

II B.Tech I Semester(R05) Supplementary Examinations, December 2009

PROBABILITY THEORY AND STOCHASTIC PROCESS

(Common to Electronics & Communication Engineering and Electronics & Computer Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Define probability based on set theory and fundamental axioms.
(b) When two dice are thrown, find the probability of getting the sums of 10 or 11. [8+8]
2. (a) What is poisson random variable? Explain in brief.
(b) What is binomial density and distribution function?
(c) Assume automobile arrives at a gasoline station are poisson and occur at an average rate of 50/hr. The station has only one gasoline pump. If all cars are assumed to require one minute to obtain fuel. What is the probability that a waiting line will occur at the pump? [5+5+6]
3. (a) A random variable X has a characteristic function given by

$$\Phi_x(\omega) = \begin{cases} 1 - |\omega| & |\omega| \leq 1 \\ 0 & |\omega| > 1 \end{cases} \text{ . Find density function}$$

- (b) A random variable X has the density function $f_X(x) = \frac{1}{a}e^{-b|x|} \quad -\infty \leq x \leq \infty$. Find E[X], E[X²] and variance. [8+8]
4. If the joint PDF of (X,Y) is given by $f_{XY}(x,y) = \begin{cases} Cxye^{-(x^2+y^2)} & x \geq 0, y \geq 0 \\ 0 & otherwise \end{cases}$ Find
 - (a) constant 'C' so that this is a valid joint density function.
 - (b) marginal distribution functions of X and Y.
 - (c) show that X and Y are independent random variables.
 - (d) Find P(X ≤ 1, Y ≤ 1). [4+6+3+3]
5. (a) State the properties exhibited by N Jointly Gaussian random variables X₁??..X_N.
(b) Prove that a linear transformation of Gaussian random variables produces Gaussian random variables. [8+8]
6. A Random process X(t) has periodic sample function as shown in figure2. where A,T and 2t₀< T are constants but ε is a random variable uniformly distributed on the interval (0,T)
 - (a) find the first order distribution function of X(t).
 - (b) Find the first order density function.
 - (c) find E[X(t)], E[X²(t)] and σ_{X²}. [16]
7. (a) The PSD of random process is given by

$$\delta_{XX}(\omega) = \begin{cases} \pi, & |\omega| < | \\ 0, & elsewhere \end{cases}$$
 Find its Auto correlation function.
(b) State and Prove any four properties of PSD. [8+8]
8. (a) State & Prove any four properties of band limited processes. [4×3=12]
(b) White noise with power density No/2 is applied to a network with impulse response h(t) = u(t) ωt exp (ω - t). Where ω > 0 is a constant. Find the correlations of input & output. [4]
