B.E. (Electronics Engineering) Semester Seventh (C.B.S.)

Elective - I : Random Signal Processing

P. Pages : 2 **KNT/KW/16/7450**

Time : Three Hours Max. Marks : 80

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. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Discuss the properties of PDF. **6**

b) X is a r.v such that $X(\xi)=c,\ \xi \in \Omega$. Find $F_x(x)$. **7**

OR

2. a) A fair coin is tossed twice, and let the r. v X represent the number of heads. Find $F_x(x)$. **7**

b) Define the probability density function and CDF. **6**

3. The random variables X & Y are said to be statistically independent if $F_{xy}(x, y) = F_x(x)\, F_y(y)$ prove the statement. **13**

OR

4. Given **13**

$$f_{xy}(x,\ y) = \begin{cases} x\,y^2\,e^{-y}, & 0 < y < \infty,\ 0 < x < 1 \\ 0\ , & \text{Otherwise} \end{cases}$$

Determine whether X & Y are independent.

5. Given Z = X + Y. Find $f_z(z)$ consider X, Y are independent random variables. **14**

OR

6. Given Z=x/y, obtain its density function. **14**

7. Let Z = aX + bY. Determine the variance of Z in terms of $\sigma_x, \sigma_y\ \&\ \rho_{xy}$. **13**

OR

8.		Prove that sum of independent Poisson r. vs is also a Poisson random variable.	**13**
9.		Given $f_{xy}(x,y)=\begin{cases} k, & 0<x<y<1 \\ 0, & \text{otherwise} \end{cases}$ determine $f_{x/y}(x/y)$ & $f_{y/x}(y/x)$.	**13**

OR

10.	a)	Discuss the properties of autocorrelation function of a process X(t).	**7**
	b)	Discuss wide sense stationarity.	**6**
11.		If $X_1, X_2, ---, X_n$ & Y are jointly Gaussian Zero mean random variables, then the best estimate for Y in terms of $x_1, x_2, \ldots x_n$ is always linear. Prove the statement.	**14**

OR

12.		$Y(t)=X(t)+N(t)$, $X(t) \to$ Information $N(t) \to$ noise, $Y(t)$ I/P. Find the O/P of the linear system, Z (t).	**14**

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