

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2015/2016

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Electronics & Computer Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
 All questions carry equal marks

- 1 (a) When two dice are thrown, find the probability of getting the sums of 10 or 11?
 (b) State and prove Baye's theorem.
- 2 (a) Define random variable and explain the concept of random variable.
 (b) Define and explain Rayleigh density function.
- 3 (a) Explain the following terms:
 (i) Variance. (ii) Skew.
 (b) The density function of a random variable X is $f_X(x) = \begin{cases} 5e^{-5x}, & 0 \leq x \leq \infty \\ 0 & \text{elsewhere} \end{cases}$
 Find: (i) $E[X]$. (ii) $E[(X-1)^2]$.
- 4 (a) Define vector random variable.
 (b) Explain the properties of joint distribution.
 (c) The joint density function of the random variables X and Y is given as;

$$f_{XY}(x,y) = 8xy \text{ for } 0 \leq x \leq 1, 0 \leq y \leq x$$

$$= 0 \text{ otherwise}$$
 Find the marginal density of X.
- 5 (a) X and Y are independent random variables having density function

$$f_X(x) = 2e^{-2x} \text{ for } x \geq 0$$

$$= 0 \text{ otherwise}$$
 And

$$f_Y(y) = 2e^{-2y} \text{ for } y \geq 0$$

$$= 0 \text{ otherwise}$$
 Find (i) $E[X+Y]$ and (ii) $E[XY]$
 (b) Explain how to obtain the pdf of two functions of two random variables.
- 6 (a) Explain the concept of stochastic process.
 (b) Distinguish between deterministic and non deterministic processes.
 (c) What is the difference between random sequence and random process?
- 7 (a) List the properties of autocorrelation function.
 (b) Explain in detail about Poisson random process.
- 8 (a) Prove that PSD and autocorrelation function of a random process form a Fourier transform pair.
 (b) Find the autocorrelation function and power spectral density of the random process,
 $x(t) = K \cos(\omega_0 t + \theta)$ where θ is a random variable over the ensemble and is uniformly distributed over the range $(0, 2\pi)$.
