M.E. First Semester (Electronics & Tele.) (Full Time) (C.G.S. - New)

13332 : Random Processes : 1 ENTC 2

P. Pages : 3
Time : Three Hours

AX - 3627
Max. Marks : 80

Notes :
1. Assume suitable data wherever necessary.
2. Illustrate your answer necessary with the help of neat sketches.
3. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) Explain probability density function and its properties. 7

   b) A PDF of a random variable X is 7

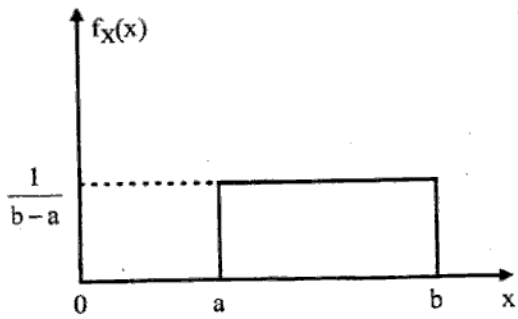
   $$f_X(x) = c(1-x), 1 \le x \le 4$$
   $$= 0, \quad \text{elsewhere}$$

   find
   i) C
   ii) $P(2 < X < 3)$
   iii) CDF

OR

2. a) Explain cumulative distribution function and its properties. 7

   b) PDF of a continuous random variable is given below. Find out the CDF 7



3. a) Explain Gaussian distribution and central limit theorem. 7

   b) Find the mean and variance of uniform random variable 6
   $X \sim u(a, b)$

OR

4. a) Explain the following: 6

   i) Gamma Distribution

   ii) Weibull Distribution

   b) Explain the moment generating function. 7

5. a) Explain Joint Gaussian Random variable with its properties. Describe its significance in signal processing. 7

b) Two random variables X and Y having the joint CDF 6

$$F(x,y)=\begin{cases}1-e^{-y}, & x>4,\ y\ge 0\\ \frac{x}{4}\left(1-e^{-y}\right), & 0\le x\le 4,\ y\ge 0\\ 0, & \text{otherwise}\end{cases}$$

Find

i) $P(X<2,\ Y<2)$

ii) $P(1<X<2,\ Y<2)$

iii) $P(X<4,\ Y>2)$

OR

6. a) State and explain properties of joint CDF. 7

b) PDF of a uniform random variable is 6

$$f(x,y)=\begin{cases}\frac{1}{12}, & 0<x\le 6,\ 0<y\le 2\\ 0, & \text{elsewhere}\end{cases}$$

Find

i) $\overline{x}$ & $\overline{y}$

ii) $E(XY)$

iii) $P(X\ge Y)$

SECTION – B

7. a) Discuss the classification of Random process. 7

b) Explain Gaussian Random process and its properties. Discuss the condition for a Random process to be determined as a Gaussian. 7

OR

8. a) Explain the following terms in detail. 7

i) White Noise

ii) Random Walk

b) Explain in detail the Poisson Process with a necessary mathematical framework. 7

9. a) Explain the properties of cross-correlation function. 6

b) Find the autocorrelation function $R_x(t+T,\ t)$ of the continuous random process $X(t)=A\cos(w_0t+\phi)$, where w_0 is a known constant, A is a random variable uniformly distributed over (0,1) and ϕ is a random variable uniformly distributed over $(0, 2\pi)$. Assume that A and ϕ are independent. 7

OR

10. a) Explain the correlation of weighted sum of Random processes. **7**

b) Explain cross-covariance and cross-correlation between two random processes X(t) and Y(t). **6**

11. a) Explain power spectral density and its properties. **6**

b) Explain in detail the zero-mean noise process. **7**

OR

12. a) Explain power spectrum estimation in Laplacian Domain. **7**

b) Draw and explain the Power Spectral Density (PSD) of a white noise. **6**

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