Code: 9A04303

R09

B.Tech II Year I Semester (R09) Supplementary Examinations December 2015

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to EIE, E.Con.E and ECE)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 (a) An experiment has a sample space with 10 equally likely elements $S = \{a_1, a_2, a_3, a_4, \ldots . a_{10}\}$. Three events are defined a $A = \{a_1, a_5, a_9\}$; $B = \{a_1, a_2, a_6, a_9\}$ and $C = \{a_6, a_9\}$. Find the probabilities of: (i) $A \cup B$. (ii) $B \cup C$.

(b) Two cards are drawn from a 52 card deck (the first one is not replaced).
(i) If the first card is a queen, find the probability that the second is also queen.
(ii) What is the probability that both cards are queens?

2 (a) List the properties of conditional distribution function.

(b) Find the value of 'b' for the density function defined as follows $g_x(X) = 4\cos(\pi x/2b)\,\mathrm{rect}(x/2b)$.

3 (a) Find the characteristic function of a Poisson random variable.

(b) Find first and second moments of Poisson random variable from the characteristic function.

4 Two random variables X and Y have a joint density:
$f_{x,y}(x, y) = \frac{10}{4}[u(x) - u(x-4)]\,u(y)y^3 \exp[-(x+1)y^2]$, find marginal densities of X, Y.

5 Two random variables X and Y have the joint characteristic function $\emptyset_{x,y}(w_1, w_2) = \exp(-2w_1^2 - 8w_2^2)$. Show that X and Y have mean zero and they are uncorrelated.

6 A random process is defined by $X(t) = At$, where A is a continuous random variable uniformly distributed on (0, 1).

(a) Determine the form of the sample functions.

(b) Classify the process.

(c) Is it deterministic?

(d) Find the first-order density function of $X(t)$ at any time t.

7 Show that the random process $X(t) = A\cos(\omega_0 t + \emptyset)$ is wide sense stationary for A, ω_0 (constants) and $\emptyset$, which is uniformly distributed random variable on the interval $(0, 2\pi)$.

8 (a) List the properties of power density spectrum.

(b) Find the power density spectrum of the random process for which $R_{xx}(\tau) = P\cos^4(\omega_0 t)$ where P and ω_0 are constants.

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