Code :RA9A04303

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II B.Tech I Semester(R09) Supplementary Examinations, May 2011
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electrical & Electronics Engineering)
(For students of R07 regulation readmitted to II B.Tech I Semester R09)

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

Answer any FIVE questions
All questions carry equal marks
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1. (a) What do you mean by Bernoulli trials? Explain.
   (b) An urn A contains 5 white and 3 black balls. Another urn B contains 3 white and 5 black balls. Two balls are taken from urn A randomly and are placed in uru B. Now, a ball is taken from urn B. What is the probability that it is a black ball?

2. (a) What are the different types of random variables? Explain each type with examples.
   (b) A random current is described by the sample space $s = \{-4 \le i \le 12\}$. A random variable x is defined by
   $$x(i) = \begin{cases} -2 & i \le -2 \\ i & -2 < i \le 1 \\ 1 & i < i \le 4 \\ 6 & 4 < i \end{cases}$$
   i. Show, by a sketch, the value x in to which the value of i are mapped by x.
   ii. What type of random variable is X?

3. (a) Explain the significance of Monotonic transformations of a continuous random variable.
   (b) A random variable x has a characteristic function given by $\varphi_x(\omega) = \begin{cases} 1-|\omega| & |\omega| \le 1 \\ 0 & |\omega| > 1. \end{cases}$
   find its density function.

4. (a) State and explain the properties of joint density function.
   (b) Show that the function
   $G_{x,y}(x,y) = \begin{cases} 0 & x \le y \\ 1 & x \ge y \end{cases}$
   Cannot be a valid distribution function.

5. (a) If x and y are two random variable, discuss when there are jointly Gaussian.
   (b) Define random variables V and W by V=X+ay; W=X-ay Where is a real number and x and y are random variables. Determine a in terms of moments of x and y such that V and W are orthogonal.

6. (a) What are the differences between deterministic and non deterministic random processes? Explain with an example.
   (b) Define a random process by $x(t) = A\cos(\pi t)$
   Where A is a gaussian random variable with zero mean and variance σ_A^2.
   i. Find the density functions of x(0) and x(1)
   ii. Is x(t) stationary is any sense?

7. (a) Discuss Gaussian random process and explain its properties.
   (b) Air craft arrive at an airport according to a poisson process at a rate of 12 per hour. All aircrafts are handled by one air traffic controller. If the controller takes a^2 minutes coffee break, what is the probability that the will miss one or more arriving aircrafts.

8. (a) State and prove Wiener-Kinchine relation.
   (b) Let A_0 and B_0 be the random variables. A random process is defined as
   $x(t) = A_0 \cos \omega ot + B_0 \sin \omega ot$, Where ω_0 is a real constant? Find the power density spectrum of x(t), if A_0 and B_0 are un correlated random variables with zero mean and same variance.

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