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328352(28)

B. E. (Third Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(Et & T Branch)

PROBABILITY and RANDOM VARIABLES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. The first part (a) in each question is compulsory which is of 2 marks. Attempt any two parts from the rest three (b), (c) and (d) is of 7 marks.*

Unit-I

1. (a) What are condition for existing of fouriers series? 2

(b) State and prove perseval theorem. 7

(c) Find the fourier transform and plote magnitude and phase spectrum of signal $x(t) = e^{-at}.u(t)$. 7

(d) Find the cross correlation between $v_1(t) = \sin wt$ and $v_2(t) = \cos wt$ 7

Unit-II

2. (a) Define sample space. 2

(b) In a game of dice, a "shooter" can win outright if the sum of the two number showing up is either 7 or 11 when two dice are thrown. What is probability of winning outright? 7

(c) An ordinary 52-card deck is the roughly shuffled. You are dealt four card up. What is the probability that all four card are sevens? 7

(d) An airline in a small city has five departures each day. If is known that any given flight has a probability of 0·3 of departing late. for any given day find the probability that 7

(i) No flights depart late,

(ii) All flight depart late.

(iii) Three or more depart on time.

Unit-III

3. (a) Define random variable. 2

(b) Find mean and variance of random variable X which is uniformar distributed between a and b, a < b 7

(c) A random variable X has the distribution function

$$F_x(x) = \sum_{n=1}^{v} \frac{n^2}{650} u(x-n)$$

Find the probabilities 7

(i) $P\{-\infty < X \le 6 \cdot 5\}$

(ii) $P\{X > 4\}$

(iii) $P\{6 < X \le 9\}$

(d) Given the function

$$g_x(x) = y\cos(\pi x/2b)\text{rect}(x/2b)$$

Find the value of b so that $g_x(x)$ is a valid probability density. 7

Unit-IV

4. (a) Define mean ergodic process. 2

(b) State and explain the properties of auto correlation function of random process. 7

(c) Write short note on Gaussion random process. 7

(d) Given the auto correlation function, for a stationary ergodic process with no periodic components is

$$R_{XX}(z) = 25 + \frac{4}{1+6\tau^2}$$

Find the mean value and variance of the process $X(t)$. 7

Unit-V

5. (a) Define power density spectrum. 2

(b) Consider the random process

$$X(t) = A_c \cos(w_o t + \theta)$$

where A_o and w_c are real constants and θ is a random variable uniformaly distributed on the interval $(0, \pi/2)$. Find the average power P_{XX} in $X(t)$. 7

(c) State and explain the properties of the power density spectrum. 7

(d) Derive the relationship between cross power spectrum and cross-correlation function. 7