Code :9A04303

R9

II B.Tech I Semester(R09) Supplementary Examinations, May 2011
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics & Instrumentation Engineering, Electronics & Control Engineering, 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 Baye's theorem
   (b) A shipment of components consists of three identical boxes. One box contains 2000 components of which 25% are defective, the 2^{nd} box has 5000 components in which20% are defective, and the 3^{rd} box contains 2000 components of which 600 are defective. A box is selected at random from the box. What is the probability by that it came from the second box?
2. (a) Discuss about uniform distribution and exponential distribution
   (b) A random variable x has the distribution function $F_x(x) = \sum_{n=1}^{12} \frac{n^2}{650} u(x-n)$ find the probabilities (a) p($-\infty \prec x \leq 6.5$) (b) p(x≻4) and (c) p(6$\prec x \leq 9$)
3. (a) What is the limitation of a characteristic function and how it is rectified in moment generating function? Explain.
   (b) Find the moment generating function of the random variable whose moments are M_r= (r+1)! 2^r
4. (a) Explain the statistical independence of two random variables.
   (b) A joint sample space for two random variables X and Y has four elements (1,1),(2,2),(3,3),and(4,4). Probabilities of these events are 0.1,0.35,0.05 and 0.5 respectively
      i. Find the probability of the event {x ≤ 2.5, Y ≤6}
      ii. Find the probability of the event { x ≤ 3}
5. (a) Write short notes on joint moments about the origin.
   (b) If X and Y be independent random variables each having density function.
   $$\begin{aligned} f_x(x) &= 3e^{-3x} && for\ x \geq 0 \\ &= 0 && elsewhere \\ f_y(y) &= 3e^{-3y} && for\ y \geq 0 \\ &= 0 && elsewhere \end{aligned}$$
   find $(a)\ E(x^2 + y^2)$ $(b)\ E(xy)$
6. (a) What are the differences between determinate and non determinate random processes? Explain each with an example.
   (b) Sample function in a discrete random process are 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, with probabilities 0.6, 0.3 and 0.1 respectively
      i. Is x(t) is deterministic.
      ii. Find the first order density function of x(t) at any time t.
7. (a) State and prove the properties of cross correction function
   (b) A random process is defined as x(t) = A cos ωt, where 'ω' is a constant and 'A' is a uniform random variable over (0,1). Find the auto correction and auto covariance of x(t).
8. (a) Derive the expression for the power spectral density of input and output of a linear system.
   (b) Prove that $|R_{xy}(\tau)| \leq \sqrt{R_{xx}(0).R_{yy}(0)}$.

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