Code No: R05210401 **R05** **Set No. 2**

II B.Tech I Semester Examinations,May/June 2012
PROBABILITY THEORY AND STOCHASTIC PROCESSES
Common to Electronics And Computer Engineering, Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define cumulative probability distribution function. And discuss distribution functions specific properties.
   (b) What are the conditions for the function to be a random variable? Discuss. What do you mean by continuous and discrete random variable? [8+8]

2. (a) Define conditional distribution and density function of two random variables X and Y.
   (b) The joint probability density function of two random variables X and Y is given by
   $f(x, y) = \begin{cases} a(2x + y^2) & 0 \leq x \leq 2 \ , \quad 2 \ \leq y \leq 4 \\ 0 & elsewhere \end{cases}$. Find
      i. value of 'a'
      ii. P(X $\leq$ 1, Y $>$ 3). [8+8]

3. (a) Based on common sense and scientific observation give the meaning of probability.
   (b) Determine the probability of getting the sums of 10 or 11 in an experiment when two dice are rolled. [8+8]

4. (a) A Signal x(t) = u(t) exp (-αt) is applied to a network having an impulse response h(t)= ω u(t) exp (-ω t). Here α & ω are real positive constants. Find the network response?
   (b) Two systems have transfer functions $H_1(\ \omega)$ & $H_2(\ \omega)$. Show the transfer function H(ω) of the cascade of the two is H(ω) =$H_1(\ \omega)$ H_2 (ω).
   (c) For cascade of N systems with transfer functions $H_n(\omega)$, n=1,2,.... .N show that H(ω) = $\pi H_n(\omega)$. [6+6+4]

5. (a) State and prove properties of moment generating function of a random variable X
   (b) The characteristic function for a random variable X is given by $\Phi_X(\omega) = \frac{1}{(1-j2\omega)^{N/2}}$. Find mean and second moment of X. [8+8]

6. (a) A number of practical systems have "Square law" detectors that produce an output W(t) that is square of its input Y(t). Let the detector's output be defined by
   W(t) = Y^2(t) = X^2(t) cos^2 (ω_0t + θ) Where ω_0 is a constant, X(t) is second

order stationary, and θ is a random variable independent of X(t) and uniform on (0, 2 Π) find

i. E[W(t)]

ii. RWW(t, t + τ) and

iii. Whether or not W(t) is wide sense stationary

(b) Explain briefly Gaussian random process and poisson random process. [8+8]

7. Two statistically independent random variables X and Y have mean values $\bar{X} = 2$and$\bar{Y} = 4$. They have second moments $\bar{X}^2$= 8and$\bar{Y}^2$= 25 find

(a) the mean value

(b) the second moment and

(c) the variance of the random variable W=3X-Y. [5+5+6]

8. (a) A WSS noise process N(t) has ACF $R_{NN}(\tau) = Pe^{-3|\tau|}$. Find PSD and plot both ACF and PSD

(b) Find $R_{YY}(\tau)$ and hence $S_{YY}(\omega)$ interns of $S_{XX}(\omega)$ for the product device shown in figure 3 if X(t)is WSS. [8+8]

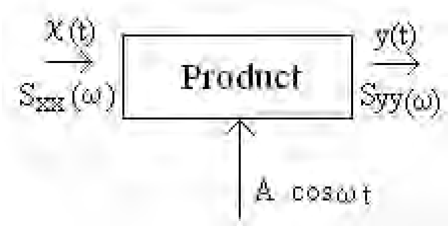

Figure 3

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1. (a) A Signal x(t) = u(t) exp ($-\alpha$t) is applied to a network having an impulse response h(t)= ω u(t) exp ($-\omega$ t). Here α & ω are real positive constants. Find the network response?
   (b) Two systems have transfer functions $H_1(\omega)$ & $H_2(\omega)$. Show the transfer function H(ω) of the cascade of the two is H(ω) =$H_1(\omega)$ H_2 (ω).
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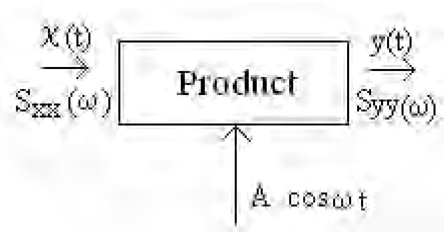

Figure 3

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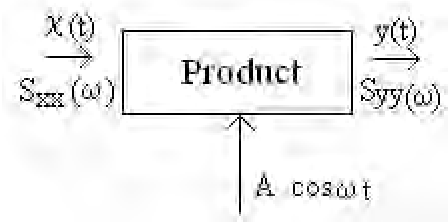

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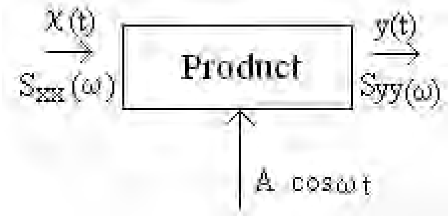

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