PVP 14

Code: EC3T2

II B.Tech - I Semester – Regular/Supplementary Examinations
November - 2019

PROBABILITY THEORY AND STOCHASTIC PROCESS
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) A single card is drawn from a pack of 52 cards. Determine the probability that the card is jack.

b) State Total probability theorem.

c) What do you understand by transformation of random variable?

d) Define continuous random variable. Give an example.

e) How can you say that the random variables X and Y are independent?

f) Show that the expected value of sum of two distinct functions is equal to the sum of the expected value of the individual functions.

g) When do you say that the random process is stationary?

h) Give the relationship between power spectrum and auto-correlation function.

i) Write the symbolic form for the Fourier transform of the response of any linear invariant system is equal to the product of the transform of the input signal and the transform of the network input function.

j) Draw the diagrams of the general single input and single output linear system and linear time invariant system.

k) Find cross correlation function $R_{X,Y}(\tau)$ for a system having white noise at its input.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) A binary symmetrical channel is used for communication between a transmitter and a receiver. A transmitter transmits two possible inputs 0 and 1. The probability of transmitting a 0 bit is 0.45 and the probability of transmitting a 1 bit is 0.55. At the receivers end, there are four possibilities-the probability of transmitting a 0 bit and receiving a 0 bit is 0.8; the probability of transmitting a 0 bit and receiving a 1 bit is 0.2; the probability of transmitting a 1 bit and receiving a 0 bit is 0.2; the probability of transmitting a 1 bit and receiving a 1 bit is 0.8. Construct a binary symmetric channel for this situation and determine the error probabilities at the receiver end.

8 M

b) When two dice are thrown, what is the probability of getting a sum of 10 or 11? 8 M

3. a) A random variable X is having the probability density function $f(x) = ae^{-b|x|}, \; -\infty < x < \infty.$ 8 M

Find (i) Cumulative distribution function of X

(ii) Relationship between a and b.

b) If $X \sim U(a,b)$ then obtain the formula for variance. 8 M

4. a) The joint probability density function of the random variables X and Y is 8 M

$$f_{X,Y}(x,y) = \begin{cases} 1/ab, & 0<x<a \text{ and } 0<y<b \\ 0, & \text{else where} \end{cases}$$

If $a < b$, find $P(X + Y \le 3a/4)$.

b) Consider two independent random variables X and Y with their probability functions. 8 M

X = x :	0	1		Y= y :	0	1
P(X = x):	1/3	2/3		P(Y= y):	2/3	1/3

Determine $E(2X + 3Y)$, $E(2X^2 - Y^2)$ and $E(XY)$

5. a) Show that auto-correlation function $R_{XX}(\tau)$ has maximum value at the origin. 8 M

b) Discuss any two properties of cross power density spectrum. 8 M

6. Suppose the input auto correlation function is described by $R_{XX}(\tau) = Ae^{-\alpha|\tau|}$, where A and α are constants.

a) Find the input spectral density 8 M

b) Draw the output power spectrum. 8 M