$  due to a 30 kg force acting at a point  $(-4, 2, 5)$  in the direction of  $12i - 4j - 3k$ . **[6]**

b) Find the rank and nullity of the Matrix.  $A =$  **[6]**

OR

**Q2)** a) Let  $W_1$  and  $W_2$  be subspaces of a vector space  $V$  such that the set theoretic union of  $W_1$  and  $W_2$  is also a subspace. Prove that one of the spaces  $W$  is contained in the other. **[6]**

b) Explain the various properties of scalar and dot product. **[6]**

**Q3)** a) Solve the following system of linear equations and give the vector form for the general solution. **[6]**

$$x_1 - x_3 - 2x_5 = 1$$

$$x_2 + 3x_3 - x_5 = 2$$

$$2x_1 - 2x_3 + x_4 - 3x_5 = 0$$

b) Use Gauss - Jordan method to find the inverse of the matrix: **[7]**

OR

**P.T.O.**

- Q4) a)** Start with the vector  $v_1 = (1, 2, 0)$  and  $v_2 = (2, 3, 0)$  [6]
- Are they linearly independent?
  - Are they a basis for any space?
  - What space  $V$  do they span?
  - What is the dimension of  $V$ ?
  - Which matrices  $A$  have  $V$  as their column space?
  - Which matrices have  $V$  as their null space?
  - Describe all vectors  $V_3$  that complete a basis  $v_1, v_2, v_3$  for  $R^3$ .  
(Solve any 6)
- b)** Explain various properties of Eigen values. [7]

- Q5) a)** The probability distribution function of a random variable  $X$  is defined as :

$f(X) = a \exp(-b|X|)$  where  $X$  ranges from Find the cumulative distribution function the relationship between  $a$  and  $b$  and the probability that the outcome  $X$  lies between 1 and 2. [6]

- b)** A binary symmetric channel has a conditional probability of error  $p = 10^{-5}$  and the messages  $m_0$  and  $m_1$  are generated at the source with equal probability. [6]

Determine :

- The probability of receiving a response of  $r_0$
- The probability of receiving a response of  $r_1$
- The probability that  $m_0$  was sent and given that  $r_0$  is received
- The probability that  $m_1$  was sent and given that  $r_0$  is received

OR

- Q6) a)** State and prove Baye's theorem. [6]

- b)** In a recent little league softball game, each player went to bat 4 times. The number of hits made by each player is described by the following probability distribution. [6]

Number of hits,	$x$	0	1	2	3	4
Probability,	$P(x)$	0.10	0.20	0.30	0.25	0.15

What is the mean of the probability distribution?

- Q7)** a) Determine the PSD and the mean square value of the sinusoidal process  $X(t)$  defined by:  $X(t) = A \cos(2\pi f ct + \Phi)$ . Where  $\Phi$  is a random variable uniformly distributed over  $(0, 2\pi)$ . [7]
- b) Explain Power Spectral Density (PSD). Also explain its various properties. [6]

OR

- Q8)** a) Discuss the transmission of random process through linear filters. [7]
- b) A stochastic process  $X(t)$  has a mean value  $m_x$  and autocorrelation  $R_X(\tau)$ . Find the mean and autocorrelation of the process  $Y(t)$  where :  $Y(t) = X(t) - X(t-T)$ . [6]



Total No. of Questions : 8]

SEAT No. :

PC-4732

[Total No. of Pages : 2

[6355]-201

M.E. (E&TC- Signal Processing)

DIGITAL IMAGE AND VIDEO PROCESSING

(2017 Pattern) (Semester - I) (504402)

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) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

**Q1)** a) What is the difference between gray scale and color images with their advantages and disadvantages? [6]

b) What is discrete cosine transform? Explain. [6]

OR

**Q2)** a) Write a short note on image sampling and quantization. [6]

b) Explain the concept of Pseudo - coloring. [6]

**Q3)** a) Define image Restoration and explain any one method of image restoration. [6]

b) Explain the histogram-based image enhancement process. [6]

OR

**Q4)** a) Define Image enhancement and explain any one method of image enhancement. [6]

b) Write a short note on maximum entropy-based method for image restoration. [6]

P.T.O.

- Q5)** a) What is the difference between lossy compression and lossless compression? Explain with their advantages, disadvantages and applications. [6]
- b) Write a short note on Hough Transform with respect to edge detection. [7]

OR

- Q6)** a) Explain the Morphological operators in edge detection. [6]
- b) Explain various image compression standards. [7]
- Q7)** a) Explain the motion estimation and Prediction selection. [6]
- b) Write a short note on color models in video. [7]

OR

- Q8)** a) Name any two image and video compression standards & explain any one of them. [7]
- b) Explain the following terms with respect to H.261. [6]
- i) Intra - frame compression.
- ii) Inter - frame compression.



Total No. of Questions : 8]

SEAT No. :

PC-4733

[Total No. of Pages : 2

[6355]-202

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

Q1) a) Write the steps in designing IIR Filter. [4]

b) What are the advantages and disadvantages of bilinear transformation?[4]

OR

Q2) a) Write the procedure for FIR filter design by Frequency Sampling Method. What is the drawback in FIR filter design using windows and Frequency Sampling method? How it is overcome? [6]

b) Differentiate IIR Filter and FIR Filter. [2]

Q3) a) What are the two ways for sampling rate conversion in the digital domain? Explain in brief. [6]

b) State the Weiner Hopf Equation. [2]

OR

Q4) a) Consider the discrete time signal.

$$x(n) = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

Determine the down-sampled version of the signals for the sampling rate reduction factors... i)  $D = 2$  ; ii)  $D = 3$  iii)  $D = 4$  [6]

b) What is LMS adaptive algorithm? [2]

P.T.O.



- Q5) a)** Explain what is meant by the term “ergodicity”. -----7 Marks [9]
- Is the sinusoid  $X(t) = A\cos(\omega t + Q)$  with random phase- $Q$  uniformly distributed on  $[0; 2\pi]$  ergodic? (There is no justification required. ----2 Marks
- b)** Compare Time averages and Ensemble averages. ----2Marks for each point. [8]

OR

- Q6) a)** What does “characterization of Random Processes” mean? Explain the process. [9]
- b)** What is Ergodicity? Explain. [8]
- Are the wide sense stationary process and Ergodic Process reasonable assumptions for a video signal?

- Q7) a)** Explain Von Neumann Architecture in detail. [9]
- b)** Write a brief note on Booth’s Multiplication algorithm. [8]

OR

- Q8) a)** Explain the process of implementation of FIR filter with the help of an example. [9]
- b)** Write the advantages and applications of FIR Filters and IIR filters. State the applications of Decimation and Interpolation. [8]



Total No. of Questions : 8]

SEAT No. :

PC-4734

[Total No. of Pages : 2

**[6355]-203**

**FY.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 cell junction with the help of diagram. **[5]**

b) Explain Heart Structure with diagram **[5]**

**Q2) a)** Explain different Bio-transducers **[5]**

b) Explain Electrical Activity of heart with diagram **[5]**

**Q3) a)** Write note on different Medical Images **[4]**

b) Explain with block diagram Biomedical Instrumentation System **[6]**

**Q4) a)** What is the purpose of PET scanning? **[4]**

b) Explain instrumentation amplifier **[6]**

**Q5) a)** Write a note on MRI and Functional MRI(FMRI) **[4]**

b) Write a note on Eigen Analysis Spectral Analysis **[4]**

c) List Time frequency Methods in processing of Bio-signals **[2]**

*P.T.O.*

- Q6)** a) Discuss the Autoregressive (AR) analysis [4]  
b) Explain in detail electromechanical models of signal generation [4]  
c) What is PET Image [2]
- Q7)** a) Discuss the model based approach for spectral estimation [4]  
b) Explain Spectral Analysis of Heart rate. [4]  
c) Write a note on Lattice adaptive filter. [2]
- Q8)** a) Explain Noise reduction by Ensemble Averaging. [4]  
b) Write a short note on RLS and Lattice Filter. [4]  
c) What is role of Isolation amplifier? [2]



Total No. of Questions : 8]

SEAT No. :

PC-4735

[Total No. of Pages : 2

[6355]-204

**FY.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 the role of vocal cord and vocal tract in speech production system and hence explain LTI model of Speech production in detail. **[6]**

- b) Explain the following terms. **[4]**
- i) Semi vowels
  - ii) Fricatives
  - iii) Consonants
  - iv) Diphthongs

**Q2) a)** What is pitch? Explain the method of finding pitch of speech signal using AMDF method? What are the advantages of finding pitch period using AMDF method over autocorrelation method. **[6]**

- b) Compare narrowband spectrogram with wideband spectrogram. **[4]**

**Q3) a)** What is LSP? What is its significance? Explain the procedure of conversion of LPC to LSP. **[5]**

- b) Explain Levinson Durbin algorithm in detail. **[5]**

*P.T.O.*

- Q4)** a) Explain the method to determine pitch period of speech signal using LPC analysis? [5]  
b) Explain the method of finding LPC coefficients using autocorrelation method. [5]
- Q5)** a) What is the need of companding? Explain the u-Law and A - law companding in Detail. [6]  
b) How the wavelet transform is useful for speech analysis. [4]
- Q6)** a) Explain evaluation of Pitch and formants using cepstrum. [6]  
b) Explain the forward adaptive quantizer in detail. [4]
- Q7)** a) What is MFCC? Explain the method to calculate MFCC using block Diagram. [6]  
b) Explain the speech coding standard G. 726. [4]
- Q8)** a) What is speech enhancement? Explain any one method of speech enhancement technique in detail. [6]  
b) Compare speaker identification system with speaker verification system.[4]



Total No. of Questions : 8]

SEAT No. :

PC-4736

[Total No. of Pages : 2

[6355]-205

M.E. (E & TC) (Signal Processing)

COMPUTER VISION

(2017 Pattern) (Semester - II) (504409)

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) Write Application and challenges in Computer Vision. [5]

b) Explain Pinhole Camera in details. [5]

**Q2)** a) Explain block diagram of digital Camera. [5]

b) Explain application of computer vision with super-resolution and blur removal. [5]

**Q3)** a) Write note on Bayer's Pattern. [5]

b) Write a note on thermal imaging. [5]

**Q4)** a) Explain Simple stereo system. [5]

b) Write a note on 3D reconstruction stereo vision. [5]

**Q5)** a) Explain Hough Transform with graph. [4]

b) Write a note on RANSAC. [4]

c) List Stereo parameter in stereo vision. [2]

P.T.O.

- Q6)** a) Explain Motion Estimation algorithm Kalman Filter. [4]  
b) Discuss various Motion Estimation Algorithm. [4]  
c) Define rectification in stereo vision. [2]
- Q7)** a) Define following : [4]  
i) Edge  
ii) Line  
iii) Points  
iv) Corners  
b) Explain feature alignment using least squares, write application. [4]  
c) Write a note on volumetric representation. [2]
- Q8)** a) Explain Differential based technique for motion estimation contaminated. [4]  
b) Write a short note on fitting ellipse to image data. [4]  
c) Define Motion field. [2]



Total No. of Questions : 8]

SEAT No. :

PC-4737

[Total No. of Pages : 2

**[6355]-206**

**S.Y.M.E. (E & TC Signal Processing)**  
**STATISTICAL SIGNAL PROCESSING**  
**(2017 Pattern) (Semester - III) (604401)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Solve any five questions from 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 if necessary.*
- 5) Use of Non-programmable calculator is allowed.*

- Q1)** a) Explain with example MA Processes. [5]  
b) What is a regular Process? From spectral factorization write properties of regular processes. [5]
- Q2)** a) Explain ARMA Process. [6]  
b) Compare Autocorrelation and covariance methods. [4]
- Q3)** a) Explain Least Square Method for signal modeling & its disadvantages. [6]  
b) Explain PADE approximation method. [4]
- Q4)** a) State and explain Shank's Method for signal modeling. [6]  
b) Explain All-Pole modeling. [4]
- Q5)** a) Explain FIR & IIR Wiener Filter. [6]  
b) What are advantages of lattice filters? [4]

*P.T.O.*



- Q6)** a) Explain LMS algorithm with applications. [6]  
b) Explain forward covariance method. [4]
- Q7)** a) Explain principle of estimation & its applications. [6]  
b) Explain Welch method. [4]
- Q8)** a) Explain the properties of estimates with unbiased & consistent estimators. [6]  
b) Explain Bartlett's Method. [4]



Total No. of Questions : 8]

SEAT No. :

PC-4738

[Total No. of Pages : 2

[6355]-207

**M.E. (E & Tc) (Signal Processing)**

**STILL IMAGE AND VIDEO COMPRESSION**

**(2017 Pattern) (Semester - III) (604402)**

*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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data; if necessary.*

**Q1)** a) What is of scalar quantization? Compare scalar and vector quantization.[6]

b) Explain the Linde-Buzo-Gray Algorithm. [6]

OR

**Q2)** a) Explain Variations on the Theme with respect to vector quantization.[6]

b) Explain the compression using fractals. [6]

**Q3)** a) Write a short note on Embedded Zero tree Coder. [6]

b) Explain the Core encoder with respect to JPEG 2000 compression standard. [6]

OR

**Q4)** a) Explain the ROI encoding with respect to JPEG 2000 compression standard. [6]

b) Write a short note on multi resolution analysis using filters. [6]

**Q5)** a) Explain the Audio Psychoacoustic Model. [6]

b) Explain the concept of group of pictures with respect to video compression. [7]

**P.T.O.**

OR

- Q6)** a) Explain the MPEG audio coding. [6]  
b) Explain picture types - I, P, B and D pictures? [7]

- Q7)** a) Explain motion estimation with respect to video compression. [6]  
b) Write a short note on H.263 and H.264. [7]

OR

- Q8)** a) Write a short note on MPEG - 4. [6]  
b) Explain the following terms with respect to H.261. [7]  
i) Intra - frame compression.  
ii) Inter - frame compression.



Total No. of Questions : 8]

SEAT No. :

PC-4739

[Total No. of Pages : 3

[6355]-208

M.E. (Mechanical) (Design Engineering/Automobile/CADM-CAM)

ADVANCED MATHEMATICS

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

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

**Q1) a)** Find an orthonormal basis for the Euclidean space  $\mathbb{R}^3$ , by applying gram - schmidt's method to the following vectors : (1, 2, 0), (8, 1, -6) and (0, 0, 1). [5]

b) If the potential function  $\phi$  is  $\frac{1}{2} \log (x^2 + y^2)$ , find the flux function  $\psi$  and the complex function  $f(z) = \phi + i\psi$  [5]

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

b) Find the mechanical system which is governed by the differential equation and with the given initial condition. [5]

$$\frac{d^2 y}{dt^2} + y = 2t + \frac{\pi}{2}, y(0) = \frac{\pi}{2}, y'(0) = 0$$

P.T.O.

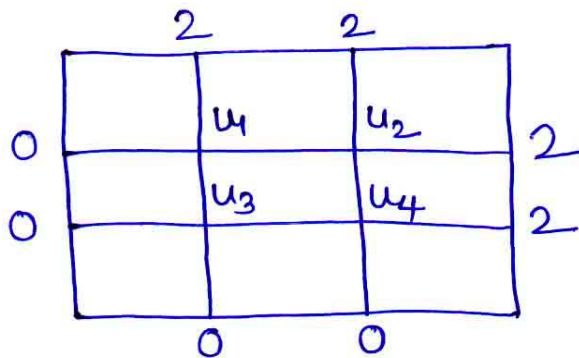
**Q3) a)** Find the Laplace transform of the function  $f(t) = \begin{cases} e^{-t}; & 0 < t \leq 3 \\ 0 & ; t > 3 \end{cases}$  by expressing it in terms of unit - step function. [5]

b) Using power series method solve the differential equation :  $xy^{11} + y = 0$ . [5]

**Q4) a)** Using power method determine the largest eigen value and the corresponding eigen vector of the matrix : [5]

$$A = \begin{bmatrix} 3 & 1 & 0 \\ 1 & 3 & 1 \\ 0 & 1 & 3 \end{bmatrix} \text{ with } X_0 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

b) Solve  $U_{xx} + U_{yy} = 0$  for the square mesh with boundary values as given below : [5]



**Q5) a)** Solve the initial boundary value problem  $\frac{\partial f}{\partial t} = 2 \frac{\partial^2 f}{\partial x^2}$  where  $f(0,t) = 10$ ,  $f(b,t) = 18$  and  $f(x, 0) = x^2/2$  with  $h = 1$  and  $k = 1/4$  by schmidt method. [5]

b) Using Rayleigh - Rits method, solve the boundary value problem  $y'' + y + 2x(1 - x) = 0$ ,  $y(0) = 0$ ,  $y(1) = 1$ . [5]

**Q6) a)** Find the extremal of the functional [5]

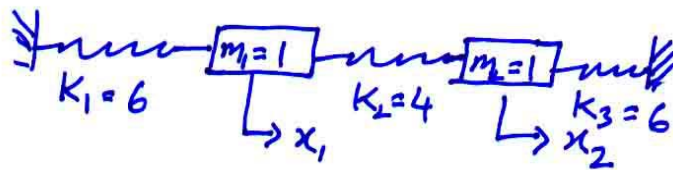
$$\int_0^{\pi/2} ((y')^2 + y^2 - 2yx) dx, y(0) = y(\pi/2) = 0$$

b) Solve the system of unear equations by least square method  $2x - 2y = -1$ ,  $-2x + 2y = 7$ ,  $5x + 3y = -26$ . [5]

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

b) What is the function  $f(x)$ , whose Fourier cosine transform is  $\frac{\sin a\lambda}{\lambda}$ ? [5]

Q8) a) Find natural frequencies of the given system and corresponding normal mode of the vibration using matrix method. [5]



b) Solve the boundary value problem  $25f_{xx} - f_{tt} = 0$ , with  $f(0, t) = f(5, t) = 0$  and  $f(x, 0) = 20x$  for  $0 \leq x \leq 1$  and  $f(x, 0) = 25(1 - x/5)$  when  $1 \leq x \leq 5$ ,

$$\frac{\partial f}{\partial t} \Big|_{t=0} = 0. \quad [5]$$



Total No. of Questions : 7]

SEAT No. :

PC-4740

[Total No. of Pages : 3

[6355]-209

**M.E. (Mechanical) (CAD Manufacture & Engineering)**

**ADVANCE MACHINE DESIGN**

**(2017 Pattern) (Semester - I) (502402)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Solve any Five Questions.*
- 2) Assume suitable data, if necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of electronic pocket calculator is allowed.*

**Q1) a)** Derive the compatibility equations in Polar co-ordinate system. **[5]**

b) Investigate the validity of stress function  $\phi = \left[ C_1 r^4 + C_2 r^2 + C_3 + \frac{C_4}{r^2} \right] \cos 2\theta$

Where r and  $\theta$  are polar coordinates. **[5]**

**Q2) a)** Investigate what problem of plane stress is represented by the function

$\phi = \frac{3F}{4h} \left( xy - \frac{2Ry^3}{3h^2} \right) + \frac{P}{2} y^2$  Where 'h' is half depth of beam, and 'F' as the concentrated load. **[5]**

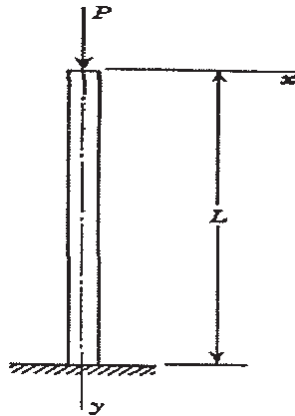
b) Explain with examples the plain stress and strain problems. **[5]**

**Q3) a)** Explain the following theories of failures with graphical representation and applications **[5]**

- i) Octahedral shearing stress theory
- ii) Maximum shear stress theory

*P.T.O.*

- b) Determine the buckling loads of the fixed end column as shown in Fig. by using the Rayleigh-Ritz method. [5]



- Q4)** a) State and explain theory of virtual work. [5]  
 b) Explain Mohr's theory of failure in detail. [5]

- Q5)** a) What is the cumulative fatigue damage? How the life of component subjected to different values of fluctuating stresses in cycle, is estimated by using Miner's equation? [5]  
 b) The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following three elements: [5]  
 i)  $\pm 350 \text{ N/mm}^2$  for 85% of time  
 ii)  $\pm 400 \text{ N/mm}^2$  for 12% of time  
 iii)  $\pm 500 \text{ N/mm}^2$  for 3% of time

The material for the component is 50C4 ( $S_{ut} = 660 \text{ N/mm}^2$ ) and the corrected endurance limit of the component is  $280 \text{ N/mm}^2$ . Determine the life of the component.

- Q6)** a) Explain the Rheological and Kelvin models. [5]  
 b) Following creep data at certain temperature is known [5]

$$S_1 = 10.5 \text{ MPa}, \epsilon_1 = 0.012\% \text{ per } 1000 \text{ hr.}$$

$$S_2 = 14 \text{ MPa}, \epsilon_2 = 0.025\% \text{ per } 1000 \text{ hr.}$$

Determine the constants of hyperbolic sine law and calculate the creep rates for stress values of 20 MPa and 28 MPa.



**Q7) a)** Describe transverse shear effect in composite laminates. **[5]**

b) Consider a graphite epoxy laminate whose elastic constant along the perpendicular direction to fibres are as follows, **[5]**

$$E_{xx} = 181 \text{ Gpa}, \quad E_{yy} = 10.3 \text{ Gpa}, \quad G_{xy} = 7.17 \text{ Gpa},$$

$$V_{yx} = 0.28, \quad V_{xy} = 0.01594.$$

Obtain the compliance coefficient approx to x'y' axes which are at,

i) + 30° counter clockwise to XY axes and

ii) + 90° to XY axes.



