Previous Question Papers

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

Time: 3 Hours   **Max. Mark75**

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
        marksand 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 thatX 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 followsbinomial 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 isthe 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 hittingthe 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. 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.

8. 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

9. Show that for the Gamma distribution $(x) = \dfrac{e^{-x}x^{l-1}}{\Gamma(l)}, 0 < x < \infty$, the mean and

variance are both equal to l.

10.   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

11.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]

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 6 and variance is 9/4, obtain the value of n. [3]

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

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

Compute (i) k, (ii) the distribution function for X, and (iii) $P(1 < X \le 2)$. [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 hire 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 size100 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 3 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]

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Time: 3 Hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) Three machines I, II and III produce 40%, 30% and 30% of the total number of items of a factory. The percentages of defective items of these machines are 4%, 2% and 3%. An item is selected at random and found to be defective. Find the probability that it is from
i) Machine- I   ii) Machine-II   iii) Machine-III

b) A continuous Random variable has the p.d.f $f(x) = \begin{cases} e^{-x} & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$

Determine: i) $P(0 \leq x \leq 2)$ ii) The mean   iii) Variance.   [8+7]

2.a) There are three boxes.
I contains- 10 light bulbs out of which 4 are defective
II contains- 6 light bulbs out of which 1 is defective
III contains- 8 light bulbs out of which 3 are defective
A box is chosen at random and a bulb is selected. If it is defective find the probability that it is from:
i) Box- I   ii) Box-II   iii) Box-III

b) A continuous Random variable has the p.d.f $f(x) = \begin{cases} \frac{1}{2}(x+1) & 1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$ Determine:

i) $P(2 \leq x \leq 4)$ ii) The mean   iii) Variance.   [8+7]

3.a) Six cards are drawn from a pack of 52 cards. Getting a red card is a success. Find the probability of getting the success:
i) At least once   ii) 3 times

b) The probabilities of a Poisson variate taking the values 1 and 2 are equal. Find:
i) μ ii) $P(x \geq 1)$ [8+7]

4.a) Assume that 60% of the students passed an examination. Find the probability that among 12.
i) Exactly 8   ii) At least 4 pass the examination

b) If the variance of a Poisson variate is 3. Find the probability that:
i) $P(x=0)$ ii) $P(1 \leq x < 4)$.   [8+7]

5.a) In a test on electrical bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 40 hrs. Estimate the number of bulbs likely to burn for more than 2140.

b) Two horses A, 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 running capacity at 95 % level.   [8+7]

6.a) If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3kgs. How many students have masses?
i) Greater than 72 kgs   ii) Between 65 and 71 kgs

b) The following table gives the number of train accidents in a country that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week. Test at the level of 0.05.   [7+8]

Days	Sun	Mon	Tues	Wed	Thurs	Fri	Satur
No. of accidents	20	18	13	23	26	11	15

7.a) A sample of 900 members has a mean 3.4 cms and S.D 2.61 cms. Is this sample has been taken from a large population of mean 3.25 and S.D 2.61.

b) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions is significant at 0.05 level of significance.   [7+8]

8. The school of international studies for population found out by its survey that the mobility of the population of a state to village, town and city is in the following percentage.

		To		
		Village	town	city
From	Village	30%	20%	50%
	Town	30%	50%	20%
	City	10%	40%	50%

What will be the proportion of population in village, town and city after two years? Present population has proportion of 0.4, 0.3 and 0.3 village, town and city respectively. Find the proportions in the long run.   [15]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2021
COMPUTER ORIENTED STATISTICAL METHODS
(Common to CSE, IT)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
- - -

1. Two dice are thrown the random variable is assigned to the sum. Write the distribution. Find the mean and variance. [15]

2.a) If the probability distribution function of a continuous random variable is $ke^{|x|}, -\alpha \le x \le \alpha$. Find i) k   ii) mean   iii) variance.
  b) A sample of 4 items is selected from 12 out of which 5 are defective. Find the expected number of defective items. [8+7]

3.a) Eight coins are tossed. Find the probability of getting heads: i) $p(x=3)$ ii) $p(x \le 4)$.
  b) The probabilities of a Poisson variate taking the values 1 and 2 are equal. Calculate:
     i) $p(x=0)$ ii) $p(x=3)$ [7+8]

4.a) Mean heights of students is 159cms with a standard deviation of 20. Find how many students heights lie between 150cms and 170cms in a class of 100 students.
  b) The expected number of typographical errors on a page of a certain magazine is 0.2. What is the probability that the next page you read contains i) 0 and ii) 2 or more typographical errors? [7+8]

5. From the following data find whether there is any significant liking in the habit of taking soft drinks among the categories of employees. [15]

Soft drinks	Employees		
	Clerks	Teachers	Officers
Pepsi	10	25	65
Thumsup	15	30	65
Maaza	50	60	30

6. Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results. Test whether two horses have the same running capacity.

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

[15]

7.a) A random sample of 100 electric bulbs, produced by a manufacturer A showed a mean life of 1190 hrs with a standard deviation of 90. Another sample of 75 electric bulbs produced by a manufacturer B showed a mean life of 1230 with a standard deviation of 120 hrs. Find whether there is significant difference between the mean.

b) 50 people were attacked by a disease and 30 were survived. If the survival rate is 70%, test the chain at 5% level.   [8+7]

8. Consider a three-state Markov chain with the transition matrix. If the initial probabilities $P_0 = (0.2, \quad 0.3, \quad 0.5)$.

$$P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 2/3 & 1/3 \\ 1/16 & 15/16 & 0 \end{bmatrix}$$

a) Find the probabilities after two transitions.
b) Find het limiting probabilities.   [8+7]

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