

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Show that $f(z) = 2z + \bar{z}$ is not analytic 6M
 b) Find the constant a for which the function $u(x, y) = ax^2 + 4xy - 3y^2$ is harmonic 6M

(OR)

2. Find an analytic function whose imaginary part is $x^2 - y^2 + \frac{x}{x^2 + y^2}$ 12M

UNIT-II

3. a) Evaluate $\oint_C \frac{z^3 - \sin 3z}{\left(z - \frac{\pi}{2}\right)^3} dz$ where C is the circle $|z| = 2$ by Cauchy's integral formula 6M
 b) Evaluate by residue theorem $\oint_C \frac{z^2 + 4}{z - 3} dz$ where C is the circle $|z| = 5$ 6M

(OR)

4. a) Expand $f(z) = \frac{1}{z^2(1-z)}$ as Laurent's series in the region $|z| > 1$ 6M
 b) Define: (i) Isolated singularity (ii) Removable singularity with an example 6M

UNIT-III

5. Suppose that the weights of 800 male students are normally distributed with mean 140 pounds and standard deviation 10 pounds. Find the number of students whose weights are in between 138 and 148 pounds 12M
(OR)
 6. a) A random sample of size 100 is taken from an infinite population having the mean 76 and the variance 256. What is the probability that the sample mean will be between 75 and 78 8M
 b) Find the value of the population correction factor for $n = 10$ and $N = 1000$ 4M

UNIT-IV

7. a) Explain (i) Type –I error (ii) Type-II error 4M
b) A sample of 26 bulbs gives a mean life of 990 hours with standard deviation of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard at level of significance 0.05 8M
- (OR)**
8. The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Test whether the samples are drawn from the same population of standard deviation 2.5 inches 12M

UNIT-V

- 9 Determine the rank correlation coefficient for the following data 12M

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

(OR)

10. Fit a second degree parabola $y = a + bx + cx^2$ for the following data 12M

x	0	1	2	3	4	5	6	7	8
y	12.0	10.5	10.0	8.0	7.0	8.0	7.5	8.5	9.0

AR18

CODE: 18BST209

SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations, October-2021

Biology

(Common to CE, CSE & IT)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Justify the need of study of Biology in Engineering with suitable examples. 6M
b) Discuss how biological observations of 18th Century that lead to major discoveries. 6M

(OR)

2. a) Explain the history and evolution of Biology in relation to engineering. 6M
b) Explain the Brownian movement in respect of thermodynamics. 6M

UNIT-II

3. a) Compare and contrast between Prokaryotes and Eukaryotes? 6M
b) Classify living organisms based on the energy and carbon utilisation. 6M

(OR)

4. a) Describe the habitat ecology of a Forest Ecosystem. 6M
b) Explain the process and significance of Sterilisation. 6M

UNIT-III

5. a) Discuss about Genetic disorders in humans with any Two examples. 6M
b) Mention different stages of Meiosis and it's significance. 6M

(OR)

6. a) What is Gene interaction and explain the phenomenon of Epistasis 6M
b) What are different steps in Recombinant DNA Technology? 6M

UNIT-IV

7. a) Write Physical and Chemical Properties of Enzymes. 6M
b) Describe the Mechanism of enzyme action with Two examples. 6M

(OR)

8. a) Explain briefly about the Hierarchy in protein structure. 6M
b) Explain the concept of Transporters-Receptors of Proteins. 6M

UNIT-V

9. a) Describe the Glycolysis cycle 6M
b) What is Anabolism? Explain briefly about Photosynthesis. 6M

(OR)

10. a) Demonstrate the energy yield in Krebs cycle 6M
b) Evaluate the process of CO₂ fixation through the Calvin cycle 6M

CODE: 16CE2005

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT,
TEKKALI**

(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations, October-2021

ENVIRONMENTAL ENGINEERING-I

(Civil Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Estimate the population for a design period of three decades by Arithmetical Increase, Geometrical Increase and Incremental Increase methods for the census data given below: 8M

Year	1961	1971	1981	1991	2001	2011
Population	1, 52, 000	1, 85, 000	2, 25, 000	2, 75, 000	3, 25, 000	3, 75, 000

Which method do you prefer for the above data? Why?

