Code No.: MA402BS | **R20** | **H.T.No.** | | | **8** | **R** | | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Supply) - February- 2024
COMPUTER ORIENTED STATISTICAL METHODS
(Common to CSE, IT, CSM)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A (20 Marks)

1. a) Define discrete and continuous random variables. [2M]
   b) The probability density function of a continuous random variable X is given by $P(x)=ae^{-|x|}$ where $-\infty\leq x\leq\infty$. Show that $a=\frac{1}{2}$. [2M]
   c) Define geometric distribution. [2M]
   d) If the mean of Binomial distribution is 3 and variance is 9/4, obtain the value of n. [2M]
   e) If z is normally distributed with mean 0 and variance 1, evaluate $P(z \leq 1.64)$. [2M]
   f) Write any two properties of F-distribution. [2M]
   g) Discuss the level of significance. [2M]
   h) Explain the terms null and alternate hypothesis. [2M]
   i) Define Markov chain. [2M]
   j) Define continuous random process. [2M]

PART-B (50 Marks)

2. Three machines I, II and III produce 40%,30% and 30% of the total number of items of a factory. The percentages of defective items of these machines are 4%, 2% and 3%. An item is selected at random and found to be defective. Find the probability that it is from i) Machine- I ii) Machine-II iii) Machine-III [10M]

OR

3. If $f(x)=Ke^{-|x|}$ is p. d.f in $-\infty\leq x\leq\infty$, find: i) K ii) the mean iii) Variance. [10M]

4. A random variable X has the following probability distribution [10M]

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

(i) Find the value of K
(ii) Evaluate $P(X<6), P(X\geq 6)$

OR

5. If a Poisson distribution is such that $p(X=1)*\frac{3}{2}=p(X=3)$ then find (i) $p(X\geq 1)$ (ii) $p(X\leq 3)$ [10M]

6. Find the mean and standard deviation of a normal distribution in which 7% of items are under 35 and 89% are under 63. [10M]

OR

7. A population consists of the five numbers 2, 3, 6, 8, and 11. Consider all possible samples of size 2 that can be drawn without replacement from this population. Find [10M]
   (i) The mean of the population.
   (ii) The standard deviation of the population.
   (iii) The mean of the sampling distribution of means.
   (iv) The standard deviation of the sampling distribution of means.

8. A candidate for election made a speech in a city. Among 500 voters from city A, 59.6% are in favour of him where as among 300 voters from city B, 50% are in favour of him. Test the significance between the differences of two proportions at 5% level. [10M]

OR

9.a) A sample of 900 members has a mean 3.4 cms and S.D 2.61 cms. Is this sample has been taken from a large population of mean 3.25 and S.D 2.61. [5M]

b) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions is significant at 0.05 level of significance. [5M]

10. A training process is considered as a two state Markov chain. If it rains it is considered to be in state 0, and it doesn't rain the chain is in state 1. The transition probability of the Markov chain is defined by $P=\begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$. Find the probability that it will rain for three days from today assuming that it is raining today. Assume that the Mutual probabilities of state 0 or state 1as 0.4 and 0.6 respectively. [10M]

OR

11. Consider a three-state Markov chain with the transition matrix. If the initial probabilities [10M]

$P_0(x)=(0.2, 0.3, 0.5)$.

$$P=\begin{pmatrix} 0 & 1 & 0 \\ 0 & 2/3 & 1/3 \\ 1/16 & 15/16 & 0 \end{pmatrix}$$

i. Find the probabilities after two transitions.

ii. Find the limiting probabilities.

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