

Code No: 153AJ

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, December - 2019

COMPUTER ORIENTED STATISTICAL METHODS

(Common to: CSE, IT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 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 as sub questions.

PART - A

(25 Marks)

- 1.a) Define distribution function of a random variable. [2]  
b) Derive mean of Geometric distribution [2]  
c) Define Gamma distribution [2]  
d) Define Tolerance limit [2]  
e) What is a stochastic matrix? When is it said to be regular? [2]  
f) If  $f(x) = \begin{cases} K(3x^2 - 1) & 0 \leq x \leq 2 \\ 0 & \text{elsewhere} \end{cases}$  is the p.d.f of a continuous random variable X, find K. [2]

- g) Define expected value and variance of a random variable [3]  
h) Define i) simple sample ii) random sample iii) purposive sample. [3]  
i) A sample of size 80 is taken from a population whose S.D is 15. Find the standard error of means. [3]  
j) If the transition probability matrix is  $\begin{bmatrix} 0 & 0.2 & x \\ x & 0.1 & y \\ 0.1 & 0.2 & z \end{bmatrix}$ . Find x, y and z. [3]

PART - B

(50 Marks)

- 2.a) If  $P(A) = 2/3$ ,  $P(B) = 1/5$ , prove that  $\frac{2}{15} \leq P(A \cap B) \leq \frac{1}{5}$ . [5]  
b) Let  $f(x) = 3x^2$ , when  $0 \leq x \leq 1$  be the probability density function of a continuous random variable X. Determine a and b such that  
i)  $P(X \leq a) = P(X > a)$  ii)  $P(X > b) = 0.05$ . [5+5]

OR

- 3.a) Two digits are selected at random from the digits 1 through 9.  
i) If the sum is odd, what is the probability that 2 is one of the digit selected.  
ii) If 2 is one of the digits selected, what is the probability that the sum is odd?  
b) Three machines produce the items 30%, 30% and 40% of the total product. If 2%, 3% and 4% are defective from three machines products. One item is selected and found to be defective. Find the probability that it is from i) Machine I ii) Machine II iii) Machine III. [5+5]

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

OR

- 5.a) Ten coins are tossed. Find the probability of getting greater than or equal to 6 heads.  
 b) Find the probability of 5 or more telephone calls arriving in a 9-minute period in a college switchboard, if the telephone calls that are received at the rate of 2 every 3 minutes following Poisson distribution. [5+5]

- 6.a) The mean voltage of a battery is 15 and standard deviation 0.2. Find the probability that four such batteries connected in series will have a combined voltage of 60.8 or more volts.  
 b) The weight of 10 samples are (in gms) 22, 25, 12, 15, 17, 19, 10, 18, 19, 23. Test whether these had been drawn from a population with mean 20. Test at 5% level. [5+5]

OR

7. Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

Test whether the two horses have the same capacity of running? [10]

- 8.a) Construct 95% confidence interval for the true proportion of computer literates if 47 out of 150 persons from rural areas are computer literates.  
 b) 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? [5+5]

OR

- 9.a) A sample of size 9 was taken from a population gave  $s^2 = 10.9$ ,  $\bar{x} = 15.8$ . Obtain the 99% confidence interval for  $\mu$ .  
 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. [5+5]

10. Three boys A, B, C are throwing a ball to each other. B always throws the ball to C; C always throws the ball to A; but A is just as likely to throw the ball to C as to B. Show that the process is Markovian. Find the transition matrix and classify the states. Do all the states are ergodic? [10]

OR

- 11.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 chain  $\{X_n\}$ . 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]