Total No. of Questions : 7]

SEAT No. :

PC-4741

[Total No. of Pages : 2

**[6355]-210**

**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 indicate to the full marks.*
- 4) Assume suitable data wherever necessary.*
- 5) Use of Non-programmable calculator is allowed.*

- Q1)** a) Explain the parametric representation of synthetic curves [5]  
b) Explain different types of Graphics standards used in CAD [5]
- Q2)** a) Explain the parametric representation of plane surface and ruled surface [5]  
b) Explain the Modelling features and Feature entities. [5]
- Q3)** a) Explain the parametric representation of COONs surface [5]  
b) Explain in brief surface manipulation techniques [5]
- Q4)** a) Explain 3D modelling operation Strategies [5]  
b) Explain different approaches used for creating an assembly [5]
- Q5)** a) Explain the algorithm used for shading and Rendering [5]  
b) Explain the tolerance representation used in CAD [5]

*P.T.O.*

- Q6)** a) Write notes on evaluation of data- exchange formats [5]  
b) Explain the Collaborative Design Principles and Approaches [5]

**Q7)** Write short notes on:

- a) NURBS [5]  
b) Constructive Solid Geometry [5]



Total No. of Questions : 7]

SEAT No. :

**PC4742**

[Total No. of Pages : 2

**[6355]-211**

**First Year M.E. (Mechanical) (Heat Power Engineering) (All Branches)**

**RESEARCH METHODOLOGY**

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

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Answer any five questions from the following.*
- 2) Assume suitable data, if necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of scientific calculator is allowed.*
- 5) Use of standard statistical tables having normal distribution, F-test and Chisquare test are permitted.*

**Q1) a)** Define the term “Research”. Explain any two types of research. **[5]**

**b)** Explain the importance of research methodology in Engineering research. **[5]**

**Q2) a)** What do you mean by research problem? Explain with suitable example. **[5]**

**b)** What is the significance of formulating the hypothesis in research work? **[5]**

**Q3) a)** What is sensitivity analysis? Explain with suitable example. **[5]**

**b)** Describe the steps in setting up a computer model to predict performance of experimental system. **[5]**

**Q4) a)** What do you understand by validity and reliability of instrument? **[5]**

**b)** Explain the static characteristics of an Instrument. **[5]**

**Q5) a)** Explain error analysis and methods to reduce errors in research process? **[5]**

**b)** What is Regression analysis? How to estimate Curve fitting and Developing Correlation. **[5]**

**P.T.O.**

**Q6)** Explain the purpose of research report? What are various stages of report writing. **[10]**

**Q7) a)** Write the concept of plagiarism, and give brief idea about its importance for scholars. **[5]**

**b)** What precautions needed to be taken during research report writing? **[5]**



Total No. of Questions : 7]

SEAT No. :

**PC4743**

[Total No. of Pages : 1

**[6355]-212**

**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)** Discuss the elements of CIM? Explain product development through CIM in brief. **[10]**

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

**Q3)** Discuss the JIT manufacturing philosophy and cellular manufacturing. **[10]**

**Q4)** Explain Flexible Manufacturing System and its strategy. **[10]**

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

**Q6)** Explain the concept of lean production? What are the benefits of lean Manufacturing? **[10]**

**Q7)** Elaborate PLM and supply chain management. **[10]**



Total No. of Questions : 7]

SEAT No. :

**PC4744**

[Total No. of Pages : 1

**[6355]-213**

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

**INDUSTRIAL PRODUCT DESIGN & PRODUCT LIFE CYCLE  
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 side indicate full marks.*
- 4) Assume suitable data if necessary.*

**Q1)** Summarize the challenges that typically arise in new product development and provide an example. **[10]**

**Q2)** Examine the steps involved in concept generation and evaluate the effectiveness of a commonly used technique within this process. **[10]**

**Q3)** Apply the principles of break-even analysis to a hypothetical business scenario and discuss its relevance. **[10]**

**Q4)** Apply a Product Lifecycle Management (PLM) strategy to manage product data and workflow within a PLM system. **[10]**

**Q5)** How would you address the challenges within a PLM system using practical examples? **[10]**

**Q6)** Demonstrate the effects of integrating Product Lifecycle Management (PLM) and Computer-Aided Design (CAD) with a practical example. **[10]**

**Q7)** Define and describe the functions of Product Data Management (PDM) within an organization. **[10]**



Total No. of Questions : 7]

SEAT No. :

**PC4745**

[Total No. of Pages : 2

**[6355]-214**

**First Year M.E. (Mechanical Engineering) (CADM&E)  
AUTOMATED MANUFACTURING SYSTEM MODELLING  
(2017 Pattern) (Semester - II) (502409)**

*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)** Discuss the different levels of automation in manufacturing and analyze their respective advantages and limitations. **[10]**

**Q2)** Discuss the steps involved in planning and implementing a flexible manufacturing system (FMS) in a production environment. Highlight the challenges and strategies for successful implementation. **[10]**

**Q3)** Design a pneumatic circuit for an automatic die casting machine, considering factors such as safety, speed, and precision. **[10]**

**Q4)** Discuss the concept of cellular manufacturing and its significance in modern production systems. How does cellular manufacturing improve flexibility and responsiveness in manufacturing operations? **[10]**

**Q5)** Explain the concept of the Internet of Things (IoT) in the context of manufacturing systems. How does IoT contribute to real-time monitoring, data analysis, and decision-making in production environments? **[10]**

**P.T.O.**



**Q6)** Discuss the advantages of using Generalized Stochastic Petri Nets (GSPN) in modeling KANBAN systems. How does GSPN facilitate the analysis and optimization of production processes? **[10]**

**Q7)** Discuss the benefits of implementing integrated automation systems in terms of production efficiency, quality improvement, and cost reduction. Provide examples of successful integration strategies. **[10]**



Total No. of Questions : 7]

SEAT No. :

**PC4746**

**[6355]-215**

[Total No. of Pages : 1

**S.Y.M.E. (Mechanical) (Computer Aided Design Manufacture & Engineering)**

**SIMULATION MODELING**

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

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) Attempt any FIVE questions from the following.*
- 2) Figures to the right indicate full marks.*
- 3) Use of Non-Programmable calculator allowed.*
- 4) Assume Suitable data if necessary.*

**Q1)** Classify the distribution system. Explain Exponential distribution system with suitable example. **[10]**

**Q2)** Explain the steps involve in a simulation. **[10]**

**Q3)** Explain Poisson Distribution. **[10]**

**Q4)** Explain Kolmogorov Smirnov test and the Chi Square test for simulation in detail. **[10]**

**Q5)** Explain different performance measures in manufacturing system modeling. **[10]**

**Q6)** What is simulation Languages and how it works? **[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. :

PC4747

[6355]-216

[Total No. of Pages : 2

**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) *Attempt Any Five Questions.*
- 2) *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)** Write a short note on composite materials and explain their orthotropic properties. **[5]**

b) Write a note on nanomaterials, their types, applications, and properties. **[5]**

**Q2) a)** The state of stress at a point in a body is given by 
$$\begin{bmatrix} 10 & 0 & 3 \\ 0 & 3 & 0 \\ 3 & 0 & 2 \end{bmatrix}$$
 **[5]**

Determine the following:

- i) Octahedral normal stress.
  - ii) Octahedral shear stress.
  - iii) Maximum shear stress.
- b) Explain Von Misses' Criteria of Yielding and draw its Yield Locus. **[5]**

**Q3) a)** A tensile specimen with a 12 mm initial diameter and 50 mm gauge length reaches maximum load at 90 kN and fractures at 70 kN. The minimum diameter at fracture is 10mm. Determine the engineering stress at maximum load and true fracture stress. **[5]**

b) Explain with neat sketch Bridgeman correction for metals. **[5]**

**P.T.O.**

- Q4)** a) Two points on a true stress-strain curve for aluminum alloy are  $\sigma = 222$  MPa at  $\varepsilon = 0.05$  and  $\sigma = 303$  MPa at  $\varepsilon = 0.15$ . 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  $\varepsilon = 0.30$ . [5]
- b) Explain Three Point Bend Test with neat sketch. [5]
- Q5)** a) The stress-strain response in simple tension for an elastic-linear hardening plastic material is approximated by the expression  $\sigma = \sigma_0 + m\varepsilon_p$ , for  $\sigma \geq \sigma_0$ . The material obeys Hook's law up to the elastic limit.  $\sigma_0 = 210$  MPa,  $E = 210$  GPa and  $m = 26$  GPa. The Material sample is first stretched to a total strain  $\varepsilon = 0.007$ , is subsequently returned to its initial strain-free state by continued compressive stressing, and then is unloaded and reloaded in tension again to reach the same strain,  $\varepsilon = 0.008$ . Sketch the stress-strain curve for the Isotropic hardening rules. [6]
- b) Explain the Deformation Theory of Plasticity. [4]
- Q6)** a) Explain shake down theorem. [5]
- b) Explain Elastic-plastic torsion of a solid circular shaft. [5]
- Q7)** a) The amplitude of a vibrating member decreases so that the amplitude on the 100th cycle is 13% of the amplitude on the 1st cycle. Determine natural Decay. [5]
- b) What is viscoelasticity? Explain Maxwell's model for viscoelastic material with neat sketch. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4807

[Total No. of Pages : 2

[6355]-216A

**M.E. Mechanical (Computer Aided Design, Manufacture & Engineering)**

**OPTIMIZATION TECHNIQUES**

**(2017 Pattern) (Semester - III) (602414)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates :*

- 1) *Answer Any five question*
- 2) *Answers in One answer Books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary*

**Q1) a)** How find the dimensions of a box of largest volume that can be inscribed in a Sphere of unit radius. **[5]**

b) How do you define Optimization Problem ? Give mathematical definition and Example? **[5]**

**Q2)** Maximize  $F = x_1 + 2x_2 + x_3$  **[10]**

Subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_i \geq 0, i = 1, 2, 3$$

**Q3)** Determine the maximum and minimum values of the function **[10]**

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 5$$

**Q4)** Write a short note on (Any 2) : **[10]**

- a) Genetic Algorithm.
- b) Neural – Network.
- c) Simulated Annealing
- d) Fuzzy Optimization

*P.T.O.*

**Q5)** Find the value of  $x$  in the interval  $[0,3]$  using Golden Section Method up to six iterations.  $F(x) = 0.65 - [0.75/(1 + x^2)] - 0.65 x \tan^{-1}(1/x)$  **[10]**

OR

**Q6)** Explain Following :

- a) Multivariable unconstrained optimization **[5]**
- b) Gradient search methods - Cauchy's method **[5]**

**Q7)** Explain Following :

- a) Cutting plane method **[5]**
- b) Random search method **[5]**

OR

**Q8)** Explain following :

- a) Particle Swarm Optimization **[5]**
- b) Duality in linear programming **[5]**



[6355]-217

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

ADVANCED STRESS ANALYSIS

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

Time : 3 Hours]

[Max. Marks : 50

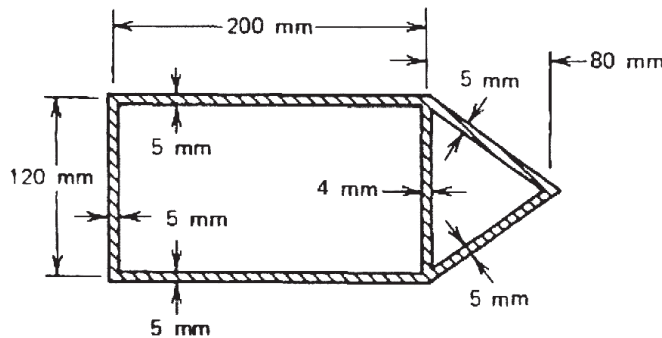
Instructions to the candidates:

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

- Q1)** a) Derive the Compatibility equation for cartesian co-ordinate in terms of stress component. [5]
- b) A strain gauge rosette is mounted on a steel specimen. For a particular state of loading of the structure the strain gauge readings are :- [5]  
 $\epsilon_A = 1200 \mu\text{m/m}$  ( $0^\circ$ ),  $\epsilon_B = 400 \mu\text{m/m}$  ( $30^\circ$ ),  $\epsilon_C = 800 \mu\text{m/m}$  ( $90^\circ$ ). Determine principal strains, principal stresses, orientation of maximum principal strain. Take Young's modulus  $E = 200 \text{ GPa}$  and poisson's ratio  $= 0.25$ .

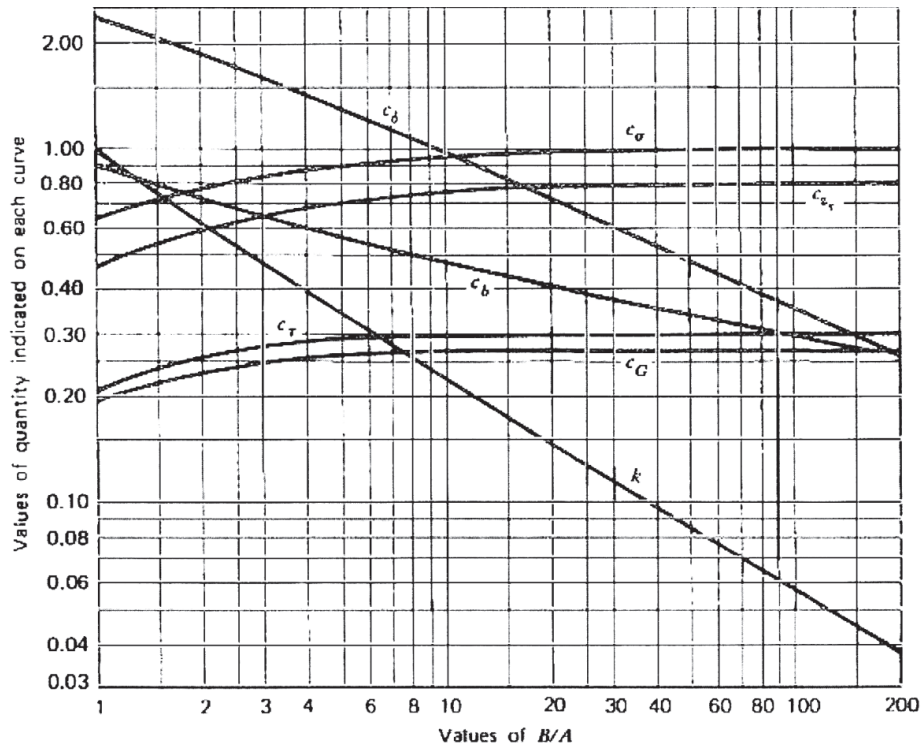
- Q2)** A stress function is given by  $\phi = \frac{1}{4} \sigma_0 r^2 (1 - \cos 2\theta)$  where  $r$  and  $\theta$  are polar coordinates. Find whether this is valid function or not. Also determine stresses. [10]

- Q3)** The aluminum ( $G = 27.1 \text{ GPa}$ ) hollow thin-wall torsion member in Fig. 1 has the dimensions shown. Its length is 3m. If the member is subjected to a torque  $T = 11 \text{ kN m}$ , determine the maximum shear stress and angle of twist. [10]



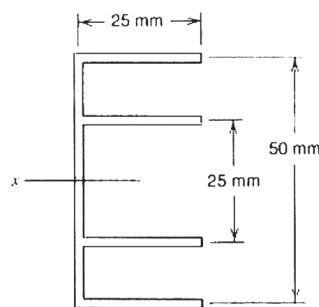
- Q4)** a) Derive Winkler Bach formula for curved beam. [5]  
 b) Explain Kelvin's Fluid flow analogy with suitable examples. [5]

**Q5)** In terms of  $P$  compute the maximum principal stress, maximum shear stress and maximum octahedral shear stress in two steel balls ( $E = 200 \text{ G Pa}$  and  $\nu = 0.29$ ) 200 mm in diameter pressed together by a force  $P$ . [10]



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

**Q6)** Locate the shear centre for the beam cross section shown in fig.2. The walls of the cross section have constant thickness  $t = 2.00 \text{ mm}$ . [10]



- Q7)** a) Explain construction and working of circular polariscope. [5]  
 b) Explain effect stressed model in plane polariscopic with suitable figure. [5]





[6355]-218

**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) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of programmable calculator is not allowed.
- 5) Assume suitable data wherever necessary.

**Q1) a)** Determine the Degree of Freedom of the mechanism shown in Fig.1. [5]

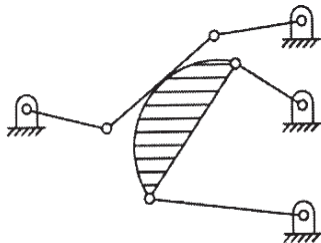


Fig.1

**b)** Find the maximum and minimum transmission angle for the mechanisms shown in Fig.2.(a) and (b). The figure indicates the dimensions in standard unit length. [5]

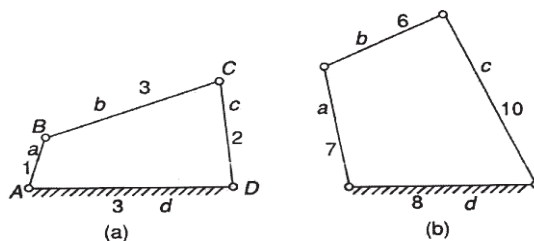


Fig.2

**Q2) a)** Explain the following terms with suitable examples. [5]

- i) Low degree of complexity
- ii) High degree of complexity

**b)** Derive Freudenstein's Equation for 4 Bar Mechanism. [5]

P.T.O.

- Q3)** a) Explain the concept of the 'Center of curvature'. Draw and explain the Hartmann Construction to find the location of the center of curvature of the locus of a point on a moving body. [5]
- b) What is the Euler-Savary equation? What are its two forms? Explain how these are used to find the location of conjugate points. [5]

**Q4)** Write short notes on the following: (Any 4) [10]

- a) Cubic of stationary curvature
- b) Brach Defect
- c) Order Defect
- d) Motion generation
- e) Function generation
- f) Path generation

**Q5)** Design a slider crank mechanism to coordinate three positions of the input and output links for the following data by the inversion method. [10]

$$\theta_{12} = 30^\circ, S_{12} = 40 \text{ mm};$$

$$\theta_{13} = 60^\circ, S_{13} = 96 \text{ mm}; \text{ Eccentricity} = 20 \text{ mm}.$$

**Q6)** Using Freudenstein's equation, design a four-bar mechanism to generate the function  $y = x^{1.4}$  for an interval in 'x' from 1 to 4. The input link is to start from  $30^\circ$  and is to have a range of  $90^\circ$ , while the output link is to start from  $90^\circ$  and is to have a range of  $90^\circ$ . Use three-point Chebyshev spacing. Take the length of fixed link as 50 mm. [10]

**Q7)** Discuss with suitable sketch Denavit-Hartenberg (D-H) parameters for the analysis of any spatial mechanism. Write displacement equations for Hooke's Joint using matrix method. [10]



[6355]-219

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

ADVANCED MECHANICAL VIBRATIONS

(2017 Pattern) (Semester - II) (502208)

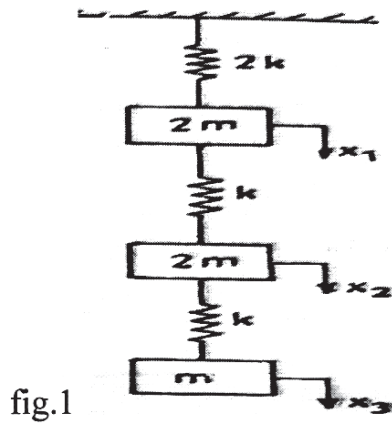
Time : 3 Hours]

[Max. Marks : 50

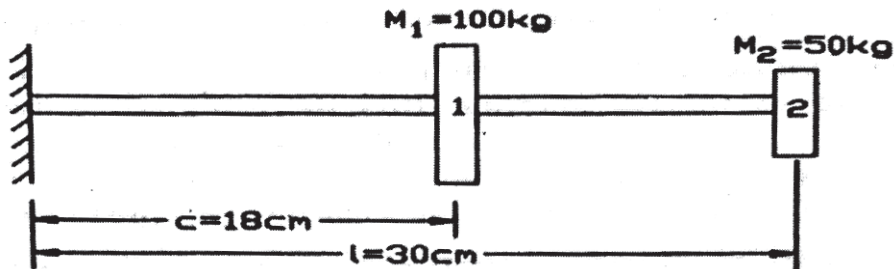
Instructions to the candidates:

- 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) Find the natural frequencies and the mode shape for system shown in Figure 1 below using matrix method. [10]



Q2) Find the lower natural frequency of vibration for the system shown in fig. 2 by Rayleigh's method.  $E = 1.96 \times 10^{11} \text{ N/m}^2$ ,  $I = 4 \times 10^{-7} \text{ m}^4$  [10]



Q3) Determine frequency equation for transverse vibrations of a beam fixed at one end and free at other end. [10]

P.T.O.

**Q4)** A trailer being pulled at a high speed, hits a 'h' cm high curb. Considering the trailer to be single degree freedom spring-mass system, analyze the system for its response. [10]

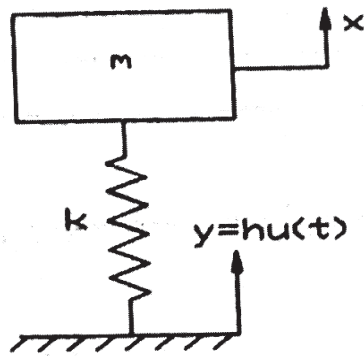


fig.3

**Q5) a)** Explain how time domain and frequency domain analysis is used for condition monitoring of machine. [6]

b) Explain dynamic vibration absorber. [4]

**Q6) a)** Explain in detail active vibration control. [6]

b) Explain analysis of Narrow band systems. [4]

**Q7)** Write Short note on any three. [10]

a) Forced vibrations of beams

b) Rayleigh-Ritz Method

c) In-situ balancing of rotors

d) Auto correlation function



Total No. of Questions : 8]

SEAT No. :

PC 4751

[6355]-220

[Total No. of Pages : 3

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

FINITE ELEMENT METHOD

(2017 Pattern) (Semester-II) (502209)

Time : 3 Hours]

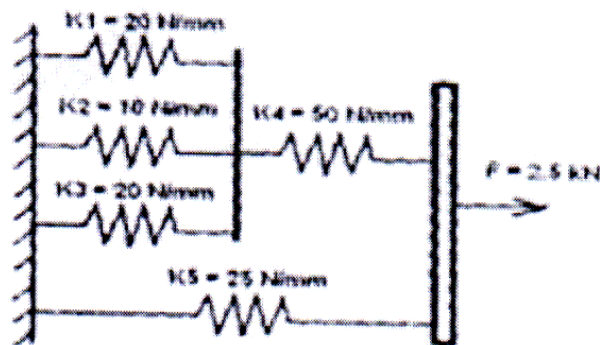
[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Discuss Discretization in FEM? Also list down any 3-finite elements used in FEM? [4]

- b) For the cluster of springs shown calculate [6]
- i) Global Stiffness Matrix
  - ii) Nodal Displacements
  - iii) Reaction Force
  - iv) Deflection of each spring?



Q2) a) A three stepped rod of  $E=2 \times 10^6$  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 10kN 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) Explain gauss elimination approach with penalty approach boundary Condition Methods with sketch for 1-D Rod Elements? [4]

P.T.O.

- Q3) a)** Six-noded triangle has following details. Calculate the displacements in x and y directions? Assume  $\zeta_1=0.5$  and  $\zeta_2=0.6$ . [6]

Nodes	1	2	3	4	5	6
x-cordi.	0	1	0	0.5	0	0.5
y-cordi..	0	0	1	0.5	0.5	0
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]
- Newton cotes Formula
  - Trapezoidal rule

- Q4) a)** Write short notes on. [5]

- Uniqueness of mapping of isoparametric elements.
  - Jacobian matrix
  - 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]
- Triangular plate
  - Rectangular plate element?

- Q6) a)** Explain modified Newton-Raphson method incremental procedure to handle material nonlinear problems? [5]

- b) Write a short note on Gaussian Quadrature Numerical integration for [5]
- 1- Dimensional
  - One - Point Formula
  - Two - Point Formula

- Q7)** a) Explain types of Vibration problems with examples? And also list out 2-numerical methods to solve eigen values? [4]
- b) Mild steel of three stepped rod of dia 100mm 80mm and 60mm with 100mm length each and fixed at both the ends. Let density=0.00073kg/cub.m,  $E=2 \times 100000 \text{ N/sq.mm}$ , calculate the eigen values considering for free vibration problem? [6]
- Q8)** a) Explain different types of symmetries that occurs in meshing? Discuss one type of symmetric problems with example? [5]
- b) List and discuss errors in FEA? Also Compare h and p Method? [5]



Total No. of Questions : 7]

SEAT No. :

PC-4752

[Total No. of Pages : 2

[6355]-221

M.E. (Design Engineering)

OPTIMIZATION TECHNIQUES

(2017 Pattern) (Semester - III) (602213)

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) Answer in one answer Book.
- 5) Assume Suitable data, if necessary.

Q1) a) Discuss in Brief [5]

- i) Design Vector
- ii) Design Constraints
- iii) Constraint surface
- iv) Objective function and
- v) Statements of Optimization problem

b) Discuss in brief classification of optimization problems. [5]

Q2) Maximize  $F = x_1 + 2x_2 + x_3$

Subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_i \geq 0, i = 1, 2, 3 \quad [10]$$

P.T.O.



