Reg. No. : | | | | | | | | | | | |

Question Paper Code : 53249

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Electronics and Communication Engineering

MA 6451 — PROBABILITY AND RANDOM PROCESSES

(Common to Biomedical Engineering / Robotics and Automation Engineering)

(Regulation 2013)

Time : Three hours — Maximum : 100 marks

Use of statistical tables is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define discrete and continuous random variable.

2. Write moment generating function of binomial distribution.

3. If X and Y are independent random variables then show that $E(Y/X) = E(Y)$ and $E(X/Y) = E(X)$.

4. State about types of correlation.

5. Write about classification of random process.

6. Define independence increment process.

7. Define cross correlation function.

8. Write any two properties of cross power spectral density.

9. Define the time invariant linear system.

10. Find the ACF of stationary process whose PSD is given by

$$S_{xx}(w) = \begin{cases} w^2 & for \quad |w| \le 1 \\ 0, & \text{otherwise} \end{cases}$$

PART B — (5 × 16 = 80 marks)

11. (a) In a normal distribution 31% of the items are under 45 and 8% are over 64 find the mean and Standard deviation of the distribution.

Or

(b) The average number of traffic accidents on a certain sections of a highway is two per week. Assume that the number of accidents follows a Poisson distribution. Find the probability of (i) no accident in a week (ii) atmost two accidents is a 2 week period.

12. (a) If X, Y, Z are uncorrelated random variables with mean and standard deviation 5, 12, 9 respectively and if $U = X + Y$, $V = X + Y$ find the correlation coefficient between U and V.

Or

(b) Let X and Y are normally distributed independent random variables with mean 0 and variance σ^2. Find the joint pdf of $R = (X^2 + Y^2)^{1/2}$ and $\theta = \tan^{-1}\left(Y/X\right)$.

13. (a) Define random telegraph process. Prove that it is a wide-sense stationary.

Or

(b) Discuss the stationary of the random process $X(t) = A(\cos w_0 t + \theta)$. is uniformly distributed random variable in $(0, 2\pi)$.

14. (a) The power spectral density of a random process is given by $S_{xx}(w) = \begin{cases} \pi, & |w| < 1 \\ 0 & elsewhere \end{cases}$. Find its auto correlation function.

Or

(b) The cross power spectrum of real random processes $\{X(t)\}$ and $\{Y(t)\}$ is given by $S_{xy}(w) = \begin{cases} a + j.bwj, & |w| < 1 \\ 0 & elsewhere \end{cases}$.

15. (a) Find the cross correlation function $X(E)$ is the input voltage to a circuit system and $Y(t)$ is the output voltage $\{X(t)\}$ is a stationary random process with $\mu_X = 0$ and $R_{XX}(\tau) = e^{-\alpha|\tau|}$. Find μ_Y, $S_{yy}(w)$ and $R_{YY}(\tau)$ if the power transfer function is $H(w) = R/(R + iLw)$.

Or

(b) If $\{N(t)\}$ is a band limited white noise such that $S_{NN}(w) = N_0/2$ for $|w| < W_B$ and zero otherwise. Find the auto correlation function.