Code No: RR210403

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II B.Tech I Semester(RR) Supplementary Examinations, May/June 2010
PROBABILITY THEORY AND STOCHASTIC PROCESS
(Electronics & Communication Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between mutually exclusive events and independent events.
   (b) A letter is known to have come either from LONDON or CLIFTON. On the postmark only the two consecutive letters 'ON' are legible. What is the Chance that it came from London? Give step-by-step answer.
   (c) Show that the chances of throwing six with 4,3 or 2 dice respectively are as 1:6:18.

   [4+6+6]

2. (a) Derive an expression for the average value and variance associated with the Gaussian probability density function.
   (b) The average life of a certain type of electric club Rs.1200 hours What percentage of this type of bulbs is expected o fail in the first 800 hours of working? What percentage is expected to fail between 800 is 1000 hours? Assume a normal distribution with σ=200 hours. [8+8]

3. (a) Find the density function whose characteristic function is exp $(-|\mathrm{t}|)$
   (b) Let X be a continuous random variable with pdf $\mathrm{f_X(x)} = 8/\mathrm{x}^3, x > 2. Find\ \ E[W]\ where\ W = X/3$

   [8+8]

4. (a) State and prove properties of power density spectrum.
   (b) Calculate the PSD of a stationary random process for which the Autocorrelation is $\mathrm{R_{xx}}(\tau) = \sigma^2.e^{-\alpha|\lambda|}$

   [8+8]

5. (a) Derive the relation between PSDs of input and output random process of an LTI system.
   (b) X(t) is a stationary random process with zero mean and auto correlation $R_{XX}\left(\tau\right)e^{-2|\tau|}$is applied to a system of function $H\left(w\right) = \frac{1}{jw+2}$ Find mean and PSD of its output.

   [8+8]

6. (a) Explain how the available noise power in an electronic circuit can be estimated.
   (b) What are the different noise sources that may be present in an electron devices?

   [8+8]

7. (a) An amplifier has input and output impedances of 75 ohm, 60dB power gain, and a noise equivalent bandwidth of 15KHz. When a 75Ω resistor at $290K$ is connected to the input, the output rms noise voltage is 75microvolt. Determine the effective noise temperature of the amplifier assuming that the meter is impedance matched to the amplifier.
   (b) List the devices in which narrowband noise can be present.

   [8+8]

8. A Discrete Message Source (DMS) has four symbols x_1, x_2, x_3 and x_4 with probabilities $p(x_1) = 0.4, p(x_2) = 0.3, p(x_3) = 0.2,\ and\ p(x_4) = 0.1,$

   (a) Calculate H (x).
   (b) Find the amount of information contained in the messages $x_1\ x_2\ x_3\ x_4\ \ and\ x_4\ x_3\ x_2\ x_1$, and compare with H (x) obtained in part (a).

   [8+8]

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