- b) Determine and elaborate the physical parameters of potable water, give their permissible limits according to Indian Standards Organization 10500. 6M
- (OR)**
2. a) Imagine the importance of hourly Fluctuations in demand of water in the design of water works, how do you manage these Fluctuations while designing the water supply scheme? 8M
- b) Visualize and elaborate the following. 6M
- i) Waterborne diseases
 - ii) Fire demand

UNIT-II

3. a) Summarize the 'Continuous' and 'Intermittent' system of water supply. Explain any 6 drawbacks of intermittent water supply. Which system is adopted in our country? Why? 7M
- b) What are the common sources of water for water supply scheme and produce the factors that govern the selection of particular source? 7M

(OR)

4. a) Illustrate the following with neat sketches 6M
 i) Sluice valve ii) Air relief valve iii) Non-return valve
 b) Examine the Hardy Cross and equivalent pipe methods along with advantages and 8M
 disadvantages.

UNIT-III

5. a) Draw the flow diagrams of water treatment for the following. 6M
 i) River water subjected to pollution from drainage waste from a city
 ii) Ground water free from pollution but containing Hardness and dissolved gases
 b) What is optimum dosage of coagulant? How is it determined in the laboratory? 8M

(OR)

6. a) Design a circular clarifier to treat 5 MLD of water. The OFR should not exceed 30, 7M
 000 lt/sq.m./day. Suitable data may be assumed.
 b) A water works has to purify the water for a town whose daily demand is 9 MLD. 7M
 Assume that the velocity of flow in the sedimentation tank as 22cm/min and
 detention period as 8 hours. Design a suitable sedimentation tank for the above.

UNIT-IV

7. a) Show three methods for disinfection of potable water. Make clear under what 7M
 circumstances you would recommend their application.
 b) Define multimedia filter and demonstrate how multimedia filters are useful to 7M
 supply water to a town and why?

(OR)

8. a) A quantity of Na⁺ form of ion-exchange resin (5g) is added to water containing 2 8M
 meq of KCl and 0.5 meq of NaCl. Calculate the residual concentration of K⁺ if
 ion-exchange capacity of the resin is 4.0 meq/g of dry weight and the selectivity
 coefficient is equals to 1.46.
 b) Focus about any six factors that affect the bactericidal efficiency of Chlorine. 6M

UNIT-V

9. a) Draw the hierarchy of municipal solid waste management chart and determine the 7M
 physical characteristics of MSW.
 b) Explain 4R' method in waste hierarchy and state the advantages of on-site 7M
 segregation of solid waste?

(OR)

10. a) Visualize and elaborate the following. 7M
 i) Shredding ii) Incineration iii) Pulverization
 b) Demonstrate the principles of solid waste management. 7M

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations October 2021

**ELECTRICAL TECHNOLOGY
(Electronics and Communication Engineering)**

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

Each Questions Carry 14 Marks

All parts of the Question must be answered at one place

UNIT – I

1. Explain the Construction and operating principle of DC Generator. [14M]

(OR)

2. a) Explain the working of 3-point starter with neat diagram [7M]

b) Explain any one speed control method for DC shunt motor [7M]

UNIT – II

3. A 200/2000V single phase 30KVA transformer having the following test results:

O.C test: 200V, 5.8A, 300W on LV side

S.C test: 75V, 16A, 800W on HV side.

Calculate the voltage regulation at 0.9 pf and parameters of the equivalent circuit referred to the LV Side. [14M]

(OR)

4. a) Draw and explain phasor diagram of transformer under no-load condition. [7M]

b) Explain various losses in a single-phase transformer [7M]

UNIT-III

5. a) Explain the torque slip characteristics of three phase induction motor [7M]

(b) Explain any one starting method for three phase induction motor [7M]

(OR)

6. Explain the working principle of three phase induction motor with neat diagram? [14M]

UNIT-IV

7. A 4-pole, 50Hz star-connected alternator has a flux per pole of 0.12Wb. It has 4 slots per [14M]

Pole per phase, conductors per slot being 4. If the winding coil span is 150°, find the induced emf.