**Q3)** Determine the maximum and minimum values of the function. [10]

$$f(x, y) = x^3 + y^3 + 2x^2 + 4y^2 + 6$$

**Q4)** Write a short note on (Any 2)

- a) Genetic Algorithm
- b) Neural - Network
- c) Simulated Annealing
- d) Fuzzy Optimization [10]

**Q5)** Find the value of x in the interval [0,3] using Golden Section Method up to six iterations.  $F(x) = 0.65 - [0.75/(1 + x^2)] - 0.65x \tan^{-1}(1/x)$  [10]

**Q6)** Explain following:

- a) ESO for stress level optimization [5]
- b) ESO for stiffness optimization. [5]

**Q7) a)** Explain how topology optimization can be used as a design tool with an example. [5]

- b) Write a short note on Bidirectional Evolutionary Optimization Method.[5]



Total No. of Questions : 10]

SEAT No. :

PC-4753

[Total No. of Pages : 4

**[6355]-222**

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

- Q1)** a) Explain any five static characteristics of instruments. [5]  
b) Compare Resistance Thermometer Detectors (RTD) and THERMISTOR. [5]

OR

- Q2)** a) How to avoid humidity measurement errors Explain with neat sketch Hair hygrometer. [6]  
b) What are the different types of tachometers? Explain Vibrating tachometers. [4]

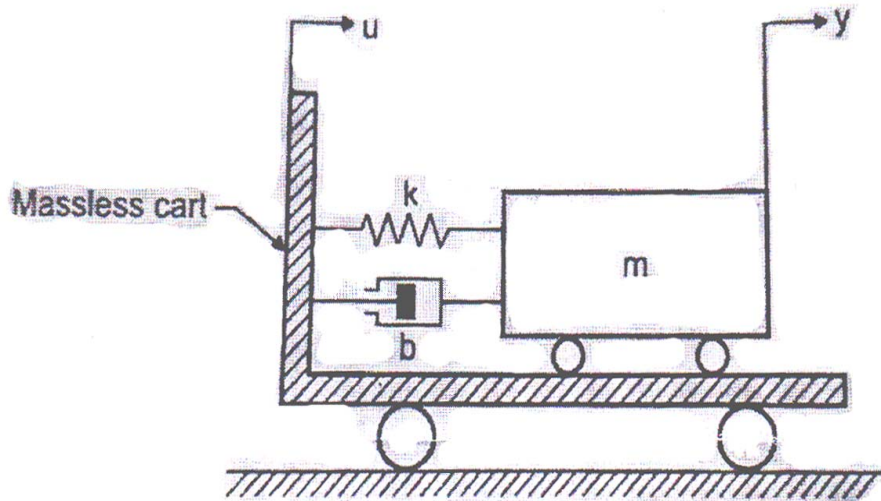
- Q3)** a) Explain The Nyquist–Shannon sampling theorem and list applications. [6]  
b) Write a short note on Bitwidth. [4]

OR

- Q4)** a) Explain with neat sketch electromagnetic flow meter and state its limitation. [6]  
b) Explain any one application of a closed loop control system. [4]

*P.T.O.*

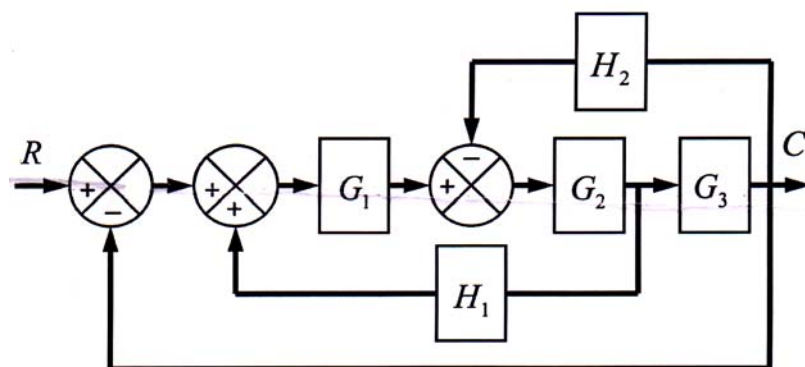
- Q5) a)** A mass spring damper system is mounted on an massless cart as soon in figure no.1. Derive the transfer function between output  $y$  and input  $u$ . Assume mass ( $m$ ) = 10 kg,  $b$  = 20 N-s/m,  $k$  = 100 N/m. [6]



- b) Write a short note on System Stability analysis using Poles and Zeros of System. [4]

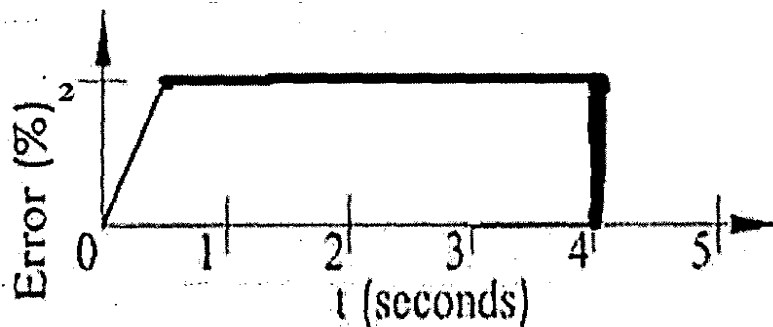
OR

- Q6) a)** Find the transfer function of the following block diagram. [6]



- b) State three ways in which system can be represented mathematically. [4]

- Q7) a)** Explain the importance of Transient response specifications w.r.t. performance of control system. [4]
- b)** Fig. 3 shows an error time graph. Sketch the PI controller output as function of time For  $0 \leq t \leq 1$ ,  $e(t) = t$ , Assume slope 1. [6]



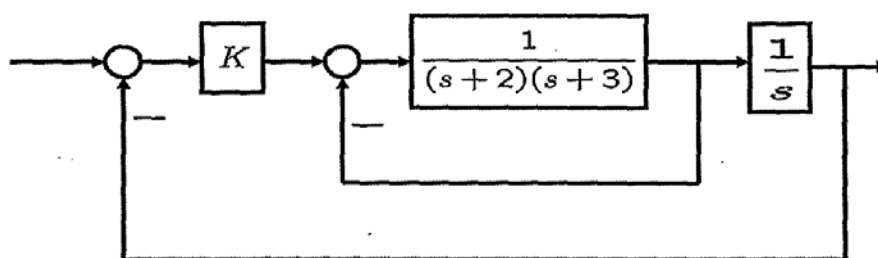
OR

- Q8) a)** For the open loop transfer function given below : [6]

$$GH(s) = \frac{500K(S+2)}{S(S+1)(S^2+5S+100)} \quad (S=j\omega)$$

- Construct the Bode plots,
  - The Gain crossover frequency and the Gain Margin,
  - The phase crossover frequency and the Phase Margin,
  - Design the value of  $K$  to change the gain crossover frequency to 1 rad/s, then find the corresponding Gain and Phase
- b)** Explain marginal stability. [4]

- Q9) a)** Refer the figure no. 4. and Determine [6]



- Determine the range of  $K$  that stabilize the closed loop system.
- b)** Discuss the importance of controllability in a control system. [4]

OR

- Q10)a)** Explain the steps of sketch the Bode Plot. What are the advantages and limitations of Bode Plots? [6]

- b) Write a note on proportional + integral + derivative controller. [4]



Total No. of Questions : 8]

SEAT No. :

PC-4754

[Total No. of Pages : 3

[6355]-223

**M.E. (Mechanical-Heat Power/Mechanical-Energy Engg.)**  
**ADVANCED MATHEMATICS AND NUMERICAL METHODS**  
**(2017 Pattern) (Semester - I) (502501/507101)**

*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 logarithmic electronic pocket calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**Q1) a)** Find the positive root of  $x^4 - x = 10$  correct to three decimal places using Newton - Raphson Method. **[5]**

**b)** Fit a curve of the form  $y = ae^{bx}$  to the following data : **[5]**

$x$	0	1	2	3
$y$	1.05	2.10	3.85	8.30

**Q2) a)** Apply LU decomposition method to solve the equations : **[5]**

$$3x + 2y + 7z = 4$$

$$2x + 3y + z = 5$$

$$3x + 4y + z = 7$$

**b)** Give the values **[5]**

$$x : \quad 5 \quad 7 \quad 11 \quad 13 \quad 17$$

$$f(x) \quad 150 \quad 392 \quad 1452 \quad 2366 \quad 5202$$

evaluate  $f(g)$ , using Newton's divided difference formula.

**P.T.O.**

**Q3) a)** Find the cubic splines and Evaluate  $y(1.5)$  for the following data : [5]

$x$	1	2	3	4
$y$	1	2	5	11

b) Use Romberg's Method to compute  $\int_0^1 \frac{dx}{1+x^2}$  correct to 3 decimal places.

[5]

**Q4) a)** Find the largest Eigen Values and corresponding Eigen vectors of the matrix [5]

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 0 \end{bmatrix}$$

b) Compute the integral  $\int_5^{12} \frac{dx}{x}$  by applying Gaussian 3-point quadratures formula. [5]

**Q5) a)** Using Ceiven's method reduce the following matrix to the tridigonal 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  $h = 0.1$ , find  $y$  at  $x = 1.2$ . [5]

**Q6) a)** Using Adams-Bash forth predictor - corrector method find  $y$  at  $x = 0.4$ , given that  $\frac{dy}{dx} = x^2 - y$ ,  $y(0) = 1$ ,  $y(0.1) = 0.905125$ ,  $y(0.2) = 0.8212352$ ,  $y(0.3) = 0.7491509$ . [5]

- b) Use Gauss-Siedel method to solve the partial differential equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  represented by a mechanical system, carry out five iterations. Give that [5]

	1	1	
0			0
0	$u_3$	$u_4$	0
	$u_1$	$u_2$	
	0	0	

- Q7)** a) Use Crank-Nicholson method to solve  $\frac{\partial u}{\partial t} + \frac{\partial^2 u}{\partial x^2}$  subject to conditions  $u(x, 0) = 0, u(0, t) = 0, u(1, t) = 2t$ , assume  $\Delta x = h = 0.25$ , in two steps for time. [5]

- b) Solve the following simultaneous equations by Gauss-Seidal Method. (5 iteration). [5]

$$23x + 13y + 3z = 29$$

$$5x + 23y + 7z = 37$$

$$11x + y + 23z = 43$$

- Q8)** a) Solve the following differential equation using modified Euler's method :

$$\frac{dy}{dx} = x - y^2, y(0) = 1 \text{ to calculate } y \text{ at } x = 0.2 \text{ using step size of } 0.2 \quad [5]$$

- b) Solve  $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$  with conditions  $u(0, t) = u(1, t) = 0, u(x, 0) = \frac{x(1-x)}{2}, u_x(x, 0) = 0$  and taking  $h = k = 0.1$ , for  $0 \leq t \leq 0.4$ . [5]





[6355]-224

**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 whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, mollier charts, electronic pocket calculator and steam tables are allowed.*
- 5) *Assume suitable data if necessary.*

**Q1) a)** Define compressibility factor and explain generalized compressibility chart with neat sketch. **[5]**

b) Write the Vander Waals equation of state? What is the physical significance of the two constants that appear in the vander Waals equation? **[5]**

**Q2) a)** State and explain Gibbs Phase Rule. **[4]**

b) Find the dryness fraction, specific volume and internal energy of steam at 7 bar and enthalpy 2550 kJ/kg. **[6]**

**Q3) a)** Explain principle of increase of entropy? **[4]**

b) Determine the entropy change of 4 kg of a perfect gas whose temperature varies from 127°C to 227°C during a constant volume process. The specific heat varies linearly with absolute temperature and is represented by the relation :  $c_v = (0.48 + 0.0096 T)$  kJ/kg K. **[6]**

**Q4) a)** Write note on Energy Destruction. **[4]**

b) A 500-kg iron block is initially at 200°C and is allowed to cool to 27°C by transferring heat to the surrounding air at 27°C. Determine the reversible work and the irreversibility for this process. **[6]**

- Q5)** a) Explain Inversion curve and Joule Thomson coefficient. [5]  
b) Explain the Maxwell relations and explain their importance in thermodynamics. [5]
- Q6)** a) What is adiabatic flame temperature? [4]  
b) Methane ( $\text{CH}_4$ ) is burned with stoichiometric amount of air during a combustion process. Assuming complete combustion, determine the air-fuel and fuel-air ratio. The molar masses of C,  $\text{H}_2$  and air are 12 kg/kmol, 2 kg/kmol, and 29 kg/kmol, respectively. [6]
- Q7)** Write notes, on (any two) : [10]  
a) Mass and Mole fraction  
b) Fugacity and Activity  
c) T-dS relations



Total No. of Questions : 8]

SEAT No. :

PC-4756

[Total No. of Pages : 2

[6355]-225

**M.E. (Mechanical-Energy Engineering)**

**NON-CONVENTIONAL ENERGY SOURCES**

**(2017 Pattern) (Semester - I) (502503)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

- Q1)** a) What are the renewable energy sources? Describe briefly [5]  
b) What is the scenario of renewable energy sources at present in our country? [5]

- Q2)** a) Explain solar energy principle. [5]  
b) Write a note on: [5]  
i) Solar pumping  
ii) Solar applications

- Q3)** a) “Sun is major source of all types of energy”. Justify. [5]  
b) Describe the factors to be considered while selecting a site for wind power stations. [5]

- Q4)** a) Explain in detail the microhydel power plant. [5]  
b) What is meant by anaerobic digestion? Explain factors affecting it? [5]

*P.T.O.*

- Q5)** a) Discuss Geothermal energy generation in India [5]  
b) Describe working of any one type of OTEC power plant with diagram.[5]
- Q6)** a) Write a note on wave energy conversion? [5]  
b) Discuss the best method of tidal power generations. [5]
- Q7)** a) Explain hydrogen fuel cell energy system [5]  
b) What is the need of hybrid systems? [5]
- Q8)** Write a short note on any two: [10]  
a) Diesel PVsystem  
b) Wind PV system  
c) Solar wind system



Total No. of Questions : 7]

SEAT No. :

PC-4757

[Total No. of Pages : 3

[6355]-226

**M.E. (Mechanical - Energy Engineering)**

**ADVANCED HEAT TRANSFER**

**(2017 Pattern) (Semester - II) (502507)**

*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 cylindrical Coordinates with Unsteady State and Heat Generation for Anisotropic material and deduce it to

- a) 1-D Fourier Equation in r coordinate
- b) 2-D Laplace Equation in r and z coordinate
- c) 1-D Poisson's Equation in z coordinate

Write Derive Three Dimensional Heat Conduction Equation in spherical Coordinates **[10]**

**Q2)** a) Discuss following : **[5]**

- i) Effect of variation of temperature on thermal conductivity of metals.
- ii) Effect of variation of temperature on thermal conductivity of non-metals.

b) What is need of Heisler and Grober charts? **[5]**

**Q3)** a) Write note on : **[5]**

- i) Reynolds analogy
- ii) Chilton-Colburn analogy

b) Experimental results for the local heat transfer heat transfer coefficient  $h_x$  for flow over a flat plate with an extremely rough surface were found to fit the relation

$$h_x(x) = x^{-0.1}$$

where  $x$  (m) is the distance from the leading edge of the plate. Develop an expression for the ratio of the average heat transfer coefficient for a plate of length  $x$  to the local heat transfer coefficient  $h_x$  at  $x$ . **[5]**

**P.T.O.**

- Q4) a)** Explain following in brief related with internal forced convection [5]
- Entrance region
  - Constant surface heat flux
- b) Water enters a tube with fully developed velocity and uniform temperature of 20°C. The inside diameter of the tube is 4 cm and its length is 9 m. It is desired to heat the water to 60°C by maintaining the surface at 90°C uniform temperature. Determine the mass flow rate to satisfy the above condition. Take [5]
- $k = 0.64 \text{ W/m } ^\circ\text{C}$ ,  $\nu = 0.62 \times 10^{-6} \text{ m}^2/\text{s}$ ,  $\rho = 995 \text{ Kg/m}^3$ ,  $C_p = 4187 \text{ KJ/kg } ^\circ\text{C}$ ,  $\beta = 4.25 \times 10^{-4} \text{ per degree Kelvin}$
- Use following correlations
- $$\text{Nu} = 0.023 \text{ Re}_d^{0.8} \text{Pr}^{0.4}$$
- Q5) a)** Discuss physical significance of any five dimensionless numbers in forced and natural convection. [5]
- b) Explain with significance: Thermal Boundary Layer. How thickness of VBL and thickness TBL are correlated with Prandtl number? [5]
- 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
- $\text{Nu} = 4.6$  for laminar flow, Constant heat flux
- $\text{Nu} = 3.66$  for laminar flow, Constant wall temperature
- $\text{Nu} = 0.023 \text{ Re}_d^{(0.8)} \text{Pr}^{(0.4)}$  for turbulent flow, Constant heat flux or wall temp
- b) Explain with neat sketch different regimes of force boiling. [5]
- Q7) a)** What is view factor? What is view factor with respect to itself? Discuss enclosure theorem. [5]
- b) What do you mean by radiation shield? Derive expression for the same. [5]

**Figure1: Physical Properties of Air (1 atm)**

$t$ °C	$\rho$ kg/m <sup>3</sup>	$c_p$ kJ/kgK	$k \times 10^2$ W/mK	$\alpha \times 10^4$ m <sup>2</sup> /hr	$\mu \times 10^2$ kg/hr-m	$\nu \times 10^6$ m <sup>2</sup> /s	$Pr$ –
10	1.247	1.005	2.511	7.22	6.346	14.16	0.705
20	1.205	1.005	2.592	7.71	6.533	15.06	0.703
30	1.165	1.005	2.673	8.23	6.717	16.00	0.701
40	1.128	1.005	2.755	8.75	6.904	16.96	0.699
50	1.093	1.005	2.824	9.29	7.067	17.95	0.698
60	1.060	1.005	2.894	9.79	7.221	18.97	0.696
70	1.029	1.009	3.045	10.28	7.523	21.09	0.692
80	1.000	1.009	3.045	10.87	7.523	21.09	0.692
90	0.972	1.009	3.127	11.48	7.701	22.10	0.690
100	0.946	1.009	3.208	12.11	7.880	23.13	0.688
120	0.898	1.009	3.336	13.26	8.170	25.45	0.686
140	0.854	1.013	3.487	14.52	8.479	27.80	0.684
160	0.815	1.017	3.638	15.80	8.786	30.08	0.682
180	0.779	1.022	3.778	17.10	9.070	32.49	0.681
200	0.746	1.026	3.929	18.49	9.380	34.85	0.680

**Figure 2: Physical Properties of Water (Liquid state)**

$t$ °C	$\rho$ kg/m <sup>3</sup>	$c_p$ kJ/kgK	$k \times 10^2$ W/mK	$\alpha \times 10^4$ m <sup>2</sup> /hr	$\mu \times 10^2$ kg/hr-m	$\nu \times 10^6$ m <sup>2</sup> /s	$Pr$ –
0	999.9	4.212	55.093	4.71	644.093	1.789	13.67
10	999.7	4.191	57.418	4.94	469.818	1.306	9.54
20	998.2	4.183	59.859	5.16	361.892	1.006	7.02
30	995.7	4.174	61.718	5.35	288.668	0.805	5.42
40	992.2	4.174	63.345	5.51	235.602	0.659	4.31
50	988.1	4.178	64.740	5.65	197.771	0.556	3.54
60	983.2	4.178	65.902	5.78	169.305	0.478	2.98
70	977.8	4.187	66.716	5.87	146.370	0.415	2.55
80	971.8	4.195	67.413	5.96	127.924	0.365	2.21
90	965.3	4.208	67.995	6.03	113.507	0.326	1.95
100	958.4	4.220	68.227	6.09	101.910	0.295	1.75



Total No. of Questions : 8]

SEAT No. :

PC-4758

[Total No. of Pages : 2

**[6355]-227**

**FY.M.E. (Mechanical-Energy Engineering)**  
**ENERGY CONVERSION AND ENVIRONMENT**  
**(2017 Pattern) (Semester - II) (502508)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

**Q1) a)** Describe Proximate and Ultimate analysis of coal **[6]**

b) Explain renewable and non-renewable energy sources **[4]**

**Q2)** The following particulars refer to a stage of a Parson's steam turbine comprising one ring of fixed blades and one ring of moving blades; Mean diameter of blade ring = 75cm, R.P.M. = 3500, Steam velocity at exit of the blades 170 m/s, Blade outlet angle =  $20^\circ$ , Steam flow through blades = 8 kg/s. **[10]**

Draw the velocity diagram and find the following

- i) Blade inlet angle,
- ii) Tangential force on the ring of moving blades,
- iii) Power developed in a stage.

**Q3) a)** Explain advantages and disadvantages of Diesel power plants **[4]**

b) Explain Energy Saving Opportunities in Cooling Towers **[6]**

*P.T.O.*



- Q4)** a) Explain suitability of compressor for different applications. [5]  
b) Define various components of the compressed air system. [5]
- Q5)** a) Explain the operating principle of a waste heat recovery boiler with example. [5]  
b) Explain heat pump with neat sketch. [5]
- Q6)** a) What do you understand by energy efficiency in respect of refrigeration plant [4]  
b) Explain centrifugal compressor with neat sketch used in refrigeration system [6]
- Q7)** Explain in detail Reheat and intercooling methods for improvement of the efficiency of gas turbine power plant with cycle analysis. [10]
- Q8)** Write a short note on the following [10]  
a) Impulse Turbines  
b) Reaction Turbine



Total No. of Questions : 7]

SEAT No. :

PC4759

[6355]-231

[Total No. of Pages :2

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

ADVANCED THERMODYNAMICS AND

COMBUSTION TECHNOLOGY

(2017 Pattern) (Semester - I) (502102)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Solve any five questions.
- 2) Draw neat diagrams whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of steam tables, Mollier charts, scientific calculators is allowed.
- 5) Assume suitable data if necessary.

**Q1)** a) What is the physical significance of the compressibility factor? State the law of corresponding states. [5]

b) Discuss Triple point of water with P-V-T surfaces. [5]

**Q2)** a) Explain Nernst heat theorem and thermal death of universe. [6]

b) What do you mean by the term 'Entropy'? Show that for an irreversible process  $ds > \frac{\delta Q}{T}$ . [4]

**Q3)** a) What is the second law efficiency? How does it differ from the first law efficiency? [4]

b) 15 kg of water is heated in an insulated tank by a churning process from 300k to 340k. If the surrounding temperature is 300k, find the loss in availability for the process. [6]

**Q4)** a) Derive the Clapeyron equation. [5]

b) Derive the relation  $C_p - C_v = -T \left( \frac{\partial V}{\partial T} \right)_P^2 \left( \frac{\partial P}{\partial V} \right)_T$  [5]

P.T.O.

- Q5)** a) Define Mass & Mole fraction. [2]  
 b) Explain Dalton's law of partial pressure. [4]  
 c) Explain Kay's rule. [4]

- Q6)** a) Explain the term Enthalpy of formation and Enthalpy of combustion. [4]  
 b) Diesel fuel ( $C_{12}H_{26}$ ) at  $25^\circ\text{C}$  is burned in a steady flow combustion chamber with 20 percent excess air that also enters at  $25^\circ\text{C}$ . The product leaves the combustion chamber at 500k. Assuming combustion is complete, determine the required mass flow rate of diesel fuel to supply heat at a rate of 200 kJ/s. [6]

Substance	$h^\circ_f$ kJ/kmol	$\bar{h}_{298k}$ kJ/kmol	$\bar{h}_{500k}$ kJ/kmol
$C_{12}H_{26}$	-291010	-	-
$O_2$	0	8682	14770
$N_2$	0	8669	14581
$H_2O_{(g)}$	-241820	9904	16828
$CO_2$	-393520	9364	17678

- Q7)** a) Explain thermodynamics of Aging and Death. [5]  
 b) Explain thermodynamics of Nutrition and exercise. [5]



Total No. of Questions : 7]

SEAT No. :

PC4760

[Total No. of Pages : 2

[6355]-232

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) Discuss Reynolds transport theorem. What is its significance? [5]  
b) Explain Streamlines, Streaklines, and Pathlines. [5]

- Q2) Derive conservation of mass equation with differential analysis and write deduce the same for following cases in Cartesian as well as polar coordinate system. [10]

- a) Steady Compressible Flow
- b) Incompressible Flow

- 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) Write Euler equations, Bernoulli equation and discuss it's applications. [4]

- Q4) a) Elaborate the concept and applications of Magnus effect. [5]  
b) What is flow separation? What causes it? What is the effect of flow separation on the drag coefficient? [5]

- Q5) a) A 2.2-cm-outer-diameter pipe is to span across a river at a 30-m-wide section while being completely immersed in water. The average flow velocity of water is 4 m/s and the water temperature is 15°C. Determine the drag force exerted on the pipe by the river. Take dynamic viscosity of water as  $1.138 \times 10^{-3}$  kg/ms, drag coefficient = 1. Density of water = 1000 kg/m<sup>3</sup>. [5]  
b) Explain the development of the velocity boundary layer over a plate with diagram. [5]

P.T.O.

