

Code No.: MA402BS

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**CMR ENGINEERING COLLEGE: : HYDERABAD**  
**UGC AUTONOMOUS**  
**II-B.TECH-II-Semester End Examinations (Supply) - February- 2023**  
**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) The probability that a regularly scheduled flight departs on time is  $P(D) = 0.83$ ; the probability that it arrives on time is  $P(A) = 0.82$ ; and the probability that it departs and arrives on time is  $P(D \cap A) = 0.78$ . Find the probability that a plane arrives on time, given that it departed on time. [2M]
- b) The probability density function of a continuous random variable  $X$  is given by  $f(x) = ke^{-|x|}$ , where  $-\infty < x < \infty$ . Show that  $k = \frac{1}{2}$ . [2M]
- c) If  $X$  is a discrete random variable prove that  $E(aX + b) = aE(X) + b$ . [2M]
- d) If  $X$  is a Poisson variate such that  $P(X = 2) = 9P(X = 4) + 90P(X = 6)$  then find its mean. [2M]
- e) Write the formula for the probability density function of Exponential and Normal distributions. [2M]
- f) State Central limit theorem. [2M]
- g) A random sample of size 100 has a standard deviation of 5. What can you say about the maximum error with 95% confidence. [2M]
- h) Explain Null Hypothesis. [2M]
- i) Define Stochastic matrix. Give one example. [2M]
- j) Classify the Stochastic Process. [2M]

**PART-B**

**(50 Marks)**

2. State and prove Baye's Theorem. Of the three men, the chances that a politician, a businessman or an academician, will be appointed as a Vice-Chancellor(V.C) of a university are 0.5, 0.3, 0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C are 0.3, 0.7, 0.8 respectively. Determine the probability that research is promoted. If research is promoted, what is the probability that V.C is an academician? [10M]

**OR**

3. A continuous random variable has the probability density function [10M]  
$$f(x) = \begin{cases} kxe^{-\lambda x}, & \text{for } x \geq 0, \lambda > 0 \\ 0 & \text{otherwise} \end{cases}$$
 Determine i) k ii) mean iii) variance.
- 4.a) If two cards are drawn from a pack of 52 cards which are diamonds, using Poisson distribution find the probability of getting two diamonds at least 3 times in 51 consecutive trails of two cards drawing each time. [5M]

- b) A random variable  $X$  has a mean  $\mu = 10$  and variance  $\sigma^2 = 4$ . Using Chebyshev's theorem, find (i)  $P(|X - 10| \geq 3)$ ; (ii)  $P(|X - 10| < 3)$  [5M]

**OR**

5. Four coins are tossed 160 times. The number of times  $x$  heads occur is given below. [10M]

$x$	0	1	2	3	4
No. of times	8	34	69	43	6

Fit a binomial distribution to this data on the hypothesis that coins are unbiased.

6. In a sample of 1000 cases, the mean of certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find [10M]
- i. How many students score between 12 and 15?
  - ii. How many score above 18?
  - iii. How many score below 18?

**OR**

7. A population consists of five numbers 2,3,6,8, and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find 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 deviation of the sampling distribution of means. [10M]
8. Write the procedure for the testing of hypothesis. Two independent samples of 8 and 7 items respectively had weights in Ounces as given below. Is the difference between means of the samples significant? [10M]

Sample-I	9	11	13	11	15	9	12	14
Sample-II	10	12	10	14	9	8	10	--

**OR**

9. In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a random of 800 from town B, 400 are found to be consumers of wheat. Do these data reveal a significant difference between town A and town B, so far as the proportion of wheat consumers is concerned? [10M]

10. The Transition probability matrix of a Markov chain  $\{X_n\}$  is given by  $P = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0.2 & 0 & 0.8 & 0 \\ 0 & 0.2 & 0 & 0.8 \\ 0 & 0 & 1 & 0 \end{bmatrix}$  [10M]

Verify 2-steps transitions of Chapman-Kolmogorov equations.

**OR**

11. The transition probability matrix of a Markov chain  $\{X_n\}; n = 1, 2, 3$  having three states 1, 2, 3 [10M]

is  $\begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$  and the initial distribution is  $P^{(0)} = \{0.7, 0.2, 0.1\}$  then find

$$P = \{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$$

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