Code No: 153AJ **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, September/October - 2023
COMPUTER ORIENTED STATISTICAL METHODS
(Common to CSE, IT, CE(SE), CSE(IOT), CSE(N))

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) 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

(25 Marks)

1.a) Define Random variable. [2]
b) If 3 fair coins are tossed and if X is the total number of heads in the outcome. Show that X is a random variable. [3]
c) Derive mean of Geometric distribution. [2]
d) If the mean is 3 and variance is 4 of a random variable X, check whether X follows binomial distribution. [3]
e) Distinguish between parameter and statistic. [2]
f) Explain why the larger variance is placed in the numerator of the statistic F. [3]
g) What is meant by a statistical hypothesis? [2]
h) Why are interval estimates in most cases more useful than point estimates? [3]
i) What is a stochastic matrix? When is it said to be regular? [2]
j) Discuss about classification of Markov process. [3]

PART – B

(50 Marks)

2.a) If $f(x)$ is a density function defined by $f(x) = ae^{-|x|}, -\infty < x < \infty$. Find i) a ii) variance.
b) State and prove addition theorem of probability. [5+5]

OR

3. The chances of A, B and C becoming G.M. of a company are in the ratio $4:2:3$. The probabilities that the bonus scheme will be introduced in the company if A, B and C become G.M. are $0.3, 0.7$ and 0.8 respectively. If the bonus has been introduced, what is the probability that A has been appointed as G.M? [10]

4.a) 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.
b) Prove that Poisson distribution is the limiting case of Binomial distribution. [5+5]

OR

5. A and B shoot independently until each has his own target. The probability of their hitting the target at each shot is 2/5 and 5/7 respectively. Find the probability that B will require more shots than A. [10]

6. Weights in kg. of 10 students are given as 38, 40, 45, 53, 47, 43, 55, 48, 52, 49. Can we say that variance of the distribution of weights of all students from which the above sample was taken is equal to 20 square kg. [10]

OR

7. Show that for the Gamma distribution $f(x) = \frac{e^{-x}x^{l-1}}{\Gamma(l)}, 0 < x < \infty$, the mean and variance are both equal to l. [10]

8. A random sample of 40 geysers produced by company A have a mean life time of 647 hours of continuous use with a standard deviation of 27 hours, while a sample 40 produced by another company B have mean life time of 638 hours with standard deviation 31 hours. Does this substantiate the claim of company A that their geysers are superior to those produced by company B at 0.01 LOS. [10]

OR

9.a) In a certain city 125 men in a sample of 500 were found to be smokers. In another city, the number of smokers was 375 in a random sample of 1000. Does this indicate that there is a greater population of smokers in the second city than in the first.

b) A random sample of size 16 values from a normal population showed a mean of 41.5 inches and the sum of the squares of deviations from means is 135 sq. inches. Find the maximum error with 95% confidence. [5+5]

10.a) A fair die is tossed repeatedly. If X_n denotes the maximum of the number occurring in the first n tosses, find the transition probability matrix P of the Markov chair $\{X_n\}$. find also P^2.

b) The transition probability matrix of a Markov chain is given by $\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$.

Is this matrix irreducible? [5+5]

OR

11. A gambler has Re.1. He bets Rs.0.5 at a time and wins Rs.0.5 with probability ½. He stops playing if he loses Re.1 or wins Rs.2.

a) What is the transition probability matrix of the related Markov chain?

b) What is the probability that he has lost his money at the end of 5 plays?

c) What is the probability that the game lasts more than 7 plays? [10]

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