(OR)

8. Explain the synchronous impedance method of finding voltage regulation for an alternator [14M]

UNIT-V

9. What are the basic requirements of indicating instruments? Briefly discuss them. [14M]

(OR)

10. Describe the construction and working of PMMC instrument. [14M]

AR16

CODE: 16ME2008

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations, October-2021

**FLUID MECHANICS & HYDRAULIC MACHINERY
(Common to EEE & ME)**

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Differentiate between: (i) Liquids and gases, (ii) Real fluids and ideal fluids, (iii) Specific weight and specific volume of a fluid. **7M**
The diameters of a small piston and a large piston of a hydraulic jack are 2 cm and 10 cm respectively. A force of 60 N is applied on the small piston. Find the load
b) lifted by the large piston, when: (a) the pistons are at the same level (b) small piston is 20 cm above the large piston. The density of the liquid in the jack is given as 1000 kg/m^3 **7M**

(OR)

2. a) Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 7.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. **7M**
b) Examine whether the following velocity components represent a physically possible flow ? **7M**
 $u_r = r \sin\theta$, $u_\theta = 2r \cos\theta$.

UNIT-II

3. a) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections I and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section I is 39.24 N/cm^2 , find the intensity of pressure at section 2. **7M**
b) Starting with Euler's equation of motion along a stream line, obtain Bernoulli's equation by its integration. List all the assumptions made. **7M**
(OR)
4. a) Derive equation of discharge for venturimeter. **7M**
b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 14.715 N/cm^2 and vacuum pressure at the throat is 40 cm of mercury. Find the discharge of water through venturimeter. **7M**

UNIT-III

5. a) Derive an expression for the loss of head due to friction in pipes. **7M**
b) For turbulent flow in a pipe of diameter 300 mm, find the discharge when the centreline velocity is 2.0 m/s and the velocity at a point 100 mm from the centre as measured by pitot-tube is 1.6 m/s. **7M**

(OR)

6. a) Show that the force exerted by a jet of water on moving inclined plate in the direction of jet is given by $F_x = \rho a(V-u)^2 \sin^2 \theta$ **6M**
b) A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate: (i) when the plate is stationary, and (ii) when the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving. **8M**

UNIT-IV

7. A Pelton wheel is working under a gross head of 400 m. The water is supplied through penstock of diameter 1 m and length 4 km from reservoir to the Pelton wheel. The co-efficient of friction for the penstock is given as .008. The jet of water of diameter 150 mm strikes the buckets of the wheel and gets deflected through an angle of 165° . The relative velocity of water at outlet is reduced by 15% due to friction between inside surface of the bucket and water. If the velocity of the buckets is 0.45 times the jet velocity at inlet and mechanical efficiency as 85% determine : (i) Power given to the runner, (ii) Shaft power, (iii) Hydraulic efficiency and overall efficiency. **14M**

(OR)

8. a) Obtain an expression for unit speed, unit discharge and unit power for a turbine. **7M**
b) A Kaplan turbine develops 9000 kW under a net head of 7.5 m. Mechanical efficiency of the wheel is 86%. The speed ratio based on the outer diameter is 2.2 and the flow ratio is 0.66. Diameter of the boss is 0.35 times the external diameter of the wheel. Determine the diameter of the runner and the specific speed of the runner. **7M**

UNIT-V

9. a) Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches. **7M**
b) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. **7M**

(OR)

10. a) Explain with neat sketches the function of air vessels in a reciprocating pump. **7M**
b) A single-acting reciprocating pump, running at 50 r.p.m., delivers $0.01 \text{ m}^3/\text{s}$ of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine : (i) The theoretical discharge of the pump, (ii) Co-efficient of discharge, and (iii) Slip and the percentage slip of the pump. **7M**

AR16

CODE: 16BS2005

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations, October-2021

**PROBABILITY AND STATISTICS
(Common to CSE& IT Branches)**

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Box – A contains 5 red and 3 white marbles; box – B contains 2 red balls and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same colours? 7M
- b) A business man goes to hotels X, Y, Z, 20%, 50%, and 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbings. What is the probability that business man's room having faulty plumbing is assigned to hotel Z. 7M

(OR)

2. a) The probability mass function of a variate X is given below. 7M

X=x	0	1	2	3	4	5	6
P(X=x)	K	3K	5K	7K	9K	11K	13K

- (i) Obtain K (ii) Obtain $P(X < 4)$, $P(X \geq 5)$, $P(3 < X \leq 6)$
- b) The probability density function of a random variable X is $f(x) = \begin{cases} 2e^{-2x}; & \text{for } x > 0 \\ 0 & ; \text{for } x \leq 0 \end{cases}$ 7M

Obtain the probabilities that it will take on a value (i) between 1 and 3 (ii) greater than 0.5

UNIT-II

3. a) Ten coins are thrown simultaneously. Obtain the probability of getting at least seven heads. 7M
- b) If a Poisson distribution is such that $\frac{3}{2} P(X = 1) = P(X = 3)$, determine 7M
- (i) $P(X \geq 1)$ (ii) $P(X \leq 3)$ (iii) $P(2 \leq X \leq 5)$.