- Q6)** a) A volcano has erupted, spewing stones, steam, and ash several thousand feet into the atmosphere. After some time, the particles begin to settle to the ground. Consider a nearly spherical ash particle of diameter 50 mm, falling in air whose temperature is  $(-50^{\circ}\text{C})$  and whose pressure is 55 kPa. The density of the particle is  $1240 \text{ kg/m}^3$ , density of air  $0.8588 \text{ kg/m}^3$ , Viscosity of air  $1.474 \times 10^{-5} \text{ kg/ms}$ . Estimate the terminal velocity of this particle at this altitude, Reynold's number. [5]
- b) Elaborate the significance of Turbulence modeling. Write equations for  $k - \epsilon$  (epsilon) model. [5]
- Q7)** a) The fluid enters a converging-diverging nozzle at 1000 kPa and  $527^{\circ}\text{C}$  with a negligible velocity. The flow is steady, one-dimensional and isentropic with specific heat ratio as 1.4. The gas constant of air is  $0.287 \text{ kJ/kg K}$ , for an exit Mach number is 2 and a throat area of  $20 \text{ cm}^2$ , determine. [5]
- Pressure and temperature at Throat conditions
  - Exit plane conditions, including the exit area
  - Mass flow rate through the nozzle
- b) Elaborate the Normal shock and oblique shock wave. [5]

Table 1

One-dimensional isentropic compressible-flow functions for an ideal gas with $k = 1.4$ .					
Ma	Ma*	A/A*	P/P <sub>0</sub>	$\rho/\rho_0$	T/T <sub>0</sub>
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
1.8	1.5360	1.4390	0.1740	0.2868	0.6068
2.0	1.6330	1.6875	0.1278	0.2300	0.5556
2.2	1.7179	2.0050	0.0935	0.1841	0.5081
2.4	1.7922	2.4031	0.0684	0.1472	0.4647
2.6	1.8571	2.8960	0.0501	0.1179	0.4252
2.8	1.9140	3.5001	0.0368	0.0946	0.3894
3.0	1.9640	4.2346	0.0272	0.0760	0.3571



Total No. of Questions : 7]

SEAT No. :

PC 4761

[6355]-233

[Total No. of Pages : 4

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 indicates 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) What do you mean by initial and boundary conditions? Explain in brief Neumann and Dirichlet boundary conditions. [5]
- b) A metal plate of 4mm thickness ( $k=95.5 \text{ W/m}^0\text{C}$ ) is exposed to vapour at 100 degrees Celsius on one side and cooling water at 25 degrees Celsius on opposite side. The heat transfer coefficients on vapour and water side are  $14500 \text{ W/m}^2\text{K}$  and  $2250 \text{ W/m}^2\text{K}$  respectively. Determine [5]
- i) The rate of Heat transfer
  - ii) The overall heat transfer coefficient
- Q2)** a) What do you mean by Overall heat transfer Coefficient? Explain the same in relation to tubular heat exchanger. [5]
- b) An ordinary egg can be approximated as a 5-cm-diameter sphere. The egg is initially at a uniform temperature of  $5^\circ\text{C}$  and is dropped into boiling water at  $95^\circ\text{C}$ . Taking the convection heat transfer coefficient to be  $h = 1257 \text{ W/m}^2 \text{ }^\circ\text{C}$ , determine how long it will take for the center of the egg to reach  $70^\circ\text{C}$ . Use One term approximation method. [5]
- Take -  $k = 0.627 \text{ W/m } ^\circ\text{C}$ ,  $\alpha = 0.151 \times 10^{-6} \text{ m}^2/\text{S}$
- Q3)** a) Explain physical significance of following dimensionless numbers. [5]
- i) Peclet Number
  - ii) Stanton Number
  - iii) Rayleigh Number
- b) A 2-m  $\times$  3-m flat plate is suspended in a room, and is subjected to air flow parallel to its surfaces along its 3-m-long side. The free stream temperature and velocity of air are  $20^\circ\text{C}$  and  $7\text{m/s}$ . The total drag force acting on the plate is measured to be  $0.86 \text{ N}$ . Determine the average friction Coefficient and average convection heat transfer coefficient for the plate based on modified Reynolds analogy. [5]

P.T.O.

- Q4) a)** Write Short Notes on following. [5]
- Thermal entrance region and length
  - Local and average Heat Transfer Coefficient
- b) A plate type 200 mm × 300 mm heater is immersed in water bath at 40 °C. The larger side of heater is maintained vertical. The heater rating is 3.5 kW. Determine the steady state temperature attended by the heater using following thermo physical properties. Consider heat transfer from one side of the plate  $k = 0.667 \text{ W/m}^\circ\text{C}$ ,  $\nu = 0.415 \times 10^{-6} \text{ m}^2/\text{S}$ ,  $\rho = 977.8 \text{ Kg/m}^3$ ,  $C_p = 4187 \text{ KJ/kg } ^\circ\text{C}$ ,  $\beta = 4.15 \times 10^{-4} \text{ per degree Kelvin}$  [5]
- For heat transfer by convection use following correlation
- $$\text{Nu} = 0.13 (\text{Ra})^{(0.33)}$$
- Q5) a)** Discuss concept of Thermal boundary layer. How thickness of VBL and thickness TBL are correlated with Prandtl number? [5]
- b) The steam at 165°C Condenses in the shell side of 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
- $$\text{Nu} = 4.6 \quad \text{for laminar flow, Constant heat flux}$$
- $$\text{Nu} = 3.66 \quad \text{for laminar flow, Constant wall temperature}$$
- $$\text{Nu} = 0.023 \text{Re}_d^{(0.8)} \text{Pr}^{(0.4)} \quad \text{for turbulent flow, Constant heat flux or wall temp}$$
- Q6) a)** Discuss with neat sketch different regimes of pool boiling curve. [5]
- b) Explain in brief [5]
- Forced convection boiling
  - Drop and film condensation
- Q7) a)** What do you by view factor? Discuss enclosure theorem and Reciprocity theorm. [5]
- b) Two parallel, infinite gray surface are maintained at temperature of 127°C and 227°C respectively. If the temperature of the hot surface is increased to 327°C. By What factor is the net radiation exchange per unit area increased? Assume the emissivities of colder and hotter surfaces to be 0.9 and 0.7, respectively. [5]



Table 1- Coefficients used in the one -term approximate solution of transient 1D heat conduction

Bi	Plane Wall		Cylinder		Sphere	
	$\lambda_1$	$A_1$	$\lambda_1$	$A_1$	$\lambda_1$	$A_1$
0.01	0.0998	1.0017	0.1412	1.0025	0.1730	1.0030
0.02	0.1410	1.0033	0.1995	1.0050	0.2445	1.0060
0.04	0.1987	1.0066	0.2814	1.0099	0.3450	1.0120
0.06	0.2425	1.0098	0.3438	1.0148	0.4217	1.0179
0.08	0.2791	1.0130	0.3960	1.0197	0.4860	1.0239
0.1	0.3111	1.0161	0.4417	1.0246	0.5423	1.0298
0.2	0.4328	1.0311	0.6170	1.0483	0.7593	1.0592
0.3	0.5218	1.0450	0.7465	1.0712	0.9208	1.0880
0.4	0.5932	1.0580	0.8516	1.0931	1.0528	1.1164
0.5	0.6533	1.0701	0.9408	1.1143	1.1656	1.1441
0.6	0.7051	1.0814	1.0184	1.1345	1.2644	1.1713
0.7	0.7506	1.0918	1.0873	1.1539	1.3525	1.1978
0.8	0.7910	1.1016	1.1490	1.1724	1.4320	1.2236
0.9	0.8274	1.1107	1.2048	1.1902	1.5044	1.2488
1.0	0.8603	1.1191	1.2558	1.2071	1.5708	1.2732
2.0	1.0769	1.1785	1.5995	1.3384	2.0288	1.4793
3.0	1.1925	1.2102	1.7887	1.4191	2.2889	1.6227
4.0	1.2646	1.2287	1.9081	1.4698	2.4556	1.7202
5.0	1.3138	1.2403	1.9898	1.5029	2.5704	1.7870
6.0	1.3496	1.2479	2.0490	1.5253	2.6537	1.8338
7.0	1.3766	1.2532	2.0937	1.5411	2.7165	1.8673
8.0	1.3978	1.2570	2.1286	1.5526	2.7654	1.8920
9.0	1.4149	1.2598	2.1566	1.5611	2.8044	1.9106
10.0	1.4289	1.2620	2.1795	1.5677	2.8363	1.9249
20.0	1.4961	1.2699	2.2880	1.5919	2.9857	1.9781
30.0	1.5202	1.2717	2.3261	1.5973	3.0372	1.9898
40.0	1.5325	1.2723	2.3455	1.5993	3.0632	1.9942
50.0	1.5400	1.2727	2.3572	1.6002	3.0788	1.9962
100.0	1.5552	1.2731	2.3809	1.6015	3.1102	1.9990
$\infty$	1.5708	1.2732	2.4048	1.6021	3.1416	2.0000

Table 2- Physical Properties of Air (1 atm)

$t$ °C	$\rho$ kg/m <sup>3</sup>	$c_p$ kJ/kgK	$k \times 10^2$ W/mK	$\alpha \times 10^4$ m <sup>2</sup> /hr	$\mu \times 10^2$ kg/hr-m	$\nu \times 10^6$ m <sup>2</sup> /s	$Pr$ –
10	1.247	1.005	2.511	7.22	6.346	14.16	0.705
20	1.205	1.005	2.592	7.71	6.533	15.06	0.703
30	1.165	1.005	2.673	8.23	6.717	16.00	0.701
40	1.128	1.005	2.755	8.75	6.904	16.96	0.699
50	1.093	1.005	2.824	9.29	7.067	17.95	0.698
60	1.060	1.005	2.894	9.79	7.221	18.97	0.696
70	1.029	1.009	3.045	10.28	7.523	21.09	0.692
80	1.000	1.009	3.045	10.87	7.523	21.09	0.692
90	0.972	1.009	3.127	11.48	7.701	22.10	0.690
100	0.946	1.009	3.208	12.11	7.880	23.13	0.688
120	0.898	1.009	3.336	13.26	8.170	25.45	0.686
140	0.854	1.013	3.487	14.52	8.479	27.80	0.684
160	0.815	1.017	3.638	15.80	8.786	30.08	0.682
180	0.779	1.022	3.778	17.10	9.070	32.49	0.681
200	0.746	1.026	3.929	18.49	9.380	34.85	0.680



Table 3 - Physical Properties of water (liquid state)

$t$ °C	$\rho$ kg/m <sup>3</sup>	$c_p$ kJ/kgK	$k \times 10^2$ W/mK	$\alpha \times 10^4$ m <sup>2</sup> /hr	$\mu \times 10^2$ kg/hr-m	$\nu \times 10^6$ m <sup>2</sup> /s	$Pr$ –
0	999.9	4.212	55.093	4.71	644.093	1.789	13.67
10	999.7	4.191	57.418	4.94	469.818	1.306	9.54
20	998.2	4.183	59.859	5.16	361.892	1.006	7.02
30	995.7	4.174	61.718	5.35	288.668	0.805	5.42
40	992.2	4.174	63.345	5.51	235.602	0.659	4.31
50	988.1	4.178	64.740	5.65	197.771	0.556	3.54
60	983.2	4.178	65.902	5.78	169.305	0.478	2.98
70	977.8	4.187	66.716	5.87	146.370	0.415	2.55
80	971.8	4.195	67.413	5.96	127.924	0.365	2.21
90	965.3	4.208	67.995	6.03	113.507	0.326	1.95
100	958.4	4.220	68.227	6.09	101.910	0.295	1.75



Total No. of Questions : 7]

SEAT No. :

**PC4762**

[Total No. of Pages : 2

**[6355]-234**

**First Year M.E. (Mechanical) (Heat Power Engg.)**

**AIR CONDITIONING TECHNOLOGY**

**(2017 Pattern) (Semester - II) (502108)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any 5 questions out of 7.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Assume suitable data if necessary and mention it clearly.*
- 4) *Use of steam table, p-h chart, Psychrometric chart and scientific calculator is allowed.*
- 5) *Figures to the right side indicate full marks.*

**Q1) a)** Explain the significance of Dry bulb temperature, Relative humidity, Bypass factor and Air washer. **[4]**

b) Explain the significance of RSHF, GSHF and ESHF. **[6]**

**Q2) a)** What are the factors that affect IAQ in the building. **[4]**

b) 30 m<sup>3</sup>/min of stream of moist air at 15°C DBT and 13°C WBT are mixed with 12 m<sup>3</sup>/min of a second stream at 25°C DBT and 18°C WBT. Barometric pressure is one standard atmosphere. Determine the dry bulb and wet bulb temperature of the resulting mixture. **[6]**

**Q3)** 100 m<sup>3</sup>/min outdoor air at 43.3°C DBT and 37% relative humidity is mixed with 200 m<sup>3</sup>/min of air at 38.2°C DBT and 24.5°C WBT. The mixed air is dehumidified first by a cooling coil having bypass factor of 0.32 and apparatus dew point of 15°C and then by a chemical dehumidifier at 30°C dry bulb temperature. Air is then passed over a cooling coil whose surface temperature is 15°C and bypass factor 0.26. calculate: **[10]**

- a) Capacity of two cooling coils in tons of refrigeration
- b) Capacity of coil dehumidifier in kg/min
- c) Capacity of chemical dehumidifier in kg/min
- d) Total dehumidifying capacity of the system in kg/min.

**P.T.O.**

**Q4)** The following data relates to the office air conditioning plant having maximum seating capacity of 25 persons: [10]

Outside design condition = 34°C DBT, 28°C WBT

Inside design conditions = 24°C DBT, 50% RH

Solar heat gain = 9000 W

Latent heat gain per person = 100 W

Sensible heat gain per person = 95 W

Lighting Load = 2300 W

Sensible heat load from other sources = 11600 W

Infiltration load = 15 m<sup>3</sup>/min

Assure 40% fresh air and 60% of recalculated air passing through the evaporator coil and the by-pass factor of 0.15, find the dew point temperature of the coil and the capacity of the plant.

**Q5)** a) Describe the procedure for the Duct design. [4]

b) With the help of example, explain static regain method of Duct design.[6]

**Q6)** a) Explain kitchen exhaust ventilation system. [4]

b) Explain in details on ventilation systems of Hospital and office buildings. [6]

**Q7)** a) Explain the significance of chiller ceiling and chiller beams. [4]

b) Short note on: [6]

i) Desiccant Dehumidification

ii) Types of ventilation system



Total No. of Questions : 7]

SEAT No. :

**PC4763**

[Total No. of Pages : 2

**[6355]-235**

**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 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 dynamic characteristics of instruments. **[5]**

b) Explain the necessity of calibration. Describe the calibration procedure for a thermocouple. **[5]**

**Q2) a)** What are different errors involved in measurement? Discuss the sources of the same. **[5]**

b) Discuss regression analysis with example. **[5]**

**Q3) a)** Discuss working principle of thermocouples with diagram. **[5]**

b) Evaluate Correlation Coefficient from the following data **[5]**

X	50	60	58	47	49	33	65	43	46	68
Y	48	65	50	48	55	58	63	48	50	70

**Q4) a)** Elaborate method for assessment of the velocity of hot gases. **[5]**

b) Discuss technique measurement of humidity. **[5]**

**P.T.O.**

- Q5)** a) Explain construction and working of any one torque measurement method. [5]  
b) How LVDT works? What are merits of the same? [5]
- Q6)** a) Explain any one instrument used for liquid level measurement. [5]  
b) Write note on PI and PID controllers. [5]
- Q7)** Explain in brief. [10]  
a) Uncertainty analysis  
b) Stroboscope



Total No. of Questions : 7]

SEAT No. :

**PC4764**

[Total No. of Pages : 2

**[6355]-236**

**S.Y.M.E. (Mechanical)/(Heat Power)  
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 mathematical nature of parabolic equation and their physical boundary conditions. **[4]**
- b) What is the importance of the mass conservation equation in fluid mechanics, and derive for it. **[6]**
- Q2)** a) Write a short note on Dirichlet, Neumann and Robbin boundary conditions. **[6]**
- b) Explain the significance of Substantial and Local Derivative in fluid mechanics. **[4]**
- Q3)** a) Difference between FDM and FVM. **[4]**
- b) Critically analyze the derivation of the discretized form of the steady, one-dimensional heat conduction equation. **[6]**
- Q4)** a) Write two dimensional heat convection-diffusion equation and discretize it with finite volume method. **[7]**
- b) Describe the significance of the Peclet number and its importance. **[3]**
- Q5)** a) Importance of Pressure correction method in SIMPLE algorithm. **[4]**
- b) Explain the significance of 1-D transient convection-diffusion system. **[6]**

**P.T.O.**

**Q6)** Outline the obstacles encountered in solving the Navier-Stokes equations and elaborate on the implementation of the SIMPLE algorithm for tackling the 2-D Navier-Stokes equations. **[10]**

**Q7) a)** Discuss the importance of incorporating turbulence modeling in computational fluid dynamics (CFD) and provide a detailed explanation of the Reynolds-average Navier-Stokes (RANS) equations. **[6]**

b) Explain the **[4]**

i)  $k$ - $\epsilon$  turbulence model and

ii)  $k$ - $\omega$  turbulence model



Total No. of Questions : 7]

SEAT No. :

**PC4765**

**[6355]-237**

[Total No. of Pages : 2

**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) What is heat exchanger? Classify the heat exchangers. [6]

b) Explain hydraulic testing of heat exchanger? [4]

**Q2)** a) Explain a method for determining effectiveness of heat exchanger. [6]

b) Explain the various parameters to be consider for designing of heat exchangers. [4]

**Q3)** a) What is significance of pressure drop estimation? [6]

b) Explain the process for pressure measurement in tubular heat exchangers. [4]

**Q4)** a) How the surface properties does affects the overall heat transfer coefficient? [6]

b) Write a note on temperature difference distribution in counter flow heat exchanger. [4]

**Q5)** a) What are various types of cooling towers? [6]

b) Explain thermal performance testing of cooling tower. [4]

**P.T.O.**



- Q6)** a) What is insulation? Explain its importance in furnace. [6]  
b) What the parameters to be considered to design heat pipe. [4]

- Q7)** a) What is importance of critical thickness of insulation? [6]  
b) Write a note on thermal interface materials. [4]



Total No. of Questions : 8]

SEAT No. :

**PC4766**

**[6355]-238**

[Total No. of Pages :2

**M.E. - I (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) Explain the concept of modeling in time and frequency domain with an example. [5]

b) Discuss the use of Force/Torque Balance in the EOM of Mechanical Systems. [5]

**Q2)** a) Describe the process of linearization of a non-linear system using Taylor's Series. [5]

b) Explain the concept of Modeling of MDOF system with an example. [5]

**Q3)** a) What is Bond Graph Modeling? Discuss its standard elements. [5]

b) Create a Bond Graph Model of an Electric Motor. [5]

**Q4)** a) Discuss the concept of Parametric Identification and its importance. [5]

b) Explain the process of Least Square identification of 1st and 2nd order systems. [5]

**Q5)** a) What is Non-parametric identification? Discuss the experimental determination of frequency response. [5]

b) Explain the concept of Time domain and frequency domain identification. [5]

**P.T.O.**

- Q6)** a) Discuss the concept of Kalman Filter and its types. [5]  
b) Provide an example of State Estimation using Kalman Filter. [5]
- Q7)** a) Explain the concept of Neural Networks and Artificial Neural Networks. [5]  
b) Discuss the Basic Learning Laws in Supervised and Un-Supervised Learning. [5]
- Q8)** a) What is Fuzzy Logic? Discuss the concept of Membership Functions. [5]  
b) Explain the process of De-Fuzzification Techniques. [5]



Total No. of Questions : 8]

SEAT No. :

**PC4767**

**[6355]-239**

[Total No. of Pages :2

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

**Q1)** a) Discuss the concept of State Space modelling. How is it used in Control Systems? [5]

b) Explain the concept of State Transition Matrix with an example. [5]

**Q2)** a) Discuss the solution to State Equation. How does it relate to the system response? [5]

b) Explain the concept of Poles and Zeros in Control Systems. [5]

**Q3)** a) Discuss the response of first order and second order system. How does it affect the system performance? [5]

b) Explain the concept of Steady state error with an example. [5]

**Q4)** a) What is the Lyapunov Criterion? How is it used to determine the stability of a system? [5]

b) Discuss the concept of Controllability & Observability. How does Condition Number affect them? [5]

**Q5)** a) Explain the concept of Full State Feedback (FSF) Control. How is it implemented using Pole Placement? [5]

b) Discuss the transformation of State Space model into Control Canonical Form. [5]

**P.T.O.**

- Q6)** a) What is Pole Placement? How is it used in system in Control Canonical Form? [5]  
b) Explain the concept of Linear Quadratic Regulator type Optimal Control. [5]
- Q7)** a) Define Linear Observer (Estimator). How is it designed using Pole Placement? [5]  
b) Discuss the transformation of State Space model into Observer Canonical Form. [5]
- Q8)** a) Explain the design of Reduced Order Observer using Pole Placement. [5]  
b) Discuss the concept of Compensator and its role in a controlled system. [5]



Total No. of Questions : 7]

SEAT No. :

**PC4768**

[Total No. of Pages : 2

**[6355]-240**

**First Year M.E. (Mechanical/Mechatronics)**

**SENSORS, TRANSDUCERS OF INTERFACING TECHNIQUES**

**(2017 Pattern) (Semester - I) (502803)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1) a)** What are the general consideration of data analysis? Explain the role of experiments. **[5]**

b) With suitable example explain the chi-square test of goodness of fit. **[5]**

**Q2) a)** Explain the operation of linear variable differential transducer (LVDT) using neat diagram. State its advantages and drawbacks. **[5]**

b) Draw & explain the Hall effect transducer state its applications. **[5]**

**Q3) a)** With the help of neat diagram explain the operation of pirani thermal conductivity gauge. **[5]**

b) Explain diaphragm & bellows gauges with neat sketch. **[5]**

**Q4) a)** State the different types of flowmeter & explain operation of any one with neat diagram. **[5]**

b) Write a note on  $\Rightarrow$  pressure probes. **[5]**

**P.T.O.**

- Q5)** a) Explain the viscosity measurement in detail. [5]
- b) What is thermocouple? Explain the concept of thermocouple compensation. [5]
- Q6)** a) State the different applications of strain gauge & Explain any one in detail. [5]
- b) What is the effect of temperature variation on strain gauge? How it is compensated? [5]
- Q7)** a) Draw a neat block diagram of 4-channel data acquisition system & explain function of each block. [5]
- b) Write notes on : [5]
- i) Data storage
  - ii) Display



Total No. of Questions : 8]

SEAT No. :

PC-4769

[Total No. of Pages : 2

**[6355]-241**

**FY.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 side indicates full mark.*
- 4) Use of Calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**Q1) a)** Explain the principles of operation of a Programmable Logic Controller (PLC). **[5]**

b) Compare and contrast PLCs and Computers. **[5]**

**Q2) a)** Describe the function of the I/O section in a PLC. **[5]**

b) What is the difference between Discrete I/O Modules and Analog I/O Modules? **[5]**

**Q3) a)** Explain the role of logic gates in PLC programming. **[5]**

b) How Boolean Algebra used in developing circuits for PLCs? **[5]**

**Q4) a)** Write a PLC program to control a traffic light system. The system should follow the sequence: Green (O:2/0) -> Yellow (O:2/1) -> Red (O:2/2). Each light should be on for 5 seconds. **[5]**

b) Describe the process of programming word level logic instructions in a PLC. **[5]**

*P.T.O.*



- Q5)** a) Explain the role of Electromagnetic Control Relays in a PLC system. [5]  
b) Describe the function of Contactors and Motor Starters in a PLC system. [5]
- Q6)** a) Write a PLC program to control a motor. The motor should start when a start button (I:1/0) is pressed and stop when a stop button (I:1/1) is pressed. The motor status should be indicated by an output coil (O:2/0). [5]  
b) How do you program an On Delay Timer Instruction and an Off Delay Timer Instruction in a PLC? [5]
- Q7)** a) Explain the function of a Master Control Reset Instruction in a PLC system. [5]  
b) What is Jump Instructions and Subroutines in a PLC? [5]
- Q8)** a) What are Addition, Subtraction, Multiplication, and Division Instructions in a PLC? [5]  
b) Write a PLC program to control a conveyor belt system. The system should start when a start button (I:1/0) is pressed and stop when an object is detected by a proximity sensor (I:1/1). The conveyor belt status should be indicated by an output coil (O:2/0). [5]



Total No. of Questions : 8]

SEAT No. :

PC-4770

[Total No. of Pages : 2

[6355]-242

M.E. (Mechanical -Mechatronics)

CONTROL SYSTEM - II

(2017 Pattern) (Semester - II) (502808)

Time : 3 Hours]

[Max. Marks : 50

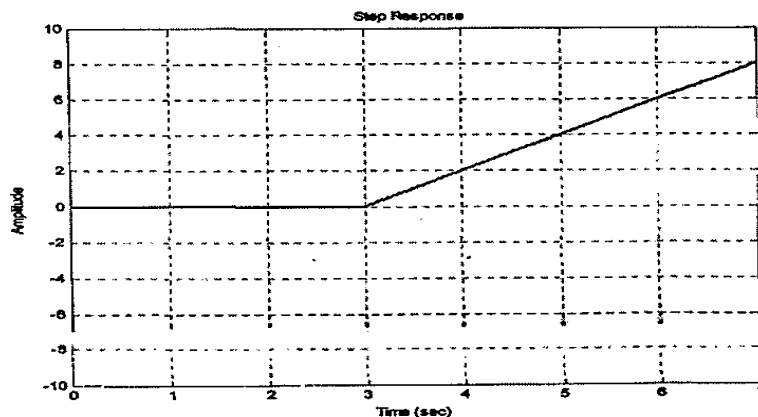
Instructions to the candidates :

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

Q1) a) Write a short note on Internal Model Controller. [5]

b) Discuss the integrator and integrator with time delay models. [5]

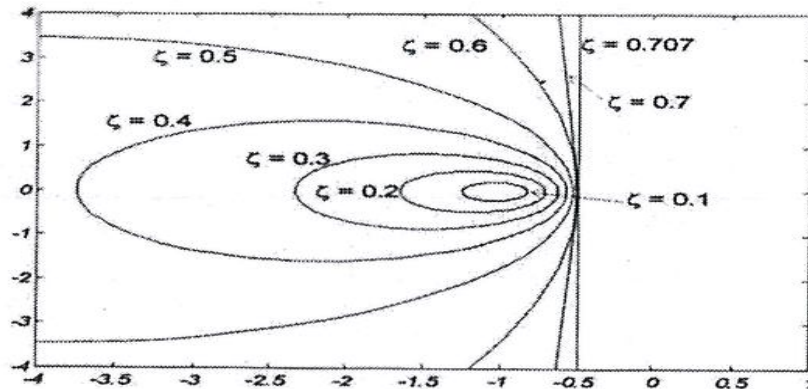
Q2) a) The step response of a model is shown below. Using suitable technique identify the model. [5]



b) Discuss the Nyquist stability criterion and its application. [5]

P.T.O.

