H.T NO.										

MLR15

Code No: A10407

MLR INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

II B.Tech I Sem Supplementary Examinations- January-2017

RANDOM VARIABLES AND STOCHASTIC PROCESSES

(ECE)

Time: 3 hours Max.Marks :75

Note: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 25 marks. Answer all questions in part A.
3. Part B consist of 5 units. Answer any one full question from each unit. Each question
Carries 10 marks and may have a, b, c as sub questions.

PART-A

1. a) Define Multinomial random variable. 2M
b) Explain Monotonic Transformation. 2M
c) Describe the concept of Strict Sense Stationary process. 2M
d) What is meant by Mean Ergodic process? 2M
e) Define Cross Power density spectrum. 2M

2. a) Explain the following (i) variance (ii) skew 3M
b)State and explain Chebyshev's inequality. 3M
c)Define the expected value of a function of two random variables. 3M
d) Write short notes on Gaussian random processes. 3M
e) State the properties of a Cross Power density spectrum. 3M

PART-B

3. a) Define and explain Gaussian random variable. 5M
b) A random variable X has a pdf 5M

$$f_X(x) = \begin{cases} C(1-x^4), & -1 \le x \le 1 \\ 0, & otherwise \end{cases}$$

(i) Find C. (ii) Find $P[|x| < 2]$.

OR

4. a) Define the Moment generating function of a random variable. State the properties of a Moment generating function. 5M
b) The pdf of a random variable X is given by $f_X(x) = \frac{x}{20}$,$2 \le x \le 5$.
Find the pdf of $Y = 3X - 5$. 5M

5. a) Define Rayleigh density and distribution functions. Explain with their plots. 5M
b) Find the characteristic function for $f_X(x) = e^{-|x|}$. 5M

OR

6. a) Five coins are tossed simultaneously .Find the mean and variance of the probability of getting a head. 5M
b) Explain about the expected value of a function of a random variable. 5M

7. a) State and explain central Limit theorem. 5M

b) The joint pdf of X and Y is given by $f_{X,Y}(x,y) = Ae^{-(2x+y)}, x \geq 0, y \geq 0$

Find (i) the value of A (ii) the marginal density functions

OR

8. a) Define Joint density function and state the properties of Joint density function with proof. 5M

b) The Joint probability density function of two random variables X and Y is given by

$$f_{X,Y}(x.y) = \begin{cases} C(2x+y), 0 \leq x \leq 2, 0 \leq y \leq 3 \\ 0, \; otherwise \end{cases}$$

Find (i)The value of C and (ii) Find $P[X \geq 1, Y \geq 2]$ 5M

9. a) State and prove the properties of autocorrelation 5M

b) Given a random process $X(t) = 10\cos[100t + \theta]$ where θ is a random variable with uniform distribution in the interval (-π,π).Show that the process is wide sense Stationary**.** 5M

OR

10. a) Explain the concept of stationarity in detail. 5M

b) The autocorrelation function of a stationary ergodic process with no periodic components is $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find the mean value and variance of the process $X(t)$ 5M

11. a) Derive the relation between power spectral density and autocorrelation of a random process. 5M

b) The autocorrelation of a random process X(t) the mean value is $E[X(t)] = 6$ and autocorrelation function is $R_{XX}(\tau) = 36 + 25e^{-|\tau|}$ Find

i)The average power of the process X(t) ii) Variance of X(t) 5M

OR

12. a) state and prove the properties of cross power density spectrum. 5M

b) Determine which of the following functions are valid power density spectrums and why ?

(i) $\frac{\cos(8\omega)}{2+\omega^2}$ (ii) $\frac{\omega^2}{\omega^6+3\omega^2+3}$ 5M

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