(OR)

4. a) What are Chief characteristics/properties of the normal distribution. 7M
- b) If X is a normal variate with mean 30 and standard deviation 5. Find the probabilities that (i) $26 \leq X \leq 40$ (ii) $X \geq 45$. 7M

UNIT-III

5. A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 that can be drawn with replacement from the population. Obtain 14M
- (a) The mean of the population. (b) The standard deviation of the population.
- (c) The mean of the sampling distribution of means and (d) The standard deviation of sampling distribution of means (i.e., the standard error of means).

(OR)

AR16

CODE: 16BS2005

SET-1

6. a) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence? 7M
- b) The mean and standard deviation of a population are 11,795 and 14,054 and $n = 50$ respectively. Construct 95% confidence interval for the true mean if $\bar{x} = 11,795$. 7M

UNIT-IV

7. Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same against that they are not at 5% level. 14M

(OR)

8. Below are given the gain in weights (in kgs) of pigs fed on two diets A and B 14M

Diet A	25	32	30	34	24	14	32	24	30	31	35	25		
Diet B	44	34	22	10	47	31	40	32	35	18	21	35	29	22

Test if the two diets differ significantly as regards their effect on increase in weight.

UNIT-V

9. The following data related to the age of husbands and wives. Obtain the regression equations and determine the most likely age of husbands for age of wife 25 years and most likely age of wife for age of husbands 30 years. 14 M

Age of husband	25	28	30	32	35	36	38	39	42	45
Age of wife	20	26	29	30	25	18	26	35	35	46

(OR)

- 10 a) Fit a second degree parabola equation to the following data. 7M

x	1	2	3	4	5
y	6	17	34	57	86

and also estimate the value of y when $x=6$.

- b) Fit an exponential curve of the type $Y = a \cdot b^x$ to the following data. 7M

X	2	3	4	5	6
Y	144	172.8	207.4	248.8	298.6

**COMPLEX VARIABLES AND STATISTICAL METHODS
(Common to CE & ME)****Time: 3 Hours****Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1 x 10 = 10 M]**

1. a) The necessary and sufficient conditions for the function $w = f(z) = u(x, y) + iv(x, y)$ to be analytic in a region R are
- b) Any function $\phi(x, y)$ is called a harmonic if it satisfies -----
- c) Write the statement of Cauchy's Integral theorem
- d) If $f(z) = \frac{1 - \cos z}{z}$, then the nature of the singularity $z = 0$ -----
- e) If $f(z) = \frac{ze^z}{(z+2)^4(z-1)}$ then the residue at the pole $z = 1$ is -----
- f) Explain about invariant points
- g) Find the value of $P\left(\frac{B}{A}\right)$ for the values $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, $P(A \cup B) = \frac{1}{2}$.
- h) Mean and variance of a Poisson distribution are -----, -----
- i) Write the formula for the standard error of sample mean
- j) Define null hypothesis

PART-B**Answer one question from each unit****[5x12=60M]****UNIT-I**

2. a) Find the analytic function, whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$ 6M
 - b) Evaluate $\oint_C \frac{3z^2 + z}{z^2 - 1} dz$. Where C is the circle $|z - 1| = 1$ 6M
- (OR)**
- 3 Using Cauchy's integral formula, evaluate $\oint_C \frac{\cos z}{z(z^2 + 8)} dz$ Where C is the boundary of the square whose sides lie along the lines $x = \pm 2$, $y = \pm 2$ 12M

UNIT-II

4. a) Find the Laurents series expansion of $f(z) = \frac{e^{2z}}{(z-1)^3}$ about $z = 1$ 6M
- b) Using residue theorem, evaluate $\oint \frac{z-3}{z^2 + 2z + 5} dz$ where C is the circle $|z + 1 - i| = 2$ 6M

(OR)

1 of 2

AR13

CODE: 13BS2007

SET-1

5. Use contour integration to evaluate $\int_0^{\infty} \frac{dx}{1+x^4}$ 12M

UNIT-III

6. a) Using the transformation $w = \sin z$, prove that the lines $x = c$ in the z -plane are transformed into confocal hyperbolas in the w -plane and the straight lines $y = c$ in the z -plane are transformed into confocal ellipses in w -plane. Where c is constant. 6M
- b) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$ 6M

