R13

Code No: 114DK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, February - 2024
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)	A fair coin is tossed until a head or five tails occurs Find i) the discrete probability distribution ii) mean of the distribution.	[2]
b)	Find the mean and variance of the distribution $f(x) = e^{-x}, x > 0$.	[3]
c)	The joint probability mass function of (X, Y) is given by $p(x, y) = K(3x + 5y)$, $x = 1, 2, 3, y = 0, 1, 2$. Find the marginal distributions.	[2]
d)	Distinguish between Correlation and Regression analysis.	[3]
e)	Explain the terms population and statistics.	[2]
f)	Write the properties of good estimator.	[3]
g)	Define the terms Busy period and Expected queue length.	[2]
h)	What are basic characteristics of queueing model?	[3]
i)	Define Stochastic matix.	[2]
j)	Discuss briefly about Chains of random process	[3]

PART - B

(50 Marks)

2.a) If X is a continuous random variable with probability density function given by

$$f(x) = \begin{cases} kx^{\alpha-1}(1-x)^{1-\beta} & \text{for } 0 < x < 1,\ \alpha > 0, \beta > 0 \\ 0 & \text{otherwise} \end{cases}$$

Find k and mean value of X.

b) Find the probability of getting 1 or 4 or 5 or 6 in throwing a die 5 to 7 times among 9 trials using normal distribution. [5+5]

OR

3. The marks obtained in Statistics by 1000 students are normally distributed with mean 78% and standard deviation 11%. Determine
a) how many students got marks above 90%?
b) what was the highest marks obtained by the lowest 10% of the students?
c) within what limits did the middle of 90% of the students lie? [3+3+4]

4. If $x = 2y + 3$ and $y = kx + 6$ are the regression lines of x on y and y on x respectively
a) Show that $0 \le k \le 1/2$
b) If $k = 1/8$, find r and $(\bar{x}, \bar{y})$. [5+5]

OR

5. The joint probability density function of the random variable X and Y is given by
$f(x,y) = K(xy + y^2), 0 \le x \le 1, 0 \le y \le 2.$
Find $P(Y > 1), P\left(X > \frac{1}{2}, Y < 1\right)$ and $P(X + Y \le 1)$. [10]

6. In 1950 in India the mean life expectancy was 50 years. If the life expectancies from a random sample of 11 persons are 58.2, 56.6, 54.2, 50.4, 44.2, 61.9, 57.5, 53.4, 49.7, 55.4, 57.0. Does it confirm the expected view? [10]

OR

7.a) Write the conditions of validity of χ^2-test.

b) 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. [5+5]

8. Show that for a single service station, Poisson arrivals and exponential service time, the probability that exactly n calling units are in the queuing system is $P_n = (1-\rho)\rho^n$, $n \ge 0$, where ρ is the traffic intensity. [10]

OR

9. In a colour T.V. manufacturing plant, a loading unit takes exactly 10 minutes to load 2 T.V. sets into a wagon and again comes back to the position to take another set of T.V. If the arrival rate is 2 T.V. sets per 20 minutes. Calculate the average time of T.V. sets in a stationary state. [10]

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 a 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. The transition probability matrix of a Markov chain $\{x_n\}$; n = 1, 2, 3 having three states 1, 2 and 3 is $P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$ and the initial distribution is $P^{(0)} = (0.7, 0.2, 0.1)$.
Find a) $P\{X_2 = 3\}$ b) $P\{X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$. [5+5]

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