

**M.E. First Semester (Electronics & Tele.) (Full Time) (C.G.S.- New)**  
**13332 : Random Processes : 1 ENTC 2**

P. Pages : 2

Time : Three Hours

**AW - 3898**

Max. Marks : 80

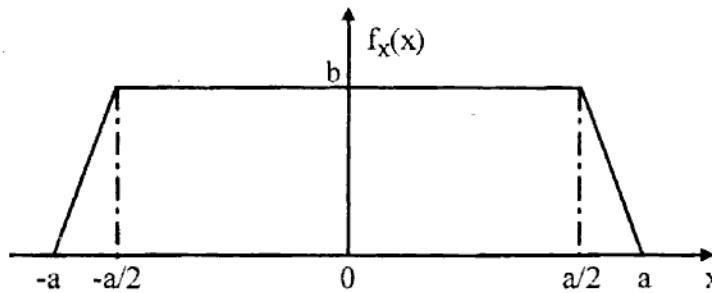
- Notes : 1. Assume suitable data wherever necessary.  
 2. Illustrate your answer necessary with the help of neat sketches.  
 3. Use of pen Blue/Black ink/refill only for writing the answer book.

**SECTION - A**

1. a) Explain the following terms related to random variable with an example. 7

- i) Probability density function
- ii) Cumulative distribution function

- b) For the PDF shown below, find the relation between a and b. 7

**OR**

2. a) Explain the important properties of expectation and variance. Define uniform random variable. 7

- b) For exponential PDF  $f_x(x) = be^{-ax}$   
 i) Find relation between a and b.  
 ii) CDF  
 iii) Find  $P(1 \leq x \leq 2)$ .

3. a) State and explain central limit theorem. 7

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

**OR**

4. a) Explain the following : 6

- i) Exponential Distribution
- ii) Poisson Distribution

- b) Find mean and variance of Binary Distribution. 7

5. a) Explain mean and variance of weighted sum of random variables. 7

- b) Random variable x and y have joint PDF given by 6

$$f_{xy}(xy) = \begin{cases} 6e^{-(2x+3y)}, & x \geq 0, y \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

find,

- i)  $p(x > y)$  and  $p(x + y \leq 1)$
- ii)  $p(\min(x, y) \geq 1)$
- iii)  $p(\min(x, y) \leq 1)$

**OR**

6. a) State and explain properties of joint PDF. 7  
b) Two random variables x and y having the joint CDF. 6

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

find

- i)  $P(X < 2, Y < 2)$   
ii)  $P(1 < X < 2, Y < 2)$   
iii)  $P(X < 4, Y > 2)$

### SECTION – B

7. a) Explain how Random processes are characterised. 7  
b) Explain in detail. 7  
i) Wiener Process  
ii) Stationary Process

### OR

8. a) If  $[x(t)]$  is a Gaussian process with  $\mu(t) = 10$  and  $C(t_1, t_2) = 16e^{-|t_1 - t_2|}$ , probability that : 7  
find  
i)  $x(10) \leq 8$   
ii)  $|x(10) - x(6)| \leq 4$

- b) Explain Poisson Process with a necessary mathematical framework. 7

9. a) Explain cross – covariance and cross – correlation between two random processes  $x(t)$  and  $y(t)$ . 7  
b) State and explain properties of Autocorrelation functions. 6

### OR

10. a) Explain how two Random processes are correlated? 7  
b) Find the autocorrelation function of a Random process given by 6  
 $x(t) = a \cos(bt + y)$ , where a and b are constants and y is uniform random variable on  $(-\pi, \pi)$ .
11. a) Define cross power spectrum. Explain power spectrum Estimation in Laplacian Domain. 7  
b) Draw and explain the power spectral density (PSD) of a white noise. 6

### OR

12. a) How does energy signal differ from power signal? Explain properties of power spectral density. 7  
b) Explain the power spectrum of two Random Process. 6

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