



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) A random variable has a CDF given by $F_X(x) = (1 - e^{-\lambda x})\mu(x)$. find the PDF. 6

b) Explain Guassian random variable also discuss the CDF of a Guassian random variable. 7

OR

2. a) Define uniform Random variable with $f_X(x)$ & $F_X(x)$. 6

b) Consider a random variable that has an exponential PDF given by 7

$$f_X(x) = \frac{1}{b} \exp\left(\frac{-x}{b}\right)\mu(x). \text{ Find the expected value.}$$

3. Suppose X is a Guassian random variable with mean, μ and variance σ^2 . A new random variable is formed according to $Y = ax + b$ find $f_Y(y)$. 13

OR

4. Suppose X is a Guassian random variable with zero mean and variance σ^2 with $Y = X^2$ find $f_Y(y)$. 13

5. a) Explain joint PDF of a pair of random variables. 7

b) If X and Y are statistically independent random variables, then find PDF of $Z = X + Y$. 7

OR

6. a) Explain the conditional PDF of a random variable X. 7

b) Suppose X & Y are independent and both have exponential distributions, find PDF of $Z = X + Y$. 7

7. a) The autocorrelation function of a wss random process is an even function, Prove the statement. 7

- b) A random process $X(t)$ consists of three member : 7
 $x_1(t) = 1, x_2(t) = -3, x_3(t) = \sin(2\pi t)$
i) Is the process wss? Is it stationary in the strict sense?

OR

8. a) For a random process $X(t)$, the power spectral density is a non – negative function. Prove the statement. 7
b) Discuss the independent identically distributed random vectors in detail. 7
9. a) Prove that a random process is wss if the mean function and auto correlation function are invariant to a time shift. 7
b) Define WSS. 6

OR

10. a) Define ergodicity in random process. 7
b) Discuss different properties of ergodicity. 6
11. Write short notes on :
a) Mean Square value of system. 6
b) Cross – correlation between input and output. 7

OR

12. a) Discuss the systems in detail that minimize mean square error. 7
b) Write short note on optimization by parameter adjustment. 6
