GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Engineering

B.TECH Electronics and Communication Engineering
Mid Term Examination - May 2024

Duration : 90 Minutes
Max Marks : 50

Sem IV - C1UC420T - Probability and Stochastic Process

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) Roll a red die and a green die. Find the probability the total is 5. K2 (2)

2) Write the Expectation and variance of binomial and Poisson distributions. K1 (3)

3) If the random variable X has the following probability distribution Find k and the mean of x. K2 (4)

X:	2	-1	0	1
P(x)	0.4	k	0.2	0.3

4) The joint PDF of two random variables X and Y are given by K2 (6)

$$f_{X,Y}(x,y) = \begin{cases} cxy, 0 \le x \le 2, 0 \le y \le 2 \\ 0, otherwise \end{cases}$$

(i) Find c. (ii) Find FX,y (x,y)(iii) Find fX (x) and fY (y)

5) The density function of coded measurements of the pitch diameter of threads of a fitting is K3 (6)

$$f(x) = \begin{cases} \frac{4}{\pi(1+x^2)}, & 0 < x < 1 \\ 0, & elsewhere \end{cases}$$

Find the expected value of *X*.

6) A manufacturer of cotter pins knows that 5% of his product is defective. If he sells cotter pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality? K3 (9)

7) If X is uniformly distributed over (0, 10), calculate the probability that (a) X < 3, (b) X > 6, and (c) 3 < X < 8. K4 (8)

8) If X is a continuous random variable with PDF K4 (12)

$$\begin{cases} x, 0 \le x < 1 \\ \frac{(x-1)^2}{2}, 1 \le x \le 2 \\ 0, otherwise \end{cases}$$

Find the cumulative distribution function F(x) of X and use it to find P(1.5<x<2.5)

OR

Let {X(t), t ∈ R} be a continuous-time random process, defined as K4 (12)

X(t)=A cos(ωt+Φ) where Φ~U(0,2π) .

a. Find the mean function μX(t).

b. Find the autocorrelation function RX(t1,t2).

c. Is X(t) a WSS process?