Code No.: MA302BS | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Regular) - January- 2022
COMPUTER ORIENTED STATISTICAL METHODS
(CSD)

[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) If $P(A \cup B) = 4/5$, $P(B^C) = 1/3$ and $P(A \cap B) = 1/5$. Compute $P(A^C \cap B)$. [2M]
   b) The probability density function of a continuous random variable X is given by $P(x) = y_0\, e^{-|x|}$, where $-\infty < x < \infty$. Prove that $y_0 = \frac{1}{2}$. [2M]
   c) State geometric distribution. [2M]
   d) If the mean of Binomial distribution is 3 and variance is 9/4, obtain the value of n. [2M]
   e) Find the area A under the normal curve to the left of $z = -1.78$. [2M]
   f) Determine the s.d. of the sampling distribution of means of 300 random samples each of size n = 36 are drawn from a population of N = 1500 which is normally distributed with mean $\mu=22.4$ and s.d. σ of 0.048, if sampling is done without replacement. [2M]
   g) A random sample of 10 ball bearings produced by a company have a mean diameter of 0.5060cm with s.d 0.004cm. Evaluate the maximum error with 95% confidence. [2M]
   h) Explain one tail test and two tail test. [2M]
   i) Define stochastic process. [2M]
   j) Show that $v = (b \;\; a)$ is fixed point of the stochastic matrix $\begin{pmatrix} 1-a & a \\ b & 1-b \end{pmatrix}$. [2M]

PART-B (50 Marks)

2. Two cards are selected at random from 10 cards numbered 1 to 10. Evaluate the Probability P that the sum is odd if (a) 2 cards are drawn together, (b) 2 cards are drawn one after the other without replacement , and (c) 2 cards are drawn one after the with replacement. [3+3+4=10M] [10M]

OR

3. A random variable X has the following probability function: [10M]

x:	0	1	2	3	4	5	6	7
p(x):	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

(a) Find the value of k, (b) Evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$.
[2+8=10M]

4. Define random variable. A pair of fair dice is tossed. Let X denote the maximum of the number appearing i.e., $X(a, b) = \max(a, b)$ and Y denotes the sum of the numbers appearing i.e., $Y(a, b) = a + b$. Compute the mean, variance and standard deviation of the distribution. [10M]

OR

5. (a) Given that $P(X = 2) = 45.P(X = 6) - 3.P(X = 4)$ for a Poisson variate X, find the probability that $3 < X < 5$. [5M]

(b) A car firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variable with mean 1.5. Calculate the proportion of days on which some demand is refused. [5M]

6. A bus travels between two cities A and B which are 100 miles apart. If the bus has a breakdown, the distance X of the point of breakdown from city A has a uniform distribution U[0, 100]. [6M]
(a) There are service garages in the city A, city B and midway between cities A and B. If a breakdown occurs, a tow truck is sent from the garage closest to the point of breakdown. What is the probability that the tow truck has to travel more than 10 miles to reach the bus,
(b) Would it be more "efficient" if the three service garages were placed at 25, 50 and 75 miles from city A? Explain.

[4M]

OR

7. A population consists of the five numbers 3, 6, 9, 15, and 27. Consider all possible samples of size 3 that can be drawn without replacement from this population. Find (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 the sampling distribution of means. [2+3+2+3=10M] [10M]

8. (a) What is the maximum error can one expect to make with probability 0.90 when using the mean of a random sample of size $n = 64$ to estimate the mean of a population with $\sigma^2 = 2.56$? [5M]
(b) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error 0.06 with at least 95% confidence?

[5M]

OR

9. An oceanographer wants to check whether the mean depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the level of significance $\alpha = 0.05$, if soundings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms? Also calculate 95% confidence interval. [10M]

10. [10M]

(a) Compute the unique fixed probability vector t of $P = \begin{pmatrix} 0 & 0.75 & 0.25 \\ 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \end{pmatrix}$.

(b) What matrix does P^n approach?

(c) What vector does

$(0.25, \quad 0.25, \quad 0.5)P^n$ approach? [4+3+3=10M]

OR

11. Suppose an urn A contains 2 white marbles and urn B contains 4 red marbles. At each step of the process, a marble is selected at random from each urn and the two marbles selected are interchanged. Let X_n denote the number of red marbles in urn A after n interchanges.
(a) Find the transition matrix P.
(b) What is the probability that there are 2 red marbles in urn A after 3 steps.

[5M]
[5M]

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