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Code No: 153BN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, September/October - 2023

PROBABILITY AND STATISTICS

(Civil Engineering)

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 Independent events and give example. [2]
- b) The random variable X has p.m.f $P(X = x) = \begin{cases} \frac{c}{x}, x = 1, 2, 3 \\ 0, \text{Otherwise} \end{cases}$. Find the value of 'c'. [3]
- c) The mean and variance of a binomial variate are 8 and 6. Determine the distribution. [2]
- d) A fair coin is flipped 10 times, what is the probability that heads comes up 5 times using Poisson distribution? [3]
- e) Define the probability density function of a Normal distribution. [2]
- f) Derive the mean and variance of an exponential distribution. [3]
- g) Write the principle of least squares. [2]
- h) Regression equations are given by $8X - 10Y + 66 = 0$; $40X - 18Y = 214$. Find the mean values of X and Y. [3]
- i) Define Type I and Type II errors in taking a decision. [2]
- j) Write down the formula of test static to test the significance of difference between the means of large samples. [3]

PART – B

(50 Marks)

- 2.a) The first bag contains 3 white balls, 2 red balls and 4 black balls. Second bag contains 2 white, 3 red and 5 black balls and third bag contains 3 white, 4 red and 2 black balls. One bag is chosen at random and from it 3 balls are drawn. If out of three balls, two balls are white and one is red. What are the probabilities that they were taken from first bag, second bag and third bag?
- b) A person is known to hit the target in 3 out of 4 shots, whereas another person is known to hit the target in 2 out of 3 shots. Find the probability of the targets being hit when the both person try. [6+4]
- OR**
- 3.a) The density function of a random variable 'X' is given by $f(x) = kx(2 - x), 0 \leq x \leq 2$. Find K, mean, variance and r^{th} moment.
- b) State and Prove Chebyshev's Inequality. [5+5]
- 4.a) Find the probability that in tossing a fair coin 5 times, there will appear (i) 3 heads (ii) 3 tails and 2 heads (iii) at least 1 head (iv) not more than 1 tail.
- b) Derive the mean of a Poisson distribution. [5+5]

OR

5. Suppose the probability of suffering a fever from the flu vaccine is 0.005. If 1000 people are given the vaccine, use the Poisson distribution to approximate the probability that

- a) 1 person suffers a fever as a result;
 b) more than 6 people suffer a fever as a result. [5+5]

6. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. [10]

OR

7. The daily consumption of milk in a city, in excess of 20,000 gallons, is approximately distributed as a Gamma variate with the parameters $\gamma = 2$ and $\lambda = 1/10,000$. The city has a daily stock of 30,000 gallons. What is the probability that the stock is insufficient on a particular day? [10]

8. Fit an exponential curve of the form $Y = ab^x$ to the following data. [10]

X	1	2	3	4	5	6	7	8
Y	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

OR

9.a) Calculate the correlation coefficient for the following heights (in inches) of fathers X and their sons Y.

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

b) The regression equation of X on Y is $3y - 5x + 108 = 0$. If the mean value of Y is 44 and the variance of X were $9/16^{\text{th}}$ of the variance of Y. Find the mean value of X and the correlation coefficient. [5+5]

10.a) A group of 10 rats fed on diet A and another group of 8 rats fed on diet B recorded the following increase in weight (gm)

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	2	3	6	8	10	1	2	8	

Find if the variances are significantly different.

b) The following data gives the number of accidents that occurred during the various base of week. Test whether the accidents are uniformly distributed over the week.

Day	Mon	Tue	Wed	Thur	Fri	Sat
No of accidents	15	19	13	12	16	15

[5+5]

OR

11.a) In a random sample of size 500 the mean is found to be 20. In another independent sample of size 400 the mean is 15. Could the samples have been drawn from the same population with S.D of 4.

b) A sample of 600 parts manufactured by a factory. The number of defective parts were found to be 45. The company however claimed that only 5% of the product is defective. Is the claim reasonable? [5+5]

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