- Q3) a)** Determine the maximum amplitude of the closed loop for below values of damping. [5]



- b) Discuss the concept of resonance frequency in frequency response. [5]
- Q4) a)** Describe the PID control and its series and parallel forms. [5]  
b) Discuss the issues of actuator saturation and integral windup in PID control. [5]
- Q5) a)** Explain the sensitivity of open loop and closed loop systems. [5]  
b) Discuss the relationship between sensitivity and gain/phase margin. [5]
- Q6) a)** Discuss the design of the Kappa Tau (KT) tuning method. [5]  
b) Explain the design of an internal model controller. [5]
- Q7) a)** In comparison to time domain analysis, discuss the advantages and the dis-advantages of the frequency domain analysis. [5]  
b) Write a short note on nyquist Stability Criterion. [5]
- Q8) a)** List the procedure for sketching the Bode Plot. [5]  
b) Discuss the importance of the “Integral” term in a PID control? [5]



Total No. of Questions : 8]

SEAT No. :

PC-4771

[Total No. of Pages : 2

[6355]-243

**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)** Explain the working principle Pressure control valve. **[5]**

b) Explain the working of gear type motor and vane type motor. **[5]**

**Q2) a)** Discuss the function of bleed off circuits. **[5]**

b) Explain different methods of starting of DC Motors. **[5]**

**Q3) a)** Explain the working principle of piston type motor with neat sketch. **[5]**

b) Sketch and explain external gear pump. **[5]**

**Q4) a)** List the applications of pressure reducing valve. **[5]**

b) Explain the purpose of using fail safe circuit in any hydraulic system. **[5]**

*P.T.O.*

- Q5)** a) Explain the Counter balance valve circuit used in the hydraulic circuit. [5]  
b) Explain the factor affecting speed of DC Motor. [5]
- Q6)** a) Explain the construction and working of following. [5]  
i) Meter in Circuit  
ii) Meter out Circuit.  
b) Explain different methods of starting of DC Motors. [5]
- Q7)** a) State the concept of slip power recovery system. [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]
- Q8)** a) A high-low circuit with an unloading valve is employed for press application. The press requires a flow rate of 200 l/min for high-speed opening and closing of the dies at maximum pressure of 30 bar. The work stroke needs a maximum pressure of 30 bar. The work stroke needs a maximum pressure of 400 bar but a flow rate between 12 and 20 l/min will be acceptable. Determine the suitable delivery for each pump. [6]  
b) Explain with a neat sketch construction & working of the double acting cylinder. [4]



Total No. of Questions : 8]

SEAT No. :

PC-4772

[Total No. of Pages : 2

**[6355]-244**

**M.E. (Mechatronics / Mechanical)**

**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)** Explain with neat diagram block diagram of PIC18F microcontroller. **[6]**

b) List and explain the instructions used for logic operations of PIC microcontroller. **[4]**

**Q2) a)** What is Integrated Development Environment (IDE)? What are the different tools in IDE? **[5]**

b) With neat diagram explain support devices of PIC18F microcontroller. **[5]**

**Q3) a)** What are different types of conditional and unconditional branch instructions? **[6]**

b) Explain the result after the execution of the following instructions. Identify the status of flags. **[4]**

i) MOVLW 5AH

ii) ADDLW 9FH

*P.T.O.*

- Q4)** a) What is subroutine? Illustrate with example. [5]  
b) With neat circuit diagram, explain interfacing of seven segment display to PIC microcontroller. [5]
- Q5)** a) With neat circuit diagram, how push buttons are interfaced to PIC microcontroller? [5]  
b) What are Interrupts? Explain different types of interrupts. [5]
- Q6)** a) List different timers used in PIC18F microcontroller. [5]  
b) Why Digital to Analog conversion is required? Explain any one method in detail. [5]
- Q7)** a) Explain basic concepts like baud rate, start bit and stop bit in serial communication. [5]  
b) Explain with block diagram Serial Peripheral Interface serial protocol.[5]
- Q8)** a) Discuss the software aspect of Embedded system design by considering Time and Temperature Monitoring System (TTMS) as a case study. [6]  
b) Explain the features of embedded systems. [4]



Total No. of Questions : 8]

SEAT No. :

PC-4773

[Total No. of Pages : 2

**[6355]-245**

**M.E. (Mechanical - Mechatronics)**

**FLEXIBLE MANUFACTURING SYSTEM**

**(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 side indicate full marks.*
- 4) Use of Calculator is allowed.*
- 5) Assume Suitable data, if necessary.*

**Q1) a)** List out the stages in Group Technology. **[4]**

b) Discuss the four factor that favour the use of manual assembly line. **[6]**

**Q2) a)** State the role of GT in CAD /CAM Integration. **[6]**

b) Discuss the application of single station automated cells. **[4]**

**Q3) a)** Explain the advantage & disadvantage of FMS implementation. **[6]**

b) Mention the various problems with conventional NC machines. **[4]**

**Q4) a)** Mention the points to be considered while designing of CNC tooling. **[6]**

b) Discuss the benefits of FMS. **[4]**

**Q5) a)** Explain in brief about DNC. **[4]**

b) Discuss the types of Coordinate measuring machines. **[6]**

*P.T.O.*



- Q6)** a) Explain the components of machine vision system [4]  
 b) The data shows the sample mean and range for 10 samples for size 5 each. [6]

Find the control limits for mean chart and range chart.

Sample	1	2	3	4	5	6	7	8	9	10
Mean	21	26	23	18	19	15	14	20	16	10
Range	5	6	9	7	4	6	8	9	4	7

- Q7)** a) Write Short note on-Concept of six sigma. [4]  
 b) Name the concurrent engineering design methodologies. [6]
- Q8)** a) Discuss the objectives of MRP System. [4]  
 b) Explain Design for Manufacturing (DFM) with respect to CE. [6]



Total No. of Questions : 5]

SEAT No. :

PC-4774

[Total No. of Pages : 2

[6355]-246

**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) What new innovations is possible using probability theory in Computer field. Explain with example. **[5]**
- b) Consider the elements defined in the universes X and Y as follows:  
 $X = \{2, 4, 6\}$  and  $Y = \{p, q, r\}$ . Find the Cartesian product of these sets, also find subset and draw coordinate diagram for the subset. **[5]**
- c) Differentiate between geometric and harmonic mean. **[5]**

**Q2) Solve any two :**

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

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

Find

- i)  $E(X)$ ,
  - ii)  $E(X^2)$
  - iii)  $E(X^3)$
- 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]**

**P.T.O.**

- c) 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]

**Q3) Solve any two :**

- a) Differentiate between geometric and harmonic mean. State the conditions when these mean are applicable. [5]
- b) Let  $G = (V, E)$  be an undirected graph with  $k$  components and  $|V| = n$  and  $|E| = m$ . prove that  $m \geq n - k$ . [5]
- c) The profit  $P$  earned, by a company, on some item is function of its units produced say  $X$  and is given by  $P = 800X - 2X^2$ , if the company's expenditure or interest, rent and salary of the staff be Rs. 1 lakh, show that the company will always be in loss. [5]

**Q4) Solve any two :**

- a) The following mistakes per page were observed in a book, [5]
- |                                    |     |    |    |   |   |
|------------------------------------|-----|----|----|---|---|
| No. of mistakes per page           | 0   | 1  | 2  | 3 | 4 |
| No. of times the mistakes occurred | 211 | 90 | 19 | 5 | 0 |
- Fit a Poisson distribution to fit data.
- b)  $\text{Var} [X+Y] = \text{Var} [X] + \text{Var} [Y]$ , if  $X$  and  $Y$  are independent random variables. [5]
- c) Using inference method, find the membership values of the triangular shapes for each of the following triangles:  $30^\circ, 60^\circ, 90^\circ$  [5]

**Q5) Solve any two :**

- a) 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]
- b) The following mistakes per page were observed in a book, [5]
- |                                    |     |    |    |   |   |
|------------------------------------|-----|----|----|---|---|
| No. of mistakes per page           | 0   | 1  | 2  | 3 | 4 |
| No. of times the mistakes occurred | 211 | 90 | 19 | 5 | 0 |
- Fit a Poisson distribution to fit data.
- c) State and prove Global Convergence Theorem. [5]



Total No. of Questions : 7]

SEAT No. :

PC-4775

[Total No. of Pages : 2

**[6355]-247**

**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.*

**Q1) a)** Explain Descriptive Software Process Models comprehensively. **[5]**

- b) Define and apply the concept of Software Requirement Engineering. Additionally, can you break down how you'd gather the must-do tasks (Functional) and the performance expectations (Non-functional) for a Hotel Management system? **[5]**

**Q2) a)** Explain following terms along with suitable examples: **[5]**

- i) Refinement      ii) Separation of concerns.

- b) Draw and Explain hierarchy of Classification of specification styles. **[5]**

**Q3) a)** How would you describe the different dimensions of a design model using an appropriate diagram? Also, could you outline the distinctions between the process dimension and the abstract dimension? **[5]**

- b) Describe the life cycle of Extreme Programming (XP) accompanied by an appropriate diagram. **[5]**

**P.T.O.**

**Q4)** a) List the typical sources of risks in a project and explain various risk mitigation and monitoring practices? [5]

b) Explore different methods of code cloning, providing examples for clarification. [5]

**Q5)** a) Why are program inspections effective in uncovering errors within a program?

Also, what kinds of errors are less likely to be found through inspections? [5]

b) Discuss the various quality attributes used to assess quality of the software. [5]

**Q6)** a) Analyze the application of Service-oriented Software Engineering with respect to case study. [5]

b) Explain the concept of Pair Programming. [5]

**Q7)** Write a brief overview on any two topics. [10]

A) Petrinets

B) Aspect Oriented Programming

C) GERT

D) CMMJ - IPPD model.



Total No. of Questions : 8]

SEAT No. :

PC-4776

[Total No. of Pages : 2

[6355]-248

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 side indicate full marks.
- 4) Assume suitable data if necessary.

**Q1)** a) Suppose you have algorithms with the five running times listed below. (Assume these are the exact running times). How much slower do each of these algorithms get when you (a) double the input size, or (b) increase the input size by one? [4]

i)  $n^3$     ii)  $100n^2$     iii)  $n \log n$     iv)  $2^n$

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]

P.T.O.

- 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]
- Q5) a)** Explain in detail the “Concept of Reducibility”. [4]
- b) Write and explain the greedy algorithm to solve the online k-server problem defined on planner trees. [6]
- Q6) 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]



Total No. of Questions : 6]

SEAT No. :

PC-4777

[Total No. of Pages : 2

[6355]-249

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

**Q1) a)** What are the different types of research? Clearly point out the difference between descriptive and analytical research with example. **[5]**

b) Briefly describe the different steps involved in a research process with suitable diagram. **[5]**

**Q2) a)** What is hypothesis? Explain Null hypothesis and alternative hypothesis. **[5]**

b) What is the necessity of defining the research problem? Explain any two techniques involved in defining a research problem. **[5]**

**Q3) a)** Differentiate between Survey and Experiment. **[5]**

b) Examine the merits and limitations of the observation method in collecting material. Illustrate your answer with suitable example. **[5]**

**Q4) a)** What are the different types of the Conference Paper? Distinguish between Conference Paper and Journal Paper. **[5]**

b) Explain the three pass approach to read the scientific paper. **[5]**

*P.T.O.*



- Q5)** a) Explain the significance of research report and narrate the various steps involved in writing a research report. [5]
- b) What is plagiarism of research work? Discuss types of plagiarism. [5]
- Q6)** a) Explain the process of patent a research finding. [5]
- b) What are the contents of research proposal? Explain in short Preamble / Introduction of research proposal. [5]



Total No. of Questions : 5]

SEAT No. :

PC-4778

[Total No. of Pages : 2

[6355]-250

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

**Q1) Solve any two :**

- a) Explain - Authentication and Authorization in detail with suitable example. [5]
- b) Explain Access Control Structures in detail. [5]
- c) What is Attack? Explain Security Triad in detail. [5]

**Q2) Solve any two :**

- a) Short note on Lattice Diagram and Security Kernel. [5]
- b) Explain Hardware Security Features. [5]
- c) Explain the Bell-LaPadula Model. [5]

**Q3) Solve any two :**

- a) Explain a Cross-Site Scripting with your own words. [5]
- b) Explain JavaScript Hijacking. [5]
- c) Explain Domain Name System (DNS) and DNS cache poisoning. [5]

*P.T.O.*

**Q4) Solve any two :**

- a) Explain cyber stalking in forensic analysis. [5]
- b) How to preserve Forensic Data? How Data is Processed? [5]
- c) Discuss Violent Crime and Digital Evidence in real time applications. [5]

**Q5) Solve any two :**

- a) Explain Intrusion Investigation Feeding Analysis Back into the Detection Phase. [5]
- b) Explain Mobile Network Investigations. [5]
- c) Explain Forensic Analysis of the NTFS Master File Table (MFT). [5]



Total No. of Questions : 8]

SEAT No. :

**PC4779**

[Total No. of Pages : 2

**[6355]-251**

**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 Fundamental Cloud Security: Basic Terms and Concepts, Threat Agents, Cloud Security Threats. **[6]**

b) Write a note on Data Center Technology. **[4]**

**Q2)** a) Demonstrate Hypervisor Clustering architecture in Cloud Computing. **[6]**

b) Explain the functionality of the Kaggle Model. **[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-Nearest Neighbors (k-NN), k-means. **[6]**

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

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

i) Rapid Provisioning Architecture

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 : 5]

SEAT No. :

PC4780

[6355]-252

[Total No. of Pages : 4

**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) *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 of the following. **[10]**

- a) What is Operations Research? Discuss on “Defining the problem and Gathering Data”. **[5]**
- b) Write Short note on “Deriving Solution from the Model”. **[5]**
- c) Solve using Graphical method: **[5]**

$$\begin{aligned} &\text{Minimize } Z = 200x_1 + 300x_2, \\ &\text{subject to} \quad 1000x_1 + 1400x_2 \geq 20000 \\ &\quad \quad \quad 2000x_1 + 1200x_2 \geq 40000 \\ &\quad \quad \quad 2100x_1 + 4000x_2 \geq 44000 \quad \text{and } x_1, x_2 \geq 0 \end{aligned}$$

**Q2)** Solve any two of the following. **[10]**

- a) Solve the following LPP using Simplex method: **[5]**

$$\begin{aligned} &\text{Maximize } Z = 3x_1 + 2x_2, \\ &\text{subject to} \quad x_1 + x_2 \leq 8 \\ &\quad \quad \quad 5x_1 + 2x_2 \leq 20 \\ &\quad \quad \quad -2x_1 - 8x_2 \geq -18 \quad \text{and } x_1, x_2 \geq 0 \end{aligned}$$

**P.T.O.**

- b) Construct the dual of the following primal: [5]

$$\begin{aligned}
 &\text{Maximize } Z = 3x_1 - 2x_2 + 4x_3 \\
 &\text{subject to} \\
 &\quad 3x_1 + 5x_2 + 4x_3 \geq 7 \\
 &\quad 6x_1 + x_2 + 3x_3 \geq 4 \\
 &\quad 7x_1 - 2x_2 - x_3 \leq 10 \\
 &\quad x_1 - 2x_2 + 5x_3 \geq 3 \\
 &\quad 4x_1 + 7x_2 - 2x_3 \geq 2 \quad \text{and } x_1, x_2, x_3 \geq 0
 \end{aligned}$$

- c) Determine the initial basic feasible solution using: [5]

- i) Least Cost Method
- ii) North-West Corner Rule

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

**Q3)** Solve any two of the following. [10]

- a) Find the Optimal solution for the following transportation problem: [5]

8	7	12	10	15	60
14	9	6	11	4	35
9	15	10	13	14	40
22	45	20	18	30	

- b) Solve the following Assignment problem: [5]

12	11	-	19	13	20
11	-	17	-	22	14
15	16	21	10	12	18
24	20	16	18	17	-
-	16	12	18	16	14

- c) Apply the rule of dominance and find the value of game: [5]

4	6	5	10	6
7	8	5	9	10
8	9	11	10	9
6	4	10	6	4

**Q4)** Solve any two of the following: [10]

- a) What is Game Theory? Define the following terms:
- Saddle Point
  - Value of Game
  - Pay-Off
  - Zero-Sum Game
- b) Explain in detail the fundamentals of Game Theory. [5]
- c) A company has decided to introduce a product in 3 phases. Phase 1 will feature making a special offer at a greatly reduced rate to attract the first time buyers. Phase 2 will involve intensive advertizing to persuade the buyers to continue purchasing at a regular price. Phase 3 will involve a follow-up advertizing and promotional campaign. A total of Rs. 5 Million has been budgeted for this marketing campaign. If  $m$  is the market share captured in phase 1, fraction  $f_2$  of  $m$  is retained in phase 2, and fraction  $f_3$  of market share in phase 2 is retained in phase 3. The expected value of  $m$ ,  $f_2$  and  $f_3$  at different levels of money spent are given below. How should the money be allocated to the 3 phases to maximize the final share. [5]

Money spent in Million Rs.	Effect of market share		
	$m\%$	$f_2$	$f_3$
0	0	0.33	0.50
1	10	0.50	0.70
2	15	0.70	0.85
3	22	0.80	0.90
4	27	0.85	0.93
5	30	0.90	0.95



**Q5)** Solve any two of the following.

**[10]**

- a) Use Dynamic programming to solve:-

**[5]**

$$\text{Minimize } Z = y_1^2 + y_2^2 + y_3^2$$

Subject to  $y_1 + y_2 + y_3 = 60$

Where  $y_1, y_2, y_3 \geq 0$

- b) Construct the network diagram for the following set of activities with their precedence given below: **[5]**

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor	-	-	-	A	B	B	C	D	E	H,I	F,G

- c) Explain in details the care one should take while constructing the network diagram in PERT/CPM **[5]**



Total No. of Questions : 5]

SEAT No. :

**PC4781**

[Total No. of Pages : 2

**[6355]-253**

**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) Answers 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) Draw architecture of PRNETs. Explain with suitable example? [5]
- b) What is hidden terminal problem? List the applications of ad hoc networks? [5]
- c) What is an Ad Hoc Network? Explain the important characteristics of MANET? [5]

**Q2)** Answer any two of three Sub-Questions.

- a) Explain the working of - Dynamic Source Routing protocol. [5]
- b) What are the advantages of hierarchical topology-based protocols over protocols that use flat topologies? [5]
- c) Explain the working of Cluster Switch Gateway Routing protocol. [5]

**Q3)** Answer any two of three Sub-Questions.

- a) Draw and discuss an architecture Reference Model for Multicast Routing Protocols. [5]
- b) Write short note on “Energy-Efficient Multicasting” [5]
- c) Differentiate Tree-Based Multicast Routing Protocols and Mesh Based Multicast Routing Protocols? Write short note on “Energy-Efficient Multicasting” [5]

**P.T.O.**

**Q4)** Answer any two of three Sub-Questions.

- a) Discuss various Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks. [5]
- b) Write a short note on “Feedback-Based TCP”? Explain any two advantages and disadvantages of it. [5]
- c) Discuss various Security issues in Ad Hoc Wireless Networks. [5]

**Q5)** Answer any two of three Sub-Questions.

- a) Discuss various Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks. [5]
- b) Write short note on “trusted key management” in ad hoc networks. [5]
- c) Discuss in detail Transmission Power Management Schemes for ad hoc networks. [5]



Total No. of Questions : 7]

SEAT No. :

**PC4782**

[Total No. of Pages : 2

**[6355]-254**

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

**Q1) a)** Why are distributed operating systems more difficult to design than operating systems for centralized time sharing systems. **[5]**

b) What is stub? How are stubs generated. Explain how the use of stubs helps in making an RPC mechanism transparent. **[5]**

**Q2) a)** Write features of a Good Message Passing System. **[5]**

b) What are the main causes of thrashing in DSM system? What are the common methods used in solving this problem. **[5]**

**Q3) a)** Give the relative advantages and disadvantages of sequential and release consistency models. **[5]**

b) What are some of the main issues involved in designing a process migration facility for a heterogenous distributed, system. **[5]**

**Q4) a)** Explain the concept of Clock synchronization with suitable algorithm. **[5]**

b) Discuss Load-balancing in the context of Distributed Operating Systems. **[5]**

**P.T.O.**

**Q5)** a) Write the foundational principles crucial for crafting a streamlined and effective Distributed File System (DFS). [5]

b) Explain the design principles related to achieving Fault Tolerance in DFS. [5]

**Q6)** a) Explain the design issues in the file systems of Android OS. [5]

b) Explain the architecture of Android OS with suitable diagram. [5]

