Maximum duration: 2 Hours

Number of printed pages: 02 Er. No...20.133

Academic Year: 2022-23

Jaypee University of Engineering & Technology, Guna

T-3 (Odd Semester 2022)

18B11MA511- Probability Theory and Random Processes

007936

Maximum Marks: 35

Notes:

1. This question paper has 5 (five) questions.

2. Write relevant answers only.

3. Do not write anything on question paper (Except your Er. no.)

Marks CO no.

Find the expected value of number on a die when thrown Q1 (a)

CO₂ [02]

The fraction X of male runners and fraction Y of female runners who complete (b) marathon races can be described by the joint probability density function:

CO₃

03

 $f(x,y) = \begin{cases} x+y; & 0 \le x \le 1, & 0 \le y \le 1 \\ 0, & Otherwise \end{cases}$

Find:

Marginal distribution function of x and y

(ii) Expected value of x and y

(iii) Covariance (x, y)

Q2 (a) What are the random processes? Differentiate random variable and random

CO₂ [02]

processes with suitable example.

(b) For sine wave random process $X(t) = Y \sin(w_0 t)$, $-\infty < t < \infty$, $w_0 = constant$, the amplitude Y is a random variable with uniform probability distribution over

[05]CO₄

(-1, 1).

Find:

(i) Expected function of the random process X(t)

(ii) Auto correlation function of X(t)

(iii) Auto covariance function of X(t)

.Q3 (a). Two fair dice are tossed. Find the probability of the followings:

CO₂ [02]

(i) Sum of outcome of two dice is 5

(ii) Sum of outcome of two dice is greater than 9

CO5

(b) A salesman's territory consists of city A, B, C. He never sells in the same city on successive days. If he sells in city A then the next day he sells in B. However if he sells either in B or C, then the next day he is twice as likely to sell to city A as in other city.

(3)

- (1) Markov chain diagram and the transition probability matrix
 - (ii) Steady state probabilities of sells to each city.
- The probability density function of the times to failure in years of the engineering instrument manufactured by certain company is given by.
- [07]CO₄

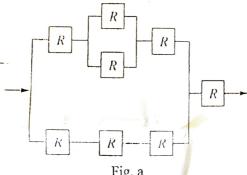
$$f(t) = \frac{200}{(t+10)^3}, \qquad t \ge 0$$

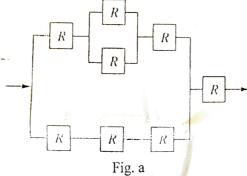
Answer the followings:

- Derive the reliability function and determine the reliability for first year of
 - Compute the "Mean Time To Failure (MTTF)" of the instrument.
- What are the design life values of the instrument at the reliability 0.95 and 0.90

For the following network (Fig .a), derive the expression for system reliability in terms of component reliability R of each component.







Find the system reliability of following system network (Reliability of each component is mentioned in Fig. b)



