



# MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi &amp; Affiliated to JNTUH, Hyderabad)

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II B.Tech I Sem Supplementary Examination, July-2022

## Probability and Statistics (CE, CSC, CSD, CSE, CSI, CSM, IT)

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

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part – A, answer all questions which carries 20 marks.

3. In Part – B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

**PART- A****(10\*2 Marks = 20 Marks)**

- |  |    |     |     |
|--|----|-----|-----|
| 1. a) Define random variable.  | 2M | CO1 | BL1 |
| b) For any two events $A$ and $B$ , Prove that $P(A^c \cap B) = P(B) - P(A \cap B)$      | 2M | CO1 | BL3 |
| c) Define Estimation a Proportion for single mean.                                       | 2M | CO2 | BL1 |
| d) State the properties of Binomial probability distribution                             | 2M | CO2 | BL1 |
| e) Distinguish between parameter and statistic.  | 2M | CO3 | BL2 |
| f) State properties of good estimator  | 2M | CO3 | BL1 |
| g) Explain types of errors of decision that arise in testing a hypothesis?               | 2M | CO4 | BL2 |
| h) Define Markov chain.  | 2M | CO4 | BL1 |
| i) Write the formula to find the rank correlation, by defining the terms involved in it. | 2M | CO5 | BL1 |
| j) Explain the difference between correlation and regression analysis.                   | 2M | CO5 | BL2 |

**PART- B****(10\*5 Marks = 50 Marks)**

- |  |    |     |     |
|--|----|-----|-----|
| 2 a) Can two events be simultaneously independent and mutually exclusive? Explain.   | 5M | CO1 | BL2 |
| b) If $X$ is the number appearing on a die when it is thrown, show that the Chebychev's inequality gives $P( X - \mu  > 2.5) < 0.47$ . While the actual probability is zero. | 5M | CO1 | BL3 |

**OR**

- |   |     |     |     |
|---|-----|-----|-----|
| 3 Suppose three companies $X, Y, Z$ produce T.V.'s. $X$ produces twice as many as $Y$ while $Y$ and $Z$ produce the same number. It is known that 2% of $X$ , 2% of $Y$ and 4% of $Z$ are defective. All the T.V.'s produced are put into one shop and then one T.V. is chosen at random. Suppose a T.V. chosen is defective, what is the probability that this T.V. is produced by company $Z$ ? | 10M | CO1 | BL3 |
| 4 a) A normal population has a mean 0.1 and a standard deviation of 2.1. Find the probability that the mean of simple sample of 900 members will be negative.   | 5M  | CO2 | BL3 |

- 4 b) A manufacturer of pins knows that 2% of his product is defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. What is the probability that a box will fail to meet the guaranteed quality? 5M C02 BL3

OR

- 5 Find mean and variance of binomial distribution. 10M C02 BL3

- 6 a) Write the conditions of validity of  $\chi^2$ -test. 5M C03 BL1  
 b) A random sample of 20 fuses subjected to overload has mean time for blow of 10.63 minutes with standard deviation 2.48 minutes. What can we assert with 95% confidence about the maximum error if we use  $\bar{x}=10.63$  minutes as a point estimate of true average it takes such fuses for blow when subjected to overload? 5M C03 BL3

OR

- 7 In 1950 in India the mean life expectancy was 50 years. If the life expectancies from a random sample of 11 persons are 58.2, 56.6, 54.2, 50.4, 44.2, 61.9, 57.5, 53.4, 49.7, 55.4, 57.0. Does it confirm the expected view? 10M C03 BL3

- 8 a) It is observed that 174 out of a random sample of 200 truck drivers on highway during night are drunk. Is it valid to state that at least 90% of the truck drivers are drunk? Use 0.05 LOS. 5M C04 BL3

- b) The owner of a machine shop must decide which of two snack vending machines to install in his shop. If each is tested 250 times, the first machine fails to work 13 times and the second machine fails to work 7 times. Test at the 0.05 level of significance whether the difference between the corresponding sample proportions is significant. 5M C04 BL3

OR

- 9 The transition probability matrix of a Markov chain  $\{X_n\}$ ;  $n = 1, 2, 3$  having three states 1, 2 and 3 is  $P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$  and the initial distribution is  $P^{(0)} = (0.7, 0.2, 0.1)$   
 Find i)  $P\{X_2 = 3\}$  ii)  $P\{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$  10M C04 BL3

- 10 Twenty-five pairs of value of variates X and Y led to the following results  $N = 25, \sum x = 127, \sum y = 100, \sum x^2 = 760, \sum y^2 = 449, \sum xy = 500$ . A subsequent scrutiny showed that two pairs of values were copied down as (8, 14) and (8, 6) instead of (8, 12) and (6, 8). Find correct value of r and correct lines of regression. 10M C05 BL3

OR

- 11 Determine the constants  $a$  and  $b$  by the method of least squares such that  $y = ae^{bx}$  10M C05 BL3

x	2	4	6	8	10
y	4.07	11.08	30.12	81.89	222.6
	7	4	8	7	2