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

a) Thrashing

b) Election Algorithms

c) Distributed computing models



Total No. of Questions : 7]

SEAT No. :

PC4783

[6355]-255

[Total No. of Pages :2

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 orthonormal vector with suitable examples. [2]

b) If  $\bar{u} = (-1, 1, 2)$ ,  $\bar{v} = (2, -1, 2)$  then find Euclidean inner product  $\langle 2\bar{u} - 3\bar{v}, 3\bar{u} + \bar{v} \rangle$ . [4]

c) Find the norm of each vector and distance between vectors  $\bar{u} = (1, 1, 2)$  and  $\bar{v} = (1, 4, -1)$ . [4]

**Q2)** a) Let  $\bar{v}_1 = (1, 0, 1)$ ,  $\bar{v}_2 = (-1, 1, 0)$  be an orthonormal set of vectors in  $R^3$ , if  $\bar{u} = (1, 2, 3)$  find orthogonal projection  $\bar{u}$  on W and orthogonal component of  $\bar{u}$  to W. [5]

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

**Q3)** a) Use Runge - Kutta method of fourth order to solve  $\frac{dy}{dx} = \sqrt{x+y}$ ,  $y(0) = 1$ , to find y at  $x = 0.2$  taking  $h = 0.1$ . [5]

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)** Determine the value of  $y$  when  $x = 0.2$ , by Euler modified method ,given that  $\frac{dy}{dx} = x^2 + y$ ,  $y(0) = 1$  and  $h = 0.1$ . [5]
- b) 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]
- Q5) a)** A continuous random variable  $X$  has a probability density function given by  $f(x) = 2e^{-2x}$ ,  $x \geq 0$ , and  $f(x) = 0$ ,  $x < 0$ . [5]  
Find
- i) Find moment generating function  
ii) the first four moment about origin.
- b) Explain the terms Skewness and Kurtosis with suitable examples. [5]
- Q6) a)** A joint density function of two random variable  $X$  and  $Y$  is given by  $f(x,y) = \frac{xy}{96}$ ,  $0 < x < 4$ ,  $1 < y < 5$ . And  $f(x,y) = 0$ , otherwise. [6]  
Find
- i)  $E(X)$   
ii)  $E(Y)$   
iii)  $E(2X + 3Y)$
- b) Explain the terms axioms of Probability. [4]
- Q7) a)** 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]
- b) Let  $R^4$  have a Euclidean inner product, Find the cosine of angle between the vectors  $\bar{u} = (-1, 2, 3, 4)$  and  $\bar{v} = (4, 1, 2, 1)$ . [5]



Total No. of Questions : 7]

SEAT No. :

**PC4784**

**[6355]-256**

[Total No. of Pages :2

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

**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) Figures to the right candidates indicate full marks.*
- 4) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) Assume suitable data, if nessacary.*

**Q1)** a) Write short note on chemical sensor. [5]

b) Suggest the suitable non contact type transducer used to measure the temperature of furnace, elaborate the concept with neat sketch. [5]

**Q2)** a) Explain static and 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) Differentiate between torque, angular velocity and power. [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]

**Q5)** a) Explain gas sensors in brief and state its applications. [5]

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

**P.T.O.**



- Q6)** a) Specify the need 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) Comment on pH and conductivity, suggest suitable scheme for pH measurement of water in tank . [5]



Total No. of Questions : 6]

SEAT No. :

**PC4785**

[Total No. of Pages : 1

**[6355]-257**

**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)** What do you mean by OPC? How does it work? **[10]**

**Q2)** Elaborate the data flow and number conversions involved in PLC analog operation. **[10]**

**Q3)** There are two BCD inputs. If A exceeds 355, output F is to go ON; if B exceeds 187, output G is to go ON; if both exceed their listed numbers, output H is to go ON; otherwise, no outputs to be ON. **[10]**

**Q4)** List and define the various major types of PLC analog inputs and outputs. **[10]**

**Q5)** Develop daisy chain topology to connect three field devices using fields Bus. **[10]**

**Q6)** Elaborate the role of Safety Instrumented System (SIS) in Automation. **[10]**



Total No. of Questions : 6]

SEAT No. :

**PC4786**

[Total No. of Pages : 2

**[6355]-258**

**M.E. - I (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 indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

**Q1) a)** What are the guiding considerations in the construction of questionnaire? Explain. [5]

b) Briefly describe the different steps involved in a research process. [5]

**Q2) a)** “The task of defining the research problem often follows a sequential pattern”. Explain. [5]

b) Find one of the regression equations (either y on x, or x on y) for following tabulated data [5]

x	35	25	29	31	27	24	33	36
y	23	27	26	21	24	20	29	30

**Q3) a)** Explain the difference between  $R^2$  and adjusted  $R^2$ . [5]

b) Explain in brief role of multivariate analysis in marketing research/research methodology. [5]

**Q4) a)** Discuss the scope of primary data in research. Also discuss features of questionnaire method. [5]

b) What are sources of research problem? [5]

**P.T.O.**

- Q5)** a) What is multiscale modeling? Explain with one example. [5]  
b) How do objectives help in hypothesis formulation? Explain and illustrate [5]
- Q6)** a) How to estimate parameters? What are different methods for analyzing estimated parameters. [5]  
b) Discuss in brief with suitable example Principal component analysis. [5]



Total No. of Questions : 6]

SEAT No. :

**PC4787**

**[6355]-259**

[Total No. of Pages : 1

**M.E. -I (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)** Design cascade control strategy for heat exchanger. **[10]**

**Q2)** Derive mathematical model of stirred tank heater using first principle. **[10]**

**Q3)** Design IMC controller for given SOPDT process. **[10]**

$$\frac{kpe^{-\theta s}}{(Tp1s + 1)(Tp2s + 1)}$$

**Q4)** Discuss with suitable example Model Reference Adaptive Control. **[10]**

**Q5)** Two liquid ingredients A & B are to be blended in the proportion of 1:2. Draw control loop schematics to indicate the two ways in which this task can be achieved. **[10]**

**Q6)** Explain a feed-forward control strategy with suitable example. **[10]**



Total No. of Questions : 5]

SEAT No. :

**PC4788**

[Total No. of Pages : 2

**[6355]-260**

**First Year M.E. (Instrumentation & 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 diagram must be drawn wherever necessary.*
- 3) *Figure to the right candidates indicate full marks.*
- 4) *Use of electronic pocket calculator.*
- 5) *Assume suitable data, if necessary.*

**Q1)** Attempt any two of the following.

- a) List and discuss different addressing modes of AVR microcontroller.[5]
- b) Draw neat block diagram and elaborate watchdog timer of AVR microcontroller. [5]
- c) Write short note on Analog Comparator of AVR  $\mu$ C. [5]

**Q2)** Attempt any two of the following.

- a) Elaborate Barrel Shifter in ARM-7 with neat sketch. [5]
- b) Discuss the Registers used in the ARM THUMB instruction set. [5]
- c) Comment on memory map of LPC2148 with neat sketch. [5]

**Q3)** Attempt any two of the following.

- a) Write short note on ISA Bus. [5]
- b) What is framing. Discuss RS-232 communication protocol. [5]
- c) Discuss RS485 communication protocol. [5]

**Q4)** Attempt any one of the following.

- a) Design and develop system for counting objects running on conveyer belt using 8051 microcontroller. Elaborate the scheme. [10]
- b) Design and develop system for monitoring CO<sub>2</sub> gas using ARM- LPC2148 microcontroller. Elaborate the scheme. [10]

**P.T.O.**

**Q5)** Attempt any one of the following.

- a) Design complete embedded system for weather monitoring using LPC2148  $\mu$ C. 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 complete embedded system using AVR  $\mu$ C for automotive dash board. 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. :

PC-4789

[Total No. of Pages : 2

[6355]-261

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

**Q1) Attempt any two questions :**

- a) Write short note on non-linear system behavior and stability. [5]
- b) Discuss the Concept of phase plane method. [5]
- c) Distinguish between Intentional and Incidental non-linearities. [5]

**Q2) Attempt any two questions :**

- a) List different methods for lyapunov function determination. [5]
- b) Brief the describing function of saturation nonlinearities. [5]
- c) Discuss the direct lyapunov method of stability analysis. [5]

**Q3) Attempt any two questions :**

- a) Consider the non-linear systems described by the equation [5]

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = -x_1 - x_1^2 - x_2$$

Obtain equilibrium states.

- b) Consider a non-linear system described by equations [5]

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

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

Investigate the stability of equilibrium state. Find a region of stability using Krasovski method. (Consider  $P = I$ ).

*P.T.O.*



- c) Check the stability of the system described by [5]

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

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

Use Krasovskii method.

**Q4) Attempt any two questions :**

- a) Discuss the concept of input – output linearization. [5]

- b) Explain the terms Stabilization and tracking. [5]

- c) Determine the stability of the system describe by the following equation. [5]

$$\dot{x} = \begin{bmatrix} -1 & -2 \\ -1 & -4 \end{bmatrix} x \text{ using direct method of stability analysis.}$$

**Q5) Attempt any one question :**

- a) Elaborate the variable structure system with suitable example. [10]

- b) Consider the following system shown in fig., Use Karsovskaa method to determine stability of the system. [10]

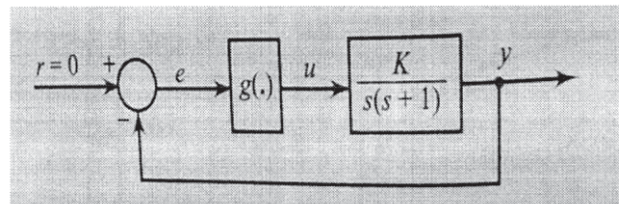


Fig.1 A Nonlinear system



Total No. of Questions : 5]

SEAT No. :

PC-4790

[Total No. of Pages : 2

[6355]-262

**M.E. Instrumentation & Control (Process Instrumentation)**

**ADVANCED SIGNAL PROCESSINGS**

**(2017 Pattern) (Semester - III) (606101)**

*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 response of LTI system when input  $x(n) = \{2 \ 2 \ 2\}$  and impulse response  $h(n) = \{1 \ 2 \ 3\}$ . Determine the response of the LTI system by DFT method. [5]
- b) Design a chebyshev filter for the following specification using bilinear transformation. [5]

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

$$|H(e^{j\omega})| \leq 0.2 \quad 0.6\pi \leq \omega \leq \pi$$

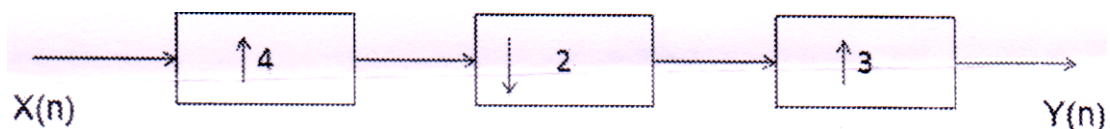
- c) List different properties of wavelet. Explain any two properties. [5]

**Q2) Attempt any two questions :**

- a) List different properties of STFT. Explain any two properties. [5]
- b) Consider the discrete time signal  $x(n) = \{1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 11 \ 12\}$ . Determine downsampled version of the signal for sampling rate conversion  $D = 2, 3, 4$ . [5]
- c) Compare Up sampling and down sampling of signal. [5]

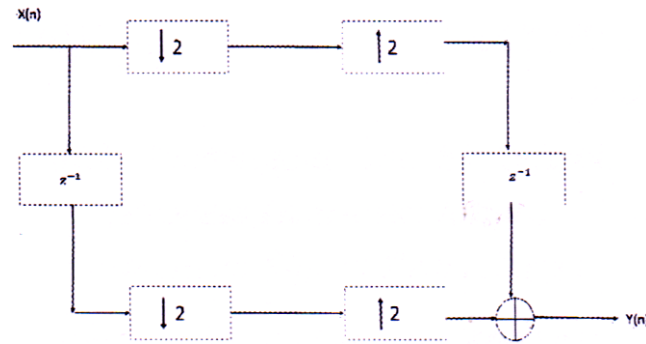
**Q3) Attempt any two questions :**

- a) Determine the output  $y(n)$  in terms of input  $x(n)$  for the mutirate system shown in figure, [5]



*P.T.O.*

- b) Consider multirate system as shown in figure, find  $y(n)$  as function of  $x(n)$ . [5]



- c) Explain RMS filters in brief. [5]

**Q4) Attempt any two questions :**

- a) Write short note on energy spectrum of discrete time signal. [5]  
b) Explain random signals and random process. [5]  
c) Explain MA modeling for power spectrum estimation. [5]

**Q5) Attempt any one questions :**

- a) Determine the frequency resolution, variability and figure of merit of the Bartlett, Welch (50% Overlap) and Blackman Tukey method when  $x(n)$  has 800 samples (i.e.  $N = 800$ ) and quality factor is 16 (i.e.  $Q = 16$ ). [10]  
b) Compute period gram of the signal vector,  $x(n) = \{1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 0 \ 0\}$  and sketch the period gram. [10]



Total No. of Questions : 7]

SEAT No. :

PC-4791

[Total No. of Pages : 2

**[6355]-263**

**M.E. (Process Instrumentation & Control)**

**BUILDING AUTOMATION**

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

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) *Answer any Five Questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume Suitable data, if necessary.*

**Q1) a)** Explain FACP Components with neat sketch. **[6]**

b) Write a short notes on "Conventional Fire Alarm System" **[4]**

**Q2) a)** Write a short notes on Fire Traingle. **[6]**

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

**Q3) a)** Explain Dual duct single zone variable air volume Air conditioning system with neat sketch. **[6]**

b) Write a short notes on Air Handling Unit (AHU) **[4]**

**Q4) a)** Explain Vapour compression cycle with neat sketch. **[6]**

b) Write a short notes on Air Handlers and Unitary Equipment. **[4]**

**Q5) a)** Explain DDC architecture with sketch. **[6]**

b) Write a short notes BAC net Protocol. **[4]**

*P.T.O.*

- Q6)** a) What is green building, Explain Energy Management in BMS. [6]  
b) Write a short notes on MODBUS Protocol. [4]
- Q7)** a) Explain Project Management, What are the characteristics of project. [6]  
b) Write a short note on Project Closure & Signoff. [4]



Total No. of Questions : 5]

SEAT No. :

PC-4792

[Total No. of Pages : 2

**[6355]-269**

**M.E. (Mechanical/Automotive Engineering)**

**VEHICLE DYNAMICS**

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

*Time : 2½ Hour]*

*[Max. Marks : 70*

*Instructions to the candidates :*

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

**Q1) Attempt any Two.**

- a) 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 : 6]

SEAT No. :

PC-4793

[Total No. of Pages : 2

[6355]-271

**M.E. (Printing Engg. & Graphic Communication)**

**Probability, Statistics and Regression Analysis**

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

*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) 1) Write a short note on hypothesis. [9]**

2) Compare simple and multiple regression.

**b) 1) What is probability. Why is it important in statistics. [9]**

2) In practical ways, how to determine probability. State the probability formula. Explain any one example stating probability.

OR

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

1) Explain the term sample and sampling distribution. Explain normal distribution.

2) 7, 7, 9, 8, 10

19, 20, 21, 20, 22

21, 21, 17, 19, 20

8, 7, 8, 9, 10

Calculate mean, median, mode, standard deviation of the above given data.

**P.T.O.**



**Q3)** Differentiate control charts for variable and attributes. Explain the significance of the following types of Control Charts, X & R, U, C, P, NP, I/MR. Explain [16]

OR

**Q4)** a) Explain Least square estimation. [8]

b) What is ANOVA and what is its significance in statistical testing. [8]

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

OR

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

- 1) Density increase
- 2) Dot gain
- 3) Poor contrast .
- 4) Low color strength.



Total No. of Questions : 6]

SEAT No. :

PC-4794

[Total No. of Pages : 2

**[6355]-272**

**M.E. (Printing Engineering & Graphic Communication)**

**PRINTING TECHNOLOGY MANAGEMENT**

**(2017 Pattern) (Credit) (Semester - I) (508102)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

**Q1)** Describe the concept of inventory applied to a big size printing press. Explain the model suitable to press and the Inventory systems applied in details. **[18]**

OR

**Q2)** Describe classification of production management systems with suitable example of each. **[18]**

**Q3)** Explain the Six sigma quality management system applied to printing industry with suitable example. **[16]**

OR

**Q4)** Explain following : **[16]**

- a) Quality cost
- b) Quality assurance
- c) Quality strategy development

*P.T.O.*

**Q5)** Describe following with respect to SPC with suitable diagram and examples. **[16]**

- a) OCcurves
- b) Types of sampling plans
- c) Acceptance sampling

OR

**Q6)** What are the objectives and benefits of application of statistical process control applied to printing industry in general, explain with greater details **[16]**



Total No. of Questions : 6]

SEAT No. :

PC-5013

[Total No. of Pages : 1

[6355]-273

**F.Y. M.E. (Printing & Graphic Communication Engg.)**

**MODERN TRENDS IN PRINTING**

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

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

**Q1)** Explain the principal of drying mechanisms including UV curing EB curing process. **[18]**

OR

**Q2)** Explain the Doctor blades- purpose & types. **[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)** Compare and Explain the breakdown and preventive maintenance for offset printing machine **[16]**



Total No. of Questions : 6]

SEAT No. :

PC-4795

[Total No. of Pages : 1

**[6355]-274**

**M.E. (Printing & Graphic Communication Engg.)**

**RESEARCH METHODOLOGY**

**(2017 Pattern) (Semester - I) (508104)**

*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*
- 2) Figures to the right in bracket indicate full marks.*

**Q1) Explain following :** **[18]**

- a) Basic principles of experimental design.
- b) Literature review.

OR

**Q2) Explain: Features of a good research design.** **[18]**

**Q3) Explain following components of research report.** **[16]**

- a) Illustrations and tables.
- b) Referencing and bibliography and footnotes.

OR

**Q4) Explain different steps in preparation of a technical report.** **[16]**

**Q5) What are the different steps in making research proposal.** **[16]**

OR

**Q6) Explain the “Trade Related aspects of Intellectual Property Rights”.** **[16]**



Total No. of Questions : 6]

SEAT No. :

PC-4796

[Total No. of Pages : 2

[6355]-275

**F.Y. M.E. (Printing & Graphic Communication Engg.)**

**COLOR 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 the right indicate full marks.*

**Q1)** Explain the following terms:

**[18]**

- a) Purkinji mechanism
- b) Luminous efficiency functions

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]**

*P.T.O.*

**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. :

PC-4797

[Total No. of Pages : 2

[6355]-276

**F.Y.M.E. (Printing Engg. & Graphic Communication Engg.)**

**WEB HANDLING ON PRESS**

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

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

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

**Q1) a)** State the working of zero-speed slicing. What are the advantages of this splicer? [9]

b) What is the significance of corona treatment? What is surface energy and does it play an important role? [9]

OR

**Q2) a)** Write short notes on : [9]

- i) Antistatic Eliminators
- ii) Flame treatment

b) State the surface structures of rollers used as web transport rollers. [9]

**Q3) a)** What is auto-control registration in a web offset press? Explain its significance. [8]

b) How is unwinder tension controlled? What are load cells? [8]

OR

**Q4)** Explain Lateral & Circumferential Register control by web movement and cylinder movement. [16]

*P.T.O.*



**Q5)** What is Static and Dynamic balancing. How is it measured and calculated?  
Why does balance of rollers change in printing machine. **[16]**

OR

**Q6)** What are angle bars? Write a note on different angle bars and their benefits on the web machine. **[16]**



Total No. of Questions : 6]

SEAT No. :

PC-5014

[Total No. of Pages : 1

**[6355]-277**

**M.E. (Printing & Graphic Communication)**

**SUBSTRATE AND INK**

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

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) All Questions are compulsory.*
- 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 Ink formulation principles and raw materials. **[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  $200\text{cm}^2$ . 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)** Find out the wt of reel of paper having width, outer and inner diameters as 63cm, 100cm and 15cm respectively. The GSM is 80 and its caliper is  $1/12\text{mm}$ . **[16]**

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

OR

**Q4)** Explain Environmental laws for print industry. **[16]**



Total No. of Questions : 6]

SEAT No. :

PC-5015

[Total No. of Pages : 2

[6355]-278

**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 diagrams must be drawn wherever necessary.*

- Q1)** a) Explain the role of paper as a substrate in printed electronics. [9]  
b) Discuss the challenges associated with using polymer substrates in printed electronics. [9]

OR

- Q2)** a) What are the essential characteristics of ferrite inks used in printed electronics? [9]  
b) Discuss the role of polymer substrates in printed electronics. [9]

- Q3)** a) Describe the communication process between an RFID tag and a reader.[8]  
b) How do RFID smart cards differ from traditional magnetic stripe cards?[8]

OR

- Q4)** a) Discuss why is RFID considered a potential replacement for UPC barcodes? [8]  
b) Explain the economic benefits of using RFID in supply chain management. [8]

*P.T.O.*

**Q5) a)** Describe how printed electronics are used in wearable healthcare devices. **[16]**

**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. :

PC-5115

[Total No. of Page : 1

[6355]-279

**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) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) Draw neat diagram wherever necessary.*
- 3) Figures to right indicate full marks.*

**Q1)** a) Explain the following operations in packaging die-cutting, punching, and holograms. [9]

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

OR

**Q2)** a) What is integration in a commercial sheetfed offset press? [9]

b) Explain the integration of bindery in the commercial press. [9]

**Q3)** a) Explain dry lamination with a neat diagram. State its applications. [8]

b) Why are surface treatments required on certain substrates? Explain any 2 types of treatments with neat diagrams. [8]

OR

**Q4)** Explain in detail aseptic packaging. Draw a neat diagram explaining the function of each layer in an aseptic package. [16]

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

OR

**Q6)** Explain barrier technology and how it is useful in packaging. [16]



Total No. of Questions : 6]

SEAT No. :

**PC4798**

**[6355]-281**

[Total No. of Pages :1

**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) *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)** a) Explain legal aspects related with the research. [5]  
b) Briefly describe the different steps involved in a research process. [5]

OR

- Q2)** Explain following in brief: [10]  
a) Brain storming technique.  
b) Delphi method.

- Q3)** a) Explain various Principles of Modeling. [5]  
b) Explain process of formulation of model based on simulation. [5]

OR

- Q4)** Write short notes on: [10]  
a) Experimentation Strategies.  
b) Laboratory Experiments.

- Q5)** a) What do you mean by process optimization? Explain it in brief. [8]  
b) Explain General Factorial Design. [7]

- Q6)** Write short notes on: [15]  
a) Principles of Thesis Writing.  
b) Uni-variate analysis.  
c) Non parametric tests.



