Code: 13A04304

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 "$\dfrac{\omega^2}{\omega^6 + 3\omega^2 + 3}$" 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:

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

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.

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: $H(\omega) = \dfrac{1}{2 + j\omega}$. 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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