Code No: 153AJ **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, April/May - 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) If the probability is 0.05 that a certain kind of measuring device will show excessive drift, what is the probability that the sixth measuring device tested will be the first to show excessive drift? [2]

b) The probability density function of a continuous random variable X is given by $P(x) = a\, e^{-|x|}$, where $-\infty < x < \infty$. Prove or disprove that $a = \frac{1}{2}$. [3]

c) When is the geometric distribution an appropriate model? [2]

d) If the mean of Binomial distribution is 3 and variance is 9/4, obtain the value of n. [3]

e) If z is normally distributed with mean 0 and variance 1, evaluate P ($z \leq 1.64$). [2]

f) Obtain 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 μ=22.4 and s.d. σ of 0.048, if sampling is done with replacement. [3]

g) Discuss the level of significance and type of errors. [2]

h) Explain the terms null and alternate hypotheses. [3]

i) Define Markov chain. [2]

j) Is the matrix $\begin{pmatrix} 0 & 1 & 0 \\ 0.5 & 0.25 & 0.25 \end{pmatrix}$ stochastic? [3]

PART – B

(50 Marks)

2. Suppose colored balls are distributed in three indistinguishable boxes as follows:

	Box I	Box II	Box III
Red	2	4	3
White	3	1	4
Blue	5	3	3

A box is selected at random from which a ball is selected at a random. What is the probability that the ball is colored a) red, b) blue? [10]

OR

3.a) Define random variable.

b) Suppose a continuous function X has the probability density function

$$f(x) = \begin{cases} 2k\, e^{-x^2}, & x > 0 \\ 0, & x \leq 0 \end{cases}.$$

Compute (i) k, (ii) the distribution function for X, and (iii) $P(1 < X \leq 2)$. [2+8]

4. 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 of both X and Y. [10]

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 $3 < X < 5$.

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 probability that on a day some demand is refused. [5+5]

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

b) A random sample of size 100 is taken from an infinite population having the mean 76 and the variance 256. What is the probability that (i) $\bar{x}$ will be in between 75 and 78, (ii) $\bar{x}$ will be less than 78? [5+5]

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 (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]

8. The efficiency expert of a computer company tested 40 engineers to estimate the average time it takes to assemble a certain computer component, getting a mean of 12.73 minutes and s.d. of 2.06 minutes. (a) If $\bar{x} = 12.73$ is used as a point estimate of the actual average time required to perform the task, determine the maximum error with 99% confidence, (b) construct 98% confidence intervals for the true average time it takes to do the job (c) with what confidence can we assert that the sample mean does not differ from the true mean by more than 30 seconds. [2+3+2+3]

OR

9. The following are the average weekly losses of worker hours due to accidents in 10 industrial plants before and after a certain safety programme was put into operation:

Before:	45	73	46	124	33	57	83	34	26	17
After :	36	60	44	119	35	51	77	29	24	11

Test whether the safety programme is effective in reducing the number of accidents at the level of significance of 0.05? [10]

10. An urn A contains 5 red, 3 white and 8 green marbles while urn B contains 3 red and 5 white marbles. A fair die is tossed; if 3 or 6 appears a marble is chosen from B otherwise from A. Determine the probability that
a) a red marble is chosen, b) a white marble is chosen, c) a green marble is chosen. [4+3+3]

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. [5+5]

---ooOoo---