(OR)

- 7 Find the bilinear transformation which maps the points $(-1, 0, 1)$ in to the points $(0, i, 3i)$. 12M

UNIT-IV

8. a) Three machines I, II, III produce 40%, 30%, 30% of the total number of items of factory. The percentage of defective items of these machines are 4%, 2%, 3%. If an item is selected at random, find the probability that the item is defective. 6M
- b) Two dice are thrown five times. Find the probability of getting 7 as sum (i) at least once (ii) two times (iii) $P(1 < X < 5)$. 6M

(OR)

- 9 A population consists of six numbers 4, 8, 12, 16, 20, 24. Consider all possible samples of size two that can be drawn without replacement from this population. Find (i) the population mean (ii) the population standard deviation (iii) the mean of the sampling distribution of means 12M

UNIT-V

10. a) Write the procedure for testing of hypothesis 6M
- b) According to the norms established for a mechanical aptitude test, persons who are 18 years old have an average height of 73.2 with a standard deviation of 8.6. If 4 randomly selected persons of that age averaged 76.7, test the hypothesis $\mu = 73.2$ against the alternative hypothesis $\mu > 73.2$ at the 0.01 level of significance. 6M

(OR)

11. Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviations are calculated and shown below. Make a large sample test to test the significance of the difference between the means. 12M

	Mean	S.D	Size of the sample
University A	55	10	400
University B	57	15	100

AR13

CODE: 13EE2008

SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations, October-2021
ELECTRICAL TECHNOLOGY

(Electronics and Communication Engineering)

Time: 3 Hours

Max Marks: 70

PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) Define faradays first law of electromagnetic induction
b) What is the formula for efficiency of a DC Motor.
c) What are the different types of transformers?
d) Define the regulation of transformer.
e) What is the relation between speed and frequency of alternator
f) Define pitch factor
g) What is the slip of an Induction motor at the time of starting?
h) What is the purpose of lamination of a core of a transformer?
i) A 3-Phase ,4-pole ,50 Hz Induction motor runs at a speed of 1440 rpm find its slip.
j) Difference between MI and MC instruments.

PART-B

Answer one question from each unit

[5x12=60M]

UNIT-I

2. a) Explain the principle of operation and working of DC generator 8M
b) A 4-pole generator has 48 slots and 8 conductors per slot. The useful flux per pole is 30mWb and speed is 800 rpm. Find the generated emf, if the machine is wave connected. 4M
- (OR)
3. a) Explain the working of 3-point starter with neat diagram 8M
b) Explain any one speed control method for DC shunt motor 4M

UNIT-II

4. a) Develop the EMF equation of a Transformer. 8M
b) The primary winding of a 50Hz single phase transformer has 500 turns and is supplied from 3300V supply. The secondary winding has 50 turns. Find peak value of the flux in the core and the secondary voltage. 4M

(OR)

5. A 200/2000V single phase 30KVA transformer having the following test results: 12M
O.C test: 200V, 5.8A, 300W on LV side
S.C test: 75V, 16A, 800W on HV side.
Calculate the voltage regulation at 0.9 pf and parameters of the equivalent circuit referred to the LV Side.

UNIT-III

6. a) Explain the speed-torque characteristics of a three-phase induction motor. 8M
b) A 6 pole, 3-phase induction motor is connected across a 400 V, 50 Hz supply source. Calculate the speed of the rotating magnetic field produced. What would be the speed of the rotor when slip is 0.04. Also calculate the frequency of rotor current at standstill and at a slip of 0.03. 4M

(OR)

7. Explain the working principle of three phase induction motor with neat diagram. 12M

UNIT-IV

8. a) Explain in detail about the constructional features of an alternator. 6M
b) A 3-phase star connected alternator has 8-poles and runs at 750rpm. It has 24 slots/phase and 10 conductors per slot, the flux being 0.055 Wb/pole. Calculate the line voltage. Assuming winding factor to be 0.96. 6M

(OR)

9. Explain the synchronous impedance method of finding voltage regulation for an alternator 12M

UNIT-V

10. Describe the construction and working of PMMC instrument. 12M
(OR)
11. Describe the construction and working of MI instrument. 12M

AR13

CODE: 13BS2006 SET-1
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)

II B.Tech I Semester Supplementary Examinations, October-2021
PROBABILITY AND STATISTICS
(Common to CSE and IT)

Time: 3 Hours

Max Marks: 70

PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) What are the axioms of probability?
b) Define cumulative distribution function
c) Define the expectation of a random variable
d) Define a binomial distribution
e) Define sampling distribution of the estimator
f) Define Type I and Type II errors
g) Write the assumptions of t - statistic
h) If the two regression lines are given as $20x-9y = 107$ and $4x-5y = -33$ then find the mean.
i) Explain the significance of range chart in statistical quality.
j) Define a queue discipline.

