Code: 13A04304

R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 2016

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Clearly explain about certainty and uncertainty with suitable examples.

(b) What is the condition for a function to be a random variable?

(c) When N random variables are said to be jointly Gaussian?

(d) How interval conditioning is different from point conditioning?

(e) What is stationery processes? Explain.

(f) Test the function "$e^{-\tau}\, u(\tau)$" for a valid ACF.

(g) Examine the function "$\frac{\omega^2}{\omega^6 + 3\omega^2 + 3}$" for valid PSD.

(h) Define power spectral density.

(i) Analyze the power density spectrum of response.

(j) Explain about mean square value of system response.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A random variable X has the distribution function:

$$F_X(x) = \sum_{n=1}^{12} \frac{n^2}{650} u(x-n)$$

Find the probabilities: (i) P{-∞ < X ≤ 6.5}. (ii) P{X > 4}. (iii) P{6 < X ≤ 9}.

OR

3 For the random variable X whose density function is:

$$f(x) = \begin{cases} \frac{1}{b-a}, & a \le x \le b \\ 0, & \text{Otherwise} \end{cases}$$

Determine Mean and Variance.

UNIT – II

4 Given the function:

$$f_{XY}(x, y) = \begin{cases} b(x+y)^2, & -2 < x < 2, \; -3 < y < 3 \\ 0, & \text{elsewhere} \end{cases}.$$

(i) Find a constant b such that this is a valid density function.

(ii) Determine the marginal density functions $f_x(x)$ and $f_y(y)$.

OR

5 A random variable X has $\overline{X} = -3$, $\overline{X^2} = 11$ *and* $\sigma_x^2 = 2$. For a new random variable Y= 2X-3, find: (i) $\overline{Y}$ (ii) $\overline{Y^2}$ (iii) σ_y^2.

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UNIT – III

6 What is ACF? State and explain any four properties of ACF.

OR

7 Explain about first order, second order, wide-sense and strict-sense stationery processes.

UNIT – IV

8 Find the auto correlation function corresponding to the power density spectrum:

$$S_{XX}(\omega) = \frac{157 + 12\omega^2}{(16 + \omega^2)(9 + \omega^2)}$$

OR

9 What is PSD? State and explain any four properties of PSD.

UNIT – V

10 X(t) is stationary random process with zero mean and auto correlation function $R_{XX}(\tau)=e^{-2|\tau|}$ is applied to a system of function: $H(\omega) = \frac{1}{2 + j\omega}$. Find Power Spectral Density of its output

OR

11 A random process X(t) is applied to a network with impulse response h(t) = u(t) t e^{-bt}, where b > 0 is a constant. The cross correlation of X(t) with the output Y(t) is known to have the same form $R_{XX}(\tau) = u(\tau)\ \tau\ e^{-b\tau}$.

(i) Find the autocorrelation of Y(t).

(ii) What is the average power in Y(t)?

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