Total No. of Questions : 8]

SEAT No. :

**PC4799**

[Total No. of Pages : 2

**[6355]-282**

**First Year M.E. (Production)/(CAD/CAM)**

**COMPUTER AIDED DESIGN**

**(2017 Pattern) (Semester - I) (511301)**

*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)** Define Explicit, Implicit and parametric representation of geometrical entities and their advantages and disadvantages. **[5]**

OR

**Q2)** Why parametric representation of geometrical entities are preferred in CAD software? Explain your answer with non-parametric and parametric equations of appropriate geometric entity. **[5]**

**Q3)** What is Homogeneous Coordinate System? Explain the necessity of Homogeneous Coordinate System for transformation of geometric entities using suitable examples. **[5]**

OR

**Q4)** Differentiate between Forward Engineering and Reverse Engineering. **[5]**

**Q5)** The coordinates of four control points are given by  $V_0 = [2, 2, 0]$ ,  $V_1 = [2, 3, 0]$ ,  $V_2 = [3, 3, 0]$ ,  $V_3 = [3, 2, 0]$ . Find the equation of Bezier curve, find the points on the curve for  $t = 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}$ , and 1, also plot the curve for the given data. **[7]**

OR

**Q6)** Explain various types of surface entities. Derive parametric equation of analytical surface models. **[7]**

**P.T.O.**

**Q7)** a) Discuss in brief the basic elements of CSG model. Explain the main building operation of CSG scheme with examples. [8]

b) What is Z-buffer algorithm for B-REP and CSG model? [7]

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

- a) Visual Realism
- b) Types of animations
- c) Parametric programming
- d) CAD/CAM integration
- e) Hidden line removal algorithm





Total No. of Questions : 6]

SEAT No. :

**PC4800**

[Total No. of Pages : 2

**[6355]-283**

**First Year M.E. (Production) (CAD/CAM)  
COMPUTER AIDED MANUFACTURING  
(2017 Pattern) (Semester - I) (511302)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

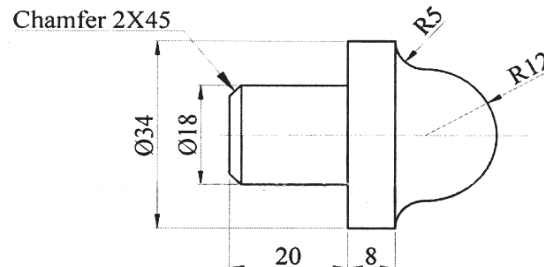
- 1) *Answer Q1 or Q.2, Q.3 or Q.4 and Q5 & Q6 are compulsory.*
- 2) *Assume suitable data if necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**Q1) a)** Write a short note on drives and controllers used in CNC machines. **[5]**

b) Explain the difference between CNC and DNC. **[5]**

OR

**Q2)** Write NC program for the following job and also explain the meaning of each step (block). **[10]**



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

- a) CNC-Moulding machines
- b) CNC-WEDM
- c) CNC-CMM

OR

**Q4) a)** What aspects should be considered while designing the material handling system? **[5]**

b) With the help of neat block diagram explain various elements of ASRS. **[5]**

*P.T.O.*

- Q5)** a) Explain contact and non-contact method of inspection. [8]  
b) Write short note on machine vision. [7]
- Q6)** a) Explain use of bar code system for shop floor data collection. [7]  
b) What is digital manufacturing? Explain in brief. [8]



Total No. of Questions : 8]

SEAT No. :

**PC4801**

**[6355]-284**

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

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

**COMPUTER INTEGRATED MANUFACTURING  
(2017 Pattern) (Semester-II) (511305)**

*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) Q. 7. and Q. 8. are compulsory.
- 3) Figures to the right indicate full marks.
- 4) Draw neat self-explanatory sketches wherever necessary.
- 5) Use of calculator is allowed.
- 6) Assume suitable data, if necessary.

**Q1)** What are the different levels of Integration against evolution of CIM? Explain. **[5]**

OR

**Q2)** What are the components of PLM software? Explain. **[5]**

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

OR

**Q4)** What are the benefits of GT to the manufacturing industry? **[5]**

**Q5)** What is a FMC? How does FMC ensure flexibility in manufacturing? **[7]**

OR

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

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

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

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

- a) GKS implementation in a CAD workstation.
- b) ESPRIT-CIM OSA model.
- c) Data associated with FMC.
- d) ASRS.



Total No. of Questions : 8]

SEAT No. :

**PC4802**

[Total No. of Pages : 2

**[6355]-285**

**M.E. - I (Production) (Manufacturing & Automation) (CAD/CAM)**

**ARTIFICIAL INTELLIGENCE AND ROBOTICS**

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

*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 the following terms associated with robot: **[6]**

- i) Robot work-envelop
- ii) Accuracy
- iii) Repeatability

b) Explain with neat sketch the body and wrist motions of an robot. **[4]**

**Q2) a)** The coordinates of the point p on the body are given by [1, 2, 3] T. Rotate the body about z axis by  $60^\circ$  and then about y axis by  $30^\circ$ . find the new coordinates of the point p with respect to the fixed frame.**[4]**

b) Carry out forward and inverse kinematic analysis of 2 DOF serial planar manipulator. **[6]**

**Q3) a)** For a pick and place type of robot, the link parameters table is given below. Determine the location of the end point of the link 3 w.r.t. to the base. **[6]**

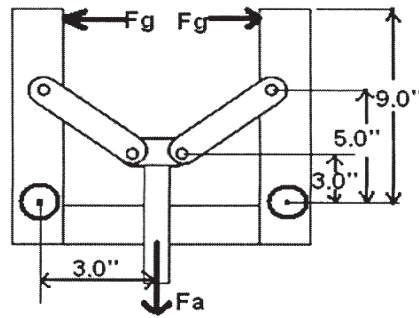
i	$\alpha_{i-1}$	$a_{i-1}$	$d_{i-1}$	$\theta_{i-1}$
1	0	0	0	$45^\circ$
2	$-90$	0	2	$60^\circ$
3	0	10	0	$30^\circ$

b) It is desired to have the first joint of a six axis robot to go from initial angle of  $30^\circ$  to a final angle of  $75^\circ$  in 5 seconds. Using a third order polynomial, calculate the joint angle at 1, 2, 3 and 4 seconds respectively.

**[4]**

**P.T.O.**

- Q4) a)** For the information given in the mechanical gripper design of following figure, determine the required actuating force if the gripper force is to be 90 lb. [6]



- b) How is force analysis done to grip the component using friction? [4]

- Q5) a)** Describe the Trajectory planning and control. [4]  
b) Write and explain a robot program for nut and bolt assembly. [6]

- Q6) a)** The 8×8 array of pixels indicating each element as the gray level of pixel is given below. [6]  
i) Construct the histogram and find threshold value.  
ii) Convert it into black and white image.  
iii) Perform shape analysis (first and second order moments centroids, run length encoding, principal angle)

9	11	13	13	13	11	13	13
10	13	10	15	15	15	14	11
9	13	14	16	16	15	15	14
8	13	14	16	17	15	15	14
9	11	15	15	15	15	15	14
7	14	14	14	14	14	14	14
8	7	6	10	12	12	8	8
6	7	8	9	10	11	12	13

- b) Write a short note on noncontact sensors. [4]

- Q7) a)** What are the different methods of motion planning? [6]  
b) What are approaches in A.I.? [4]

- Q8) a)** What is work force torque sensor (WFTS)? Explain with a sketch. [5]  
b) Demonstrate with suitable example the use of any two artificial intelligence techniques used in industrial robotics. [5]



Total No. of Questions : 6]

SEAT No. :

**PC4803**

**[6355]-286**

[Total No. of Pages : 2

**First Year M.E. (Production) (CAD/CAM)**  
**COMPUTATION TECHNIQUES IN CAD/CAM**  
**(2017 Pattern) (Semester-II) (511307)**

*Time : 3 Hours]*

*[Max. Marks :50*

*Instructions to the candidates:*

- 1) *Answer Q1. OR Q2; Q3 OR Q4; and Q5 & Q6 are compulsory.*
- 2) *Assume suitable data if necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain in short the steps in static analysis. **[4]**  
b) Describe dynamic analysis in FEA. **[6]**

OR

- Q2)** Define engineering stress-strain and true stress-strain and also derive the relation between them. **[10]**

- Q3)** a) Write short note on turbulence model. **[5]**  
b) Explain the numerical method for incompressible flow. **[5]**

OR

- Q4)** a) Solve the following differential equation using Euler's method **[5]**

$$\frac{dy}{dx} = 1 + xy$$

Given:  $y(0) = 1$  and

Also find  $y$  for  $x = 0$  (0.1) 0.5

- b) Apply Runge Kutta method of 4<sup>th</sup> order to solve differential equation **[5]**

$$\frac{dy}{dx} = x + y^2, \quad y(0) = 1$$

to find  $y$  for  $x = 0.2$  with  $h = 0.1$

**P.T.O.**

**Q5)** Write short note on (any three)

**[15]**

- a) Direct search method
- b) Gradient base method
- c) Geometric programming
- d) Point elimination methods

**Q6)** a) Solve the following unconstraint non-linear optimization problem using Simulated Annealing (SA) (only one Iteration) **[7]**

$$\min(z) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2 + 0.1[(x_1 - 3)^2 + (x_2 - 2)^2]$$

Subjected to:

$$-6 \leq x_1, x_2 \leq 6$$

b) Minimize **[8]**

$$f(x_1, x_2) = x_1^2 + x_2^2 - 2x_1 - 4x_2 + 5$$

Such that

$$0 \leq x_1, x_2 \leq 4$$

Using Steepest Descent (Cauchy) method. Perform first iteration only.

Assume initial point as  $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$



Total No. of Questions : 6]

SEAT No. :

**PC4804**

[Total No. of Pages : 2

**[6355]-287**

**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 and 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) a)** Elaborate related to fixture design the application of AI for **[6]**

- i) Applying dynamic clamping forces
- ii) Fixturing constraint analysis

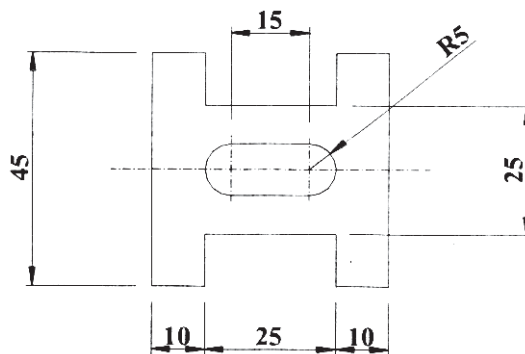
b) Write short note on application of CAFD in fixture design. **[4]**

OR

**Q2) a)** Find out press tonnage with staggering and Full shear **[6]**

Given: stock thickness = 1mm,

Shear strength of material=260 MPa.



**Fig: 1: Material: Al, 1mm thick**

b) Applications of AI techniques for process planning in progressive dies.[4]

*P.T.O.*



**Q3) Write short note on (any two)**

**[10]**

- a) Use of AI in process planning of forging impression.
- b) Finite element method for material flow analysis in forging operations.
- c) Automatic determination of parting line in forging die design.

**OR**

**Q4) a) Computer aided injection mold design.**

**[5]**

- b) Explain use of AI techniques for mould flow analysis and solidification in injection moulding.

**[5]**

**Q5) a) CAE analysis for material flow in die casting process.**

**[8]**

- b) Explain with suitable example computer aided die casting die design.

**[7]**

**Q6) a) Describe the casting solidification in the sand casting process and how AI assists in solidification analysis?**

**[7]**

- b) How the mould filling time is calculated in the sand casting process, explain with suitable example.

**[8]**



Total No. of Questions : 6]

SEAT No. :

**PC4805**

[Total No. of Pages : 2

**[6355]-288**

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

*Time : 2 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)** a) What are types of trends? Explain with suitable sketches. [5]  
b) Describe the computerized method for design of facility layout. [5]

OR

- Q2)** a) Explain rank order clustering algorithm used for group technology. [5]  
b) Discuss the benefits of design rationalization. [5]

- Q3)** a) Explain detailed capacity planning. manufacturing resources planning.[5]  
b) Discuss manufacturing resources planning. [5]

OR

- Q4)** a) Briefly describe various measures of performance in multiple machine scheduling problem with independent jobs. [6]  
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]

**P.T.O.**

**Q6)** Write short notes on the following.

**[15]**

- a) Computer generated time standard
- b) Shop floor control- data collection
- c) Process simulators



Total No. of Questions : 8]

SEAT No. :

PC-5016

[Total No. of Pages : 2

[6355]-290

**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 5 Questions.*
- 2) Figures to the right side 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)** How can you apply the principles of fluid mechanics to diagnose a performance issue in a hydraulic system of loss of pressure? Describe the steps involved in troubleshooting. **[5]**

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

**Q2) a)** What are the different types of hydraulic filters, and what role do they play in a hydraulic system? **[5]**

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

**Q3) a)** Draw the suitable pneumatic circuit using cascade system to actuate cylinder 'A', cylinder 'B' and cylinder 'C' as per following sequence: **[6]**

- i)** Cylinder A extends
- ii)** Cylinder B extends
- iii)** Cylinder C extends
- iv)** Cylinder A retracts
- v)** Cylinder C retracts
- vi)** Cylinder B retracts

**b)** Explain the role of pressure regulators in a pneumatic system **[4]**

*P.T.O.*

- Q4)** a) Describe the main components of a pneumatic system and their functions [5]  
b) What is a sequential circuit in pneumatics, and how is it used to control the sequence of operations in an automated system? [5]
- Q5)** a) With neat sketch and example explain closed loop and open loop control system. [6]  
b) Explain any two temperature measurement sensors. [4]
- Q6)** a) Explain P, PI and PID Controllers [6]  
b) What is a Programmable Logic Controller (PLC), and what are its main components? [4]
- Q7)** a) With neat sketch explain any three configurations of industrial robots.[6]  
b) Explain the role of Automated Guided vehicles in manufacturing [4]
- Q8)** a) Explain Role of AI in manufacturing systems [5]  
b) Explain the role of Artificial Neural Networks in manufacturing automation [5]



Total No. of Questions : 8]

SEAT No. :

**PC5017**

[Total No. of Pages : 2

**[6355]-291**

**First Year M.E. (Production) (Manufacturing & Automation)**

**ADDITIVE MANUFACTURING**

**(2017 Pattern) (Semester - II) (511109)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Figures to the right indicates full marks.*
- 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) *Solve Any 5 Questions.*

- Q1)** a) What is Additive Manufacturing Process Chain? Explain in Detail. [5]  
b) What challenges in traditional manufacturing are solved by Additive Manufacturing? [5]
- Q2)** a) Additive Manufacturing is economically viable alternative to conventional manufacturing technologies for producing highly complex parts, justify the statement. [6]  
b) Explain the importance of design for Additive Manufacturing (DFAM).[4]
- Q3)** a) How does digitization play a role in the Additive Manufacturing process? [6]  
b) Explain the process and advantages of 3D scanning for digitization in Additive Manufacturing. [4]
- Q4)** a) Describe the process of converting medical scan data (CT. MRI) into a 3D printable model using MIMICS. [6]  
b) How can MAGICS be used for process simulation and reducing errors in Additive Manufacturing? [4]
- Q5)** a) What are the key material properties that influence the performance of a 3D printed part? [5]  
b) What post-processing techniques can be used to improve the surface finish of Additive Manufactured parts? [5]

**P.T.O.**

- Q6)** a) What are the typical tolerances achievable in Additive Manufacturing, and how do they compare to traditional manufacturing methods? [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 Laminated Object Manufacturing. [5]
- b) With neat sketch explain the process of Electron Beam Melting (EBM)[5]
- Q8)** a) Discuss a case study where Additive Manufacturing has been used to fabricate patient-specific scaffolds for bone regeneration. [5]
- b) How does Computer-Aided Tissue Engineering (CATE) integrate with 3D printing technologies in the creation of custom tissue structures? [5]



Total No. of Questions : 6]

SEAT No. :

**PC4806**

[Total No. of Pages : 2

**[6355]-292**

**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)** a) Give the significance of mechatronics in day to day life. [5]  
b) Describe the working of Strain Gauges with a neat sketch. [5]

OR

- Q2)** a) Describe force weight sensor with application. [5]  
b) In a certain system, an electric heating element was found to increase the temperature of a piece of metal  $17^{\circ}$  for each ampere of current. The metal expands 0.001 in /degree and pushes on a load sensor which outputs 1 V/0.005 in. of compression. Find the transfer function of three components and draw block diagram and also determine overall transfer function. [5]

- Q3)** a) Draw pin diagram of a microprocessor 8086. [3]  
b) How Microbalance Machine works used which is for measurement of weight in jewelers shop, explain its working with suitable diagram? [7]

OR

- Q4)** a) Write the instructions to load two hexadecimal numbers 78D and 96C in the registers A and B respectively. Add the numbers, and store the result in memory location 429B. [6]  
b) Write a note on signal conversion. [4]

**P.T.O.**



**Q5) a)** Devise a circuit that could be used with a conveyor belt which is used to move an item to a work station. The presence of the item at the work station is detected by means of breaking a contact activated by a beam of light to a photo sensor. There it stops for 100s for an operation to be carried out before moving on and stops the conveyor. The motor for the belt is started by a normally open start switch and stopped by a normally closed switch. Belt is started by a normally open start switch and stopped by a normally closed switch. **[9]**

b) Explain input output components of PLC system. **[6]**

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

- a) Electromechanical system model
- b) Composite control system
- c) Advance mechatronics system



Total No. of Questions : 6]

SEAT No. :

PC-5018

[Total No. of Pages : 2

**[6355]-301**

**M.E. (Electrical Engineering)  
POWER SYSTEM MODELING  
(2024 Pattern) (503401) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6*
- 2) Figures to the right indicate full marks.*
- 3) Use of electronic calculator is allowed.*
- 4) Assume suitable data, if necessary.*

**Q1)** a) What is the need of Modeling of Power System. Explain Different models for power system analysis. **[10]**

b) Explain with block diagram Excitation Control. What is the effect of change in excitation on system parameters? **[8]**

OR

**Q2)** a) 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]**

b) Explain Steady state analysis for synchronous machine **[8]**

**Q3)** Explain the AC excitation system modeling. Discuss the field-controlled alternator rectifier system, brushless excitation system, and static excitation system with necessary diagrams. **[16]**

OR

**P.T.O.**

**Q4)** Model the excitation control system using a DC generator exciter. Discuss the self-excited and separately excited DC generator systems, and their role in the excitation system. **[16]**

**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) 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]**

OR

**Q6) a)** 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]**

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. :

PC-5019

[Total No. of Pages : 2

**[6355]-302**  
**M.E. (Electrical Engineering)**  
**ADVANCED POWER ELECTRONICS**  
**(2024 Pattern) (Semester - I) (503402)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Figures to the right 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) 3 level voltage source converters.
- ii) 3-ph- full wave bridge converter.

**b)** Explain about the following with neat circuit diagrams. **[8]**

- i) Concept of Multilevel.
- ii) Diode Clamped inverter.
- iii) Cascaded multi-level inverter.

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 diagram explain types of resonant pulse converters. **[8]**

**b)** Explain Voltage control of resonant inverters and Class E Resonant inverter. **[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]**

*P.T.O.*

- Q5)** a) Explain the Conventional concepts of active and reactive power in single phase and three phase circuits of Akagi's p-q theory. [8]  
b) Write a short note on the three phase four wire system of p-q theory. [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]



[6355]-303

**M.E. (Electrical Power System)**  
**COMPUTER APPLICATIONS IN POWER SYSTEM**  
**(Revised 2024) (Semester - I) (503403)**

*Time : 3 Hours]**[Max. Marks : 50**Instructions to the candidates:*

- 1) *Q.1 is compulsory, Solve 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) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

**Q1) Attempt any three :****[18]**

- a) What are the theorems used in optimizing single variable functions?
- b) Draw surface constraint diagram showing behaviour and side constraints. Also indicate bounded and unbounded, acceptable and unacceptable points on surface constraint.
- c) What are the assumptions made in decupled and fast decoupled load flow method?
- d) Derive the equations used in three phase load flow analysis.

**Q2) a) State economical dispatch problem****[6]**

- i) Unconstrained without loss
- ii) Constrained without loss
- iii) Unconstrained with loss
- iv) Constrained with loss

**b) Two units of the system have following cost curves****[10]**

$$f(P_{G1}) = 0.00889P_{G1}^2 + 10.333P_{G1} + 200 \text{ Rs/h}$$

$$f(P_{G2}) = 0.00741P_{G2}^2 + 10.833P_{G2} + 240 \text{ Rs/h}$$

The transmission loss are given by

$$P_L = 0.001P_{G1}^2 + 0.002P_{G2}^2 + 0.0004P_{G1}P_{G2}$$

where  $P_G$  is in MW. Determine the economic operating schedule to meet the demand of 150 MW using classical method perform one iteration.

**P.T.O.**

OR

**Q3) a)** Explain solution economic load dispatch problem using NR method. [6]

b) Incremental fuel costs in rupees per MWh for plant consisting two units are [10]

$$\frac{\partial F1}{\partial p_{g1}} = 0.20P_{g1} + 40 \text{ and } \frac{\partial F2}{\partial P_{g2}} = 0.4P_{g2} + 30$$

Generator limits are  $30\text{MW} \leq P_{g1} \leq 175\text{MW}$  and  $20\text{MW} \leq P_{g2} \leq 130\text{MW}$ . Determine total load and load shared by each generator if incremental cost is

i)  $\lambda = 50$

ii)  $\lambda = 75$

iii)  $\lambda = 77$

**Q4) a)** The transmission loss coefficients  $B_{mn}$  expressed in  $pu$  on the base of 100MVA of a power system network having three plants are given by [10]

$$B = \begin{bmatrix} 0.01 & -0.001 & -0.002 \\ -0.001 & 0.02 & -0.003 \\ -0.002 & -0.003 & 0.03 \end{bmatrix}$$

Three plants supply power of 100MW, 200MW and 300MW respectively into the network. Calculate the transmission loss and incremental transmission losses of the plant in MW.

b) Derive transmission loss coefficient using sensitivity factor. [6]

OR

**Q5) a)** Derive general formula of fault current and fault voltage for LLG type fault. [8]

b) Show that transmission loss formula is a function of generation and load. [8]



Total No. of Questions : 6]

SEAT No. :

PC-5021

[Total No. of Pages : 2

**[6355]-304**

**F.Y.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 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)** Explain the terms Copyright, royalty and patent. **[6]**

**Q4)** Explain the Elimination method of solving linear simultaneous equations with example. **[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]**

**P.T.O.**



**Q6)** Write short note on the following with applicable example in Electrical Engineering(Attempt any two)

- a) Simulated Annealed Method [8]
- b) Linear and Multi regression [8]
- c) Ant Colony Method [8]



Total No. of Questions : 8]

SEAT No. :

**PC5173**

[Total No. of Pages : 2

**[6355]-305**

**F.Y.M.E.(IoT)**

**SENSORS & MEASUREMENTS**

**(2024 Pattern) (Semester-I) (504801)**

*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 of questions indicate full marks.*
- 4) Assume suitable data, if necessary.*

**Q1) a)** How pressure sensor works? Illustrate detailed example with applications. **[5]**

b) Highlight the purpose of signal conditioning circuit in a sensor system. Illustrate with necessary examples. **[5]**

**Q2) a)** What are the applications of Sensors in Internet of Things (IoT)? **[5]**

b) Explain working principle of LED and semiconductor lasers with their real time applications. **[5]**

**Q3) a)** Describe accelerometer working, characteristics and applications. **[5]**

b) Justify the role of phase sensors in phase detection with practical applications. **[5]**

**Q4) a)** Explain the working principle of Electromagnetic velocity sensor with its applications. **[5]**

b) Write short note on Monolithic and optical gyroscopes. **[5]**

**P.T.O.**

- Q5)** a) What is an inductive sensor and how does it work? [5]  
b) Compare LVDT and RVDT. Also list real time applications of both sensors. [5]
- Q6)** a) Differentiate between magnetostrictive and piezoelectric transducers. [5]  
b) How ultrasonic sensor works? What are their common disadvantages? [5]
- Q7)** a) How do acoustic sensors work? What are the advantages of using piezoelectric acoustic sensors? [5]  
b) How anemometer works? Key highlight its advantages, disadvantages and applications. [5]
- Q8)** a) Explain working principle of Coriolis Mass Flow Sensor. [5]  
b) Explain working principle of piezoelectric temperature sensor. [5]



Total No. of Questions : 8]

SEAT No. :

**PC5200**

[Total No. of Pages : 2

**[6355]-306**

**F.Y.M.E. (Internet of Things)**

**DATA COMMUNICATION & NETWORKING**

**(2024 Pattern) (Semester - I) (504802)**

*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 transport and application layers that are widely used in data communication and networking? **[5]**

b) What do you understand by multimedia? What type of data is communicated in multimedia communication? **[5]**

**Q2) a)** Explain the term congestion control as it relates to data communications and networking. **[5]**

b) Explain the term reliability and why it is important for data communications and networking. **[5]**

**Q3) a)** What do you understand by network management? Why is Self-Organizing Network (SON) important in network management? **[5]**

b) Explain wireless sensor networks. Why is wireless networking preferred over wired networks? **[5]**

