

**Probability and Stochastic Processes
(Electronics and Communication Engineering)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. State and Prove Bayes theorem of probability? [12M]
(OR)
2. a) Explain the following
 - (i) Discrete Sample Spaces (ii) Probability as a relative frequency [6M]
 - (iii) Conditional Probability (iv) Independent Events
- b) When Two dice are thrown, find the probability of getting sum of 10 or 11. [6M]

UNIT-II

3. A discrete random variable x has possible values $x_i = i^2$, $i = 1, 2, 3, 4, 5$, which occur with probabilities 0.4, 0.25, 0.15, 0.1, and 0.1 respectively. Find the mean value $x = E[x]$ of x . [12M]
(OR)
4. a) Define moment generating function? State properties of moment generating function? [6M]
- b) Show that the mean value and variance of the random variable having the uniform distribution functions are

$$\frac{(a+b)}{2} \text{ and } \frac{(b-a)^2}{12} \quad [6M]$$

UNIT-III

5. Define Marginal density function? Find the Marginal density functions of below joint density function. $f_{xy}(x, y) = 1/12 e^{-x/3} e^{-y/4}$. [12M]
(OR)
6. State and prove Central Limit Theorem. [12M]

UNIT-IV

7. Prove that the random process $X(t) = \cos(\omega_c t + \Phi)$ is WSS if it is assumed that ω_c is a constant and Φ is uniformly distributed variable in the interval $(0, 2\pi)$. [12M]
(OR)
8. a) Define Auto correlation function and explain its properties. [6M]
- b) A random process is described by $X(t) = A^2 \cos^2(\omega_c t + \Phi)$ where A and ω_c are constants and Φ is a random variable uniformly distributed between $\pm\pi$. Is $X(t)$ wide sense stationary. [6M]

UNIT-V

9. The power spectral density of a stationary random process is given by $S_{xx}(\omega) = A$, then Determine the auto correlation function. [12M]
- (OR)**
10. a) State and prove Wiener-Khinchin relation. [10M]
- b) Find whether given power spectrum $\frac{\omega^2}{\omega^6 + 3\omega^2 + 3}$ is valid or not. [2M]

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