

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

B. Tech. -III Semester (CSE/IT)

COURSE CODE(CREDITS): 18B11MA311(3)

MAX. MARKS: 15

COURSE NAME: Probability and Statistics

COURSE INSTRUCTORS: BKP\*, SST

MAX. TIME: 1 Hour

*Note: (a) All questions are compulsory.*

*(b) Marks are indicated against each question in square brackets.*

*(c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.*

*(d) Use of scientific calculator is allowed.*

1. A 3-bit binary string is sent over a network. The valid set of strings recognized by the receiver are those that end with "0". What is the probability that a randomly sent 3-bit string will be recognized by the receiver? **(CO1)[2]**
2. A data centre has two servers: Server A and Server B. Server A handles 60% of the traffic, and Server B handles 40% of the traffic. Server A has a failure rate of 2%, while Server B has a failure rate of 5%. If a request fails, what is the probability that it was handled by Server B? **(CO1)[4]**
3. Let  $X$  and  $Y$  be the number of hardware failures in two computer labs in a given month. The joint distribution of  $X$  and  $Y$  is given in the table below:

$P_{XY}(x, y)$		x		
		0	1	2
y	0	0.52	0.20	0.04
	1	0.14	0.02	0.01
	2	0.06	0.01	0

- a) Compute the probability of at least one hardware failure.
- b) From the given distribution, are  $X$  and  $Y$  independent? Why or why not?
- c) Compute  $P[X = 0|Y = 1]$ . **(CO2)[1+1+1]**

4. The lifetime, in years, of some electronic component is a continuous random variable with the probability density function:

$$f_X(x) = \begin{cases} \frac{k}{x^3}, & x \geq 1 \\ 0, & x < 1 \end{cases}$$

- a) Find  $k$ .  
b) Compute the probability for the lifetime to exceed 5 years. (CO2)[1.5+1.5]
5. Let  $N$  be a random variable with the following cumulative distribution function:

$$F_N(n) = \begin{cases} 0, & n < 1 \\ 0.2, & 1 \leq n < 2 \\ 0.5, & 2 \leq n < 3 \\ 0.8, & 3 \leq n < 4 \\ 1, & n \geq 4 \end{cases}$$

- a) What is the expected value of  $(N + 1)$ ?  
b) What is the variance of  $2N$ ? (CO2)[1.5+1.5]