**Q4) a)** Explain the ISO-OSI 7 layer network architecture model as it relates to data communications and networking. **[5]**

b) What is a sensor? Explain the types of sensors widely used in sensor networks in data communication and networking. **[5]**

**P.T.O.**

- Q5)** a) Explain network traffic behaviour under the context of network layers and topology design. [5]
- b) Explain classical and modern data communication technologies and highlight its types? [5]
- Q6)** a) What do you understand by synchronization? Explain the basic principles of time synchronization and how it is useful for network management.[5]
- b) What do you understand by multimedia? What type of data is communicated in multimedia communication? [5]
- Q7)** a) Explain about the motivation for cross layer protocol design with neat diagram. [5]
- b) What does scheduling mean? Write the names of two networks used in data communication and networking. [5]
- Q8)** a) Explain the term quality of service (QoS) used extensively in data communications and networking. [5]
- b) Explain in detail the widely used architectural components of Software Defined Networking (SDN) and its features. [5]



Total No. of Questions : 8]

SEAT No. :

**PC5201**

**[6355]-307**

[Total No. of Pages : 2

**First Year M.E. (Internet of Things) (IoT)**  
**WIRELESS SENSOR NETWORK FOR IoT**  
**(2024 Pattern) (Semester - I) (504803)**

*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 labeled diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

**Q1) a)** Distinguish between CAN bus and Flex Ray. **[5]**

b) Describe the various applications of ZigBee technology. **[5]**

**Q2) a)** State and explain the major differences between WSNs and traditional Adhoc networks. **[5]**

b) Explain IEEE 802.15.4 MAC Protocol. **[5]**

**Q3) a)** Describe the transceiver design considerations in WSNs. **[5]**

b) Explain the parameters that impact data dissemination protocols. **[5]**

**Q4) a)** Explain the performance metrics/figure of metrics that are used for evaluating the performance of WSN. **[5]**

b) What is Gateway in WSN and describe the Gateway Functions in WSN. **[5]**

**Q5) a)** Explain how does a sensor node address the appropriate Internet host to send a message. **[5]**

b) Describe 2 types of Schedule-based protocols. **[5]**

**P.T.O.**

- Q6)** a) What is data dissemination? Explain the challenges in ensuring reliable data dissemination in WSNs. [5]
- b) Describe in detail Contention Based protocols. [5]
- Q7)** a) Explain the significance of 6LoWPAN in enabling IP-based WSNs. [5]
- b) Define M2M communication. How does M2M communication contribute to IoT ecosystems? [5]
- Q8)** a) What is the purpose of the AllJoyn framework? Give advantages of using AllJoyn for IoT development. [5]
- b) Explain the primary components of a TinyOS? What makes TinyOS suitable for IoT devices. [5]

**x x x**

Total No. of Questions : 7]

SEAT No. :

PC-5174

[Total No. of Pages : 2

**[6355]-308**

**M.E. (Internet of Things - IoT)**  
**RESEARCH METHODOLOGY**  
**(2024 Pattern) (Semester - I) (504804)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Solve any 5 questions.*
- 2) Figure to the right indicate full marks.*
- 3) Assume suitable data if required.*

**Q1) a)** Define a research problem. Explain its importance in the research process. **[5]**

b) What are the common errors in selecting a research problem? Explain with examples. **[5]**

**Q2) Solve the following :**

- a) Describe the process of data collection using a digital computer system in an experimental setup. **[5]**
- b) Describe different types of research. Distinguish between an experiment and a survey. **[5]**

**Q3) Solve the following :**

- a) Explain multi-scale modeling & verifying performance of process system. **[5]**
- b) Explain the concept of regression analysis and its applications in statistical modeling. **[5]**

**Q4) Solve the following :**

- a) Explain sensitivity theory application. **[5]**
- b) What is Regression analysis & explain it? **[5]**

*P.T.O.*



**Q5) Solve the following :**

- a) Explain the concept of asymptotic analysis and its application in evaluating system behavior. [5]
- b) What is nonlinear analysis in system modeling? Illustrate with an example. [5]

**Q6) Solve the following :**

- a) Discuss the steps involved in preparing a research proposal for academic purposes. [5]
- b) What are the characteristics of a good research proposal. [5]

**Q7) Solve the following :**

- a) What is meaning of research problem. And how to define it. [5]
- b) Explain Role of DSP in collected data contains noise. [5]



Total No. of Questions : 8]

SEAT No. :

**PC5202**

[Total No. of Pages : 2

**[6355]-309**

**First Year M.E. (Artificial Intelligence)**

**ARTIFICIAL INTELLIGENCE**

**(2017 Pattern) (Semester - I) (510501)**

*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, Q.7 or Q.8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data if necessary.*

**Q1)** 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

**Q6) a)** How AI can be applied in healthcare applications? **[8]**

b) How collaborative filtering predicts the rating for recommendation? **[8]**

*P.T.O.*

**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 : 12]

SEAT No. :

PC-5175

[Total No. of Pages : 2

[6355]-310

**M.E. (Artificial Intelligence)**

**DATA PREPARATION AND ANALYSIS**

**(2017 Pattern) (Semester - I) (510502 F)**

*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.No.12.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**Q1)** Define the terms : Data Gathering and Data Preparation. **[8]**

OR

**Q2)** What are the Scalability issues in data preparation? Explain. **[8]**

**Q3)** Which are data cleaning methods? Discuss. **[8]**

OR

**Q4)** Write a short note on : **[8]**

- a) Min-Max Normalization
- b) Z-Score Normalization.

**Q5)** What is data transformation? Compare Linear and Quadratic transformation Methods. **[9]**

OR

**Q6)** Enlist and describe various ETL tools. **[9]**

**Q7)** What is Data Exploration? Explain Data Exploration through Summary Statistics **[8]**

OR

**Q8)** Explain the following terms : **[8]**

- a) Feature Engineering
- b) Feature selection.

**P.T.O.**

***Q9)*** What is Data Visualization? Explain the different data visualization techniques. [8]

OR

***Q10)*** Explain the importance of Data Visualization in statistics. [8]

***Q11)*** Explain Open-source tools for data preparation and Analysis. [9]

OR

***Q12)*** What is Web Scraping? Explain how web scrapping is done on social media. [9]



Total No. of Questions : 12]

SEAT No. :

PC5176

[Total No. of Pages : 2

[6355]-311

**First Year M.E. (Artificial Intelligence)  
DATA MODELING AND VISUALIZATION @  
(2017 Pattern) (Semester - I) (610303G)**

*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, 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 diagram must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

**Q1)** What are the different stages in data visualization? Explain with a diagram. **[8]**

OR

**Q2)** How fitts law is helpful in visualization? Justify your answers with example. **[8]**

**Q3)** How scatter plots and histograms are useful in visualization of numerical data. Explain with example. **[8]**

OR

**Q4)** How Streamlines are useful in flow visualization? Give examples. **[8]**

**Q5)** Write short notes on : **[8]**

- a) Node link diagram
- b) Tree map

OR

**Q6)** Explain shade maps, heat maps with example. **[8]**

**Q7)** Explain the method of subspace clustering in high dimensional data. **[9]**

OR

*P.T.O.*

**Q8)** Explain PROCLUS, a top-down subspace approach. [9]

**Q9)** Explain importance of Gestalt law. Explain gestalt law of connectedness, continuity with example. [9]

OR

**Q10)** Explain Gestalt law of figure and ground, proximity. [9]

**Q11)** Explain the various components of Tableau Desktop/Public Desktop. [8]

OR

**Q12)** What are evaluation methods based on Psychophysics? [8]



Total No. of Questions : 8]

SEAT No. :

PC-5203

[Total No. of Pages : 2

[6355]-312

**M.E. (Electronics & Tele Communication) (VLSI Design)**

**MICROELECTRONICS & NANO-ELECTRONICS**

**(2017 Pattern) (Semester - I) (504701)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1)** a) What are parasitic elements in microelectronics? What are the effects of it on performance? [7]

b) Explain the role of mathematical modeling in Microelectronics. [7]

OR

**Q2)** a) What are the characteristic of Microelectronics? [7]

b) What are the layout rules in Microelectronics? [7]

**Q3)** a) Explain fabrication methods in Nano-technology conductor [6]

b) Give some emerging application of Nanotechnology [6]

OR

**Q4)** a) What are the design aspects in Microelectronics? [6]

b) Explain the application of Nano-technology in medical field. [6]

**P.T.O.**



- Q5)** a) Explain energy sub-bands in nano-technology [6]  
b) Give applications of resonant tunneling also explain what is resonant tunneling. [6]

OR

- Q6)** a) Calculate the probability of transmission that a 1 eV electron will penetrate a potential barrier of 4 eV, when the width of the barrier is 2 [6]  
b) Write short note on electronics and optical properties of nanostructure [6]

- Q7)** a) What are deposition techniques for nano-scale devices? [6]  
b) Explain fabrication methods in Nano technology conductor [6]

OR

- Q8)** a) Write short note on Scanning Tunneling Microscope [6]  
b) Define Nano wires and Nano magnetic materials? [6]



Total No. of Questions : 8]

SEAT No. :

PC-5177

[Total No. of Pages : 2

[6355]-313

**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) Explain the concept of regularity, modularity and locality. [5]

b) Explain VLSI design flow. [5]

**Q2)** a) Explain VLSI design styles, design quality, packaging technology in detail. [5]

b) Brief about Long channel [5]

i) C-V characteristics

ii) DC transfer characteristics

**Q3)** a) Explain the ASIC Design Flow. [5]

b) Explain different synthesis optimization techniques in detail. [5]

**Q4)** a) List out the layout design rules and explain the concepts of stick diagram. [5]

b) Compare ASIC and SoC. [5]

**Q5)** a) How to calculate interconnect delay. [5]

b) Explain any two MOS Inverters (Switching Characteristics). [5]

**P.T.O.**

- Q6)** a) Draw and explain inverter with n-type MOSFET load. [5]  
b) Brief: Network-on Chip (NoC) concept. [5]
- Q7)** a) With the help of schematic, explain the concept of ratioed circuits. [5]  
b) Explain the concept of Setup time and hold time static with examples.[5]
- Q8)** a) Implement SRAM, DRAM structure. [5]  
b) With the help of neat diagram, Explain CMOS D-latch and edge-triggered flip-flop. [5]



Total No. of Questions : 8]

SEAT No. :

PC-5178

[Total No. of Pages : 2

[6355]-314

**F.Y. M.E. (Electronics & Communication - VLSI Design)**

**ANALOG IC DESIGN**

**(2017 Pattern) (Semester - I) (504703)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Attempt any five questions.*
- 2) Assume suitable data if necessary.*
- 3) Figures to right indicate full marks.*

- Q1)** a) Discuss the impact of mismatch in differential amplifiers on CMRR and gain. [5]  
b) Explain the significance of tail current source. [5]
- Q2)** a) Explain the difference between negative and positive feedback in amplifiers. [5]  
b) Write a note on OCTC method. [5]
- Q3)** a) Explain CMRR, how it's derived and it's practical significance. [5]  
b) Explain Millers theorem. [5]
- Q4)** a) What is loop gain, how does it affect amplifier stability? [5]  
b) Write a short note on differential amplifier with MOS diode load. [5]
- Q5)** a) Use Millers theorem to estimate BW of differential amplifier. [5]  
b) Draw and explain feedback amplifier. [5]

*P.T.O.*

- Q6)** a) Describe series and shunt feedback and their impact on impedance. [5]  
b) Write a note on loop gain and gain stability. [5]
- Q7)** a) Explain PSRR in details. [5]  
b) Write a note on Analog CMOS Lay out. [5]
- Q8)** a) What is mean by fingering and digitization in layout? [5]  
b) Explain common centroid layout and it's benefits. [5]



Total No. of Questions : 8]

SEAT No. :

PC-5204

[Total No. of Pages : 2

**[6355]-315**

**F.Y. 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)** Explain the 'Research Need' in Society and Industry. **[5]**

**b)** Compare Descriptive Research verses Analytical Research. **[5]**

**Q2) a)** Explain Research methods and Methodology. **[5]**

**b)** Compare Applied Research verses fundamental Research. **[5]**

**Q3) a)** Identify gap from literature review. **[5]**

**b)** Why literature review is important in defining a problem statement. **[5]**

**Q4) a)** How to define the research problem. **[5]**

**b)** Steps to publish a Research patent. **[5]**

**Q5) a)** Explain Important concepts relating to research design. **[5]**

**b)** What is criteria for selecting sampling procedure and explain characteristics of good sampling design. **[5]**

*P.T.O.*

- Q6)** a) Explain scale construction techniques. [5]  
b) Explain different methods of data collection in research. [5]
- Q7)** a) Draw a structure of thesis report writing. [5]  
b) Explain LATEX tool for Documentation and presentation. [5]
- Q8)** a) Write a Research proposal for project-based innovative Research. [5]  
b) Explain types of technical papers and explain review paper concept. [5]



Total No. of Questions : 7]

SEAT No. :

PC5179

[Total No. of Pages : 3

[6355]-321

First Year M.E. (Mechanical Engineering) (Robotics & Automation)

**MERA-501 : ADVANCED MATHEMATICS AND NUMERICAL  
METHODS**

**(2021 Pattern) (Semester - I)**

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

**Q1)** a) Solve the following system of linear algebraic equations by using Gauss seidel method.  $27x + 6y - z = 3$ ,  $6x + 15y + 2z = 72$ ,  $x + y + 54z = 110$

b) Compute the solution of  $x^3 - x^2 - 1 = 0$  in (1,2) by using bisection method I correct up to two decimals.

**[10]**

**Q2)** a) Find the regression line of y on x for the data  $(x, y) = (1,4), (1,0), (4, -3), (6, -1), (8, -10)$ .

b) Set up Newton's divided difference formula for the data tabulated below and derive the polynomial of highest possible degree and find f (4)

x	0	1	2	5
F(x)	2	3	12	13

**[10]**

**P.T.O.**



**Q3) a)** Evaluate the integral  $I = \int_{-1}^1 2x^2 + 3xy + 4y^2 dx dy$  by using gauss quadrature.

b) By means of newton divided difference formula find the value of  $f(8)$  from the following table.

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

[10]

**Q4) a)** Find the characteristic equation and eigenvalues of  $A = \begin{bmatrix} 3 & 1 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 3 \end{bmatrix}$  by using Faddeev laeverries method.

b) Find the numerically larger eigenvalue of the given matrix by power method

$$A = \begin{bmatrix} 4 & 0 & 1 \\ -2 & 0 & 1 \\ 2 & 0 & 1 \end{bmatrix} \text{ where initial vector } X_0 = \begin{bmatrix} 1 \\ -0.5 \\ 0.5 \end{bmatrix}.$$

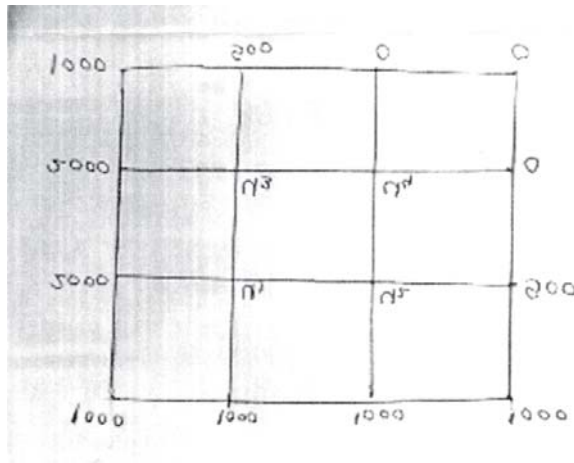
[10]

**Q5) a)** If  $\frac{dy}{dx} = 2x$  with  $y(1) = 2$  then estimate  $y(1.5)$  by using Eulers's Method using step size 0.1.

b) Use the shooting method to approximate the solution of the boundary value problem  $\frac{d^2y}{dx^2} - 2y = 0, y(0) = 1.2, y(1) = 0.9, h = 0.25$ .

[10]

- Q6)** a) Give the classification of partial differential equations of function of two independent variables. Explain the type of Laplace Equation.
- b) Given the values of  $u(x,y)$  on the boundary of the square 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 Jacobi's Method.



[10]

- Q7)** a) Find a real root of equation  $3x = \cos x + 1$  by using Newton Raphson Method.
- b) If  $\frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 2xy = 1$   $y(0) = 1$ ,  $y'(0) = 0$ , Evaluate  $y(0.1)$  using Runge Kutta method of order 4.

[10]

\* \* \*

Total No. of Questions : 7]

SEAT No. :

PC-5180

[Total No. of Pages : 2

[6355]-322

**M.E. (Mechanical Engineering) (Robotics & Automation)**

**MERA 502 : MACHINE VISION SYSTEM**

**(2017 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

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

**Q1)** Compare between Human vision, Machine vision and Computer vision.  
Write the benefits of Machine Vision over others. **[10]**

**Q2)** What is Image Acquisition? Explain Image Processing in Spatial and Frequency Domain? **[10]**

**Q3)** Explain Image analysis on the basis of, **[10]**

- a) Feature extraction
- b) Shape and Size features,
- c) Texture Analysis,
- d) Template Matching and Classification.

**Q4)** Write Machine vision applications in metrology and gauging, Vision guided robotics, Field and Service Applications, and Bio medical field. **[10]**

**Q5)** How to interface machine vision system? Explain the calibration of vision system. **[10]**

**P.T.O.**

**Q6)** Define Object Detection. Explain in detail Silhouette-Based Method for Object Classification and Viola Jones object detection framework. **[10]**

**Q7)** Explain the terms **[10]**

- a) Hidden Markov Models
- b) HMM Framework for Gait Recognition



Total No. of Questions : 7]

SEAT No. :

PC-5181

[Total No. of Pages : 2

**[6355]-323**

**M.E. (Mechanical Engineering) (Robotics & Automation)**

**MEERA 503 : TOTAL INTEGRATED AUTOMATION  
INDUSTRY - 4.0**

**(2021 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates :*

- 1) Answer any five questions from the following.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*

**Q1) Discuss the below terms.**

**[10]**

- a) Break-Even Analysis
- b) Cost of Manufacturing Lead time and Work-in process.

**Q2) Explain Automation for Machining Operations with example.**

**[10]**

**Q3) Explain following terms :**

**[10]**

- a) Analysis for Material Handling Systems
- b) Conveyor Systems
- c) Automated Guided Vehicle Systems

**Q4) Explain following terms :**

**[10]**

- a) LAN, Analog & Digital I/O Modules
- b) SCADA System
- c) RTU

**P.T.O.**

***Q5)*** Why there is a need of Inspection and testing in Total Integrated Automation Industry. **[10]**

***Q6)*** Write a PLC Program for any industrial application. **[10]**

***Q7)*** Explain the sequential steps of working PLC system. **[10]**



Total No. of Questions : 7]

SEAT No. :

PC-5182

[Total No. of Pages : 2

[6355]-324

**M.E. Mechanical (Robotics & Automation)**  
**ENGINEERING RESEARCH METHODOLOGY**  
**(2017 Pattern) (Semester - I) (MERA 504)**

*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.*

**Q1) a)** What is motivation for doing research? **[5]**

b) Discuss various types of research? **[5]**

**Q2) a)** Explain the importance of review of literature and different sources of literature? **[5]**

b) Explain selection of suitable journal for publishing research work. **[5]**

**Q3) a)** Explain basic principles of experimental design with suitable example. **[5]**

b) Discuss steps involve in developing a research plan. **[5]**

**Q4) a)** Discuss the different types of data collection techniques? **[5]**

b) Define the role of statistics for data analysis and discuss with appropriate example. **[5]**

**P.T.O.**

**Q5)** Define the following terms with example,

**[10]**

- i) Chi-square test
- ii) Student's t-test
- iii) Regression modelling
- iv) ANOVA
- v) F-test

**Q6)** Explain the steps involve in writing a research proposal?

**[10]**

**Q7)** Differentiate the parametric V/s Non Parametric methods used in data collection.

**[10]**





Total No. of Questions : 10]

SEAT No. :

**PC5183**

[Total No. of Pages : 2

**[6355]-325**

**M.E. (Computer Engineering)**

**OPERATING SYSTEM DESIGN**

**(2013 Pattern) (Semester - II) (510107)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Attempt any 5 questions from 1 to 8. Attempt any one question from 9 and 10.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Assume suitable data, if necessary.*
- 4) Figures to the right indicate full marks.*

**Q1)** a) Elucidate the functionality of four resources of virtual computer. [4]  
b) Elaborate the functionality of general purpose and control registers. How do base and bound registers control access to memory in user mode.? [4]

**Q2)** a) State and explain the steps involved in software design process. [4]  
b) Describe the following system calls. [4]  
i) Unlink  
ii) Lseek  
iii) Stat  
iv) Execv

**Q3)** a) Elaborate the functionality of system call interrupt handler? [4]  
b) Write short note on “Win Big Then Give Some Back” with OS examples [4]

**Q4)** Brief on any 4 of the following: [8]  
a) Remote Procedure Call  
b) Multiple Queue Scheduling  
c) Two Phase locking  
d) Highest Response Ratio Next Scheduling(HRN)  
e) Semaphores

**Q5)** a) Explain the concept of buddy system. [4]  
b) Comment on the following mechanisms. [4]  
i) Mutual Exclusions  
ii) Producer consumer  
iii) Multiple server & client  
iv) Deadlocks and prevention

**P.T.O.**

- Q6)** a) Explain why round robin scheduling is also called time slicing. Why is the context switch time important in closing a time quantum in round robin scheduling? [4]
- b) What is the basic purpose of mutual exclusion and signaling in IPC pattern? [4]
- Q7)** a) What are the differences between first fit algorithm, next fit algorithm, best fit algorithm and worst fit algorithm. [4]
- b) Compare local and global page replacement algorithms. Mention advantages of each. [4]
- Q8)** a) Explain the following: [4]
- i) “law of diminishing returns”
  - ii) Binding time
  - iii) Lazy creation
  - iv) Lazy evaluation
- b) What is late binding? Give examples of late binding. Explain the design technique of late binding in virtual memory. [4]
- Q9)** a) Comment on the following terminologies [5]
- i) Block device and character devices
  - ii) Strategy routine
  - iii) Double buffering
  - iv) Batching and aging
  - v) Unified interface
- b) Why are I/o devices important in a computer system? Define seek time and Latency Time. [5]
- Q10)** a) Clarify the following with respect to Queuing theory [8]
- i) An arrival distribution
  - ii) A service distribution
  - iii) Little’s law
  - iv) Queuing discipline
- b) What do you mean by digital signature? How can cryptography be used to implement digital signatures? [2]



Total No. of Questions : 6]

SEAT No. :

PC-5184

[Total No. of Pages : 2

[6355]-326

**M.E. (Computer Engineering)**  
**SOFTWARE DESIGN AND ARCHITECTURE**  
**(2013 Pattern) (Semester - II) (510108)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) Solve question number 1 or 2, 3 or 4 and 5 or 6.*
- 2) Neat diagrams must be drawn whenever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) How is Software Architecture documented? What are Context diagrams, what do they depict. [8]
- b) When and why is it important to describe multiple architectural views? [8]

OR

- Q2)** a) Describe the system quality attributes? Explain Modifiability and Performance quality attributes in detail. [8]
- b) Describe the role of the architectural views in knowledge transfer. What are the different types and challenges in this knowledge transfer. [8]

- Q3)** a) What are Behavioral patterns? List and explain Four Behavioral patterns. [8]
- b) Explain Views, Viewtypes and Styles. For a particular system how are the relevant views identified? Explain with an example. [8]

OR

- Q4)** a) How are design patterns classified? Explain in brief any two patterns under each class. [8]
- b) List the difference between Factory and Abstract Factory Design Pattern? [8]

**P.T.O.**

- Q5)** a) Explain layered architecture in Hierarchical architectures and comment on its probable application domains. [9]
- b) What are archetypes and patterns, explain with an example. State the UML profile for archetypes. [9]

OR

- Q6)** a) What are the goals of Customer Relationship Management (CRM)? Explain how to model the Customer with an example. [9]
- b) Explain archetypes and patterns. Comment on the archetype variations and optionality. [9]

