



Date: 13-11-2024

Dept. No.

Max. : 100 Marks

Time: 09:00 am-12:00 pm

SECTION A - K1 & K2 (CO1)

Q.No	Levels	Answer ALL the Questions	(10 x 2 = 20)
1	K1	Define complementary event.	
2		If two events A and B are mutually exclusive, what shall be the probability of their union?	
3		If A, B and C are three events, how can you express the probability of simultaneous events A, B and C?	
4		Define multiplicative law of probability.	
5		What do you understanding by a distribution function?	
6	K2	Define Moment Generating function.	
7		Define Characteristic function using continuous random variable.	
8		Explain marginal distribution function if X is a continuous random variable.	
9		What is the expected value of $(a + bX)$?	
10		Define covariance between X and Y.	

SECTION B – K3 & K4 (CO2)

		Answer ALL the Questions	(4 x 10 = 40)
11	K3	(i) State and prove multiplication theorem on probability. (ii) Prove (a) $P(\phi) = 0$, (b) $P(s) = 1$	(6) (4)
		[OR]	
12		State and prove addition theorem on probability for two events if the events are not mutually exclusive.	
13		Explain the properties of probability mass function and density function.	
	K4	[OR]	
14		Let X be a continuous random variable with PDF $f_X(x) = \begin{cases} 4x^3, & 0 < x \leq 1 \\ 0, & \text{otherwise} \end{cases}$ Find $P\left(X \leq \frac{2}{3} \vee X > \frac{1}{3}\right)$.	
15		List out the properties of classical probability of an event A.	
		[OR]	
16	K4	State and prove Boole's Inequality.	
17		Suppose that the time in minutes that a person has to wait at a certain bus stop for a bus is found to be a random phenomenon, with a probability function specified by the distribution function: $F(x) = \begin{cases} 0, & x < 0 \\ \frac{x}{8}, & 0 \leq x < 2 \\ \frac{x^2}{16}, & 2 \leq x < 4 \\ 1, & x \geq 4 \end{cases}$	

		(i) Is the distribution function continuous? (ii) What is the probability that a person will have to wait (a) more than 2 minutes, (b) less than 2 minutes, and (c) between 1 and 2 minutes
18		[OR] Show that, if X is a random variable, then $V(aX+b) = a^2 V(X)$, where a and b are constants.
SECTION C – K5 & K6 (CO3)		
	Answer ALL the Questions	(2 x 20 = 40)
19	K5	(a) A committee of 4 people is to be appointed from 3 officers of the production department, 4 officers of the purchase department, two officers of the sales department and 1 chartered accountant. Find the probability of forming the committee in the following manner: (i) There must be one from each category. [5] (ii) It should have at least one from the purchase department. [5] (iii) The chartered accountant must be in the committee. [5] (b) If A, B, C are mutually independent events then A U B and C are also independent. [5]
20		[OR] (a) State and Prove Bayes theorem of probability [10] (b) In a bolt factory machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 per cent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A and B? [10]
21	K6	An-experiment consists of three independent tosses of a fair coin. Let X = The number of heads, Y = The number of head runs, Z = The length of head runs, a head run being defined as consecutive occurrence of at least two heads, its length then being the number of heads occurring together in three tosses of the coin. Find the probability function of (i) X, (ii) Y, (iii) Z, (iv) X +Y and (v) XY and construct probability tables and draw their probability charts. [20]
22		[OR] (a) State and prove Chebyshev's Inequality. (b) State and prove Markov's Inequality.

\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$