PART-B

Answer one question from each unit

[5x12=60M]

UNIT-I

- 2 A random variable X has the following probability function

12M

X_i	-3	-2	-1	0	1	2	3
$P(X_i)$	K	0.1	K	0.2	2K	0.4	2k

Find (i) K (ii) Mean (iii) $P(x \leq -1)$, $P(x > 1)$

(OR)

3. a) Police plan to enforce speed limits by using RADAR traps at 3 different locations within the city limits. The radar traps at each of the locations L_1 , L_2 & L_3 are operated 20%, 30% & 50% of the time, and if a person who is speeding on his way to work has probabilities of 6%, 3% and 2% respectively, of passing through these locations.

6M

- a) What is the probability that he will receive a speeding ticket?
- b) The person received a speeding ticket on his way to work, what is the probability that he passed through the radar trap located at L_3 ?

AR13

CODE: 13BS2006

SET-1

- b) The trouble shooting capability of an IC chip in a circuit is a random variable X with probability density function given by **6M**

$$f(x) = \begin{cases} ax, & 0 \leq x < 1 \\ a, & 1 \leq x < 2 \\ 3a - ax, & 2 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Find i) The constant, ii) Mean, $E(X)$

UNIT-II

4. Out of 800 families with 5 children each, how many would you expect to have **12M**
- i) 3 boys
 - ii) atleast one boy?
 - iii) 5 girls?

(OR)

5. A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size two which can be drawn without replacement from this population. Then, find **12M**
- (i) The mean of the population
 - (ii) The standard deviation of the population
 - (iii) The mean of the sampling distribution of means and
 - (iv) The standard error of the sampling distribution of means.

UNIT-III

6. The average hourly wage of a sample of 150 workers in a plant 'A' was Rs.2.56 with a standard deviation of Rs.1.08. the average hourly wage of a sample of 200 workers in plant 'B' was Rs.2.87 with a standard deviation of Rs.1.28. can an applicant safely assume that the hourly wage paid by plant 'B' are higher than those paid by plant 'A' ? **12M**

(OR)

7. To compare two kinds of bumper guards, 6 of each kind were mounted on a car and then the car was run into a concrete wall. The following are the costs of repairs. **12M**

Guard 1	107	148	123	165	102	119
Guard 2	134	115	112	151	133	129

Use the 0.01 level of significance to test whether the difference between two sample means significant.

UNIT-IV

8. Apply the method of least squares to fit a straight line for the following data pertain to the number of computer jobs per day and the required CPU time required: **12M**

Number of Jobs (x)	10	12	13	16	17	20	25
CPU time (y)	10	22	24	27	29	33	37

(OR)

9. Ten samples each of size 5 are drawn at regular intervals from a manufacturing process. The sample means (\bar{x}) and their range (R) are given below. **12M**

Sample	1	2	3	4	5	6	7	8	9	10
Mean \bar{x}	49	45	48	53	39	47	46	39	51	45
Range R	7	5	7	9	5	8	8	6	7	6

Calculate the control limits in respect of \bar{x} chart and R- chart comment on the state of control. Charts need not be drawn.

(you are given $A_2 = 0.58, D_4 = 2.115$)

UNIT-V

10. A self-service canteen employs one cashier at its counter. 8 customers arrive per every 10 minutes on an average. The cashier can serve on average one per minute. Assuming that the arrivals are Poisson and the service time distribution is exponential, determine: **12M**

- The average number of customers in the system,
- The average queue length
- Average time a customer spends in the system
- Average waiting time of each customer.

(OR)

11. An airlines organization has one reservation clerk on duty in its local branch at any given time. The clerk handles information regarding passenger reservations and flight timings. Assume that the number of customers arriving during any given period is poisson distributed with an arrival rate of eight per hour and that the reservation clerk can service a customer in six minutes on an average, with an exponentially distributed service time. **12M**

- What is the probability that the system is busy?
- What is the average time a customer spends in the system?
- What is the average length of the queue and what is the average number of customers in the system?