Code: 9A04303 **R09**

II B.Tech I Semester (R09) Supplementary May 2012 Examinations
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Common to Electronics & Instrumentation Engineering, Electronics & Control Engineering and Electronics & Communication Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE questions
All questions carry equal marks

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1. (a) State and prove the addition law of probability.
   (b) At a certain military installation six similar radars are placed in operation. It is known that a radar's probability of failing to operate before 500 hours of "on" time have accumulated is 0.06. What are the probabilities that before 500 hours have elapsed?
   (a) All will operate (b) All will fail and (c) only one will fail.

2. (a) What are the conditions for a random variable to be Gaussian? Explain.
   (b) Coin A has a probability of head equal to ¼ and probability of tail equal to ¾ . Coin B is a fair coin. Each coin is flipped four times. Let the random variable X denote the number of heads resulting from coin A and Y denote the resulting number of heads form coin B.
   (a) What is the probability that x=y=2.
   (b) What is the probability that x=y.
   (c) What is the probability that x+y≤5.

3. (a) Discuss about Chebychev's inequality.
   (b) Find the moment generating function of the random variable having probability density function.

$$f_x(x) = x, \quad 0 \le x \le 1.$$
$$= 2 - x, 1 \le x \le 2.$$
$$= 0 \quad \text{else where}$$

4. (a) Let X and Y be two standardized Gaussian random variable. Find the density function of Z=X+Y.
   (b) Explain the statistical independence of two random variables.

5. (a) State and prove the theorems of covariance.
   (b) If X and Y be independent random variables each having density function.

$$f_x(x) = 2.e^{-2x} \quad \text{for } x \ge 0;$$
$$= 0 \quad \text{else where;}$$
$$f_y(y) = 2\,e^{-2y} \quad \text{for } y \ge 0$$
$$= 0 \quad \text{else where}$$

   Find (a) E(X+Y) (b) E[X^2+Y^2].

6. (a) Explain different types of random processes.
   (b) Sample functions in a discrete random process are a constants: that is

   X(t) =C= constant

   Where C is a discrete random variable having possible values C_1=1, C_2=2, and C_3=3 occurring with probability 0.6, 0.3 and 0.1 respectively.
   (a) Is x (t) is determination.
   (b) Find the first-order density function of x(t) at any time t.

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7. (a) State and prove the properties of auto correlation function.
   (b) If x(t) is a stationary process having mean =3 and auto-correlation function $R_{xx}(\tau) = 9 + 2e^{-|\tau|}$. Find the mean and variance of the random variable.

8. (a) State and prove the properties of cross power density spectrum.
   (b) The cross spectral density of two random processes $x(t)$ and $y(t)$ is

$$S_{xy}(w) = 1 + \frac{Jw}{k} \quad \text{for} - k < w < k$$
$$= 0 \quad \text{else where}$$

Where $k > 0$. Find the cross correlation function between the processes.

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