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

Question Paper Code: 34024

B.E. / B.Tech. DEGREE EXAMINATION, AUGUST 2021

Fourth Semester

Electronics and Communication Engineering

01UMA424 - PROBABILITY AND RANDOM PROCESSES

(Regulation 2013)

Duration: 1:45 hour Maximum: 50 Marks

PART A - (10 x 2 = 20 Marks)

(Answer any ten of the following questions)

1. If a Random variable *X* has the moment generating function $M_x(t)=\frac{2}{2-t}$. Determine the variance of *X*.
2. Let *X* and *Y* be random variables with joint density function *f(x, y)=2-x-y* in $0\leq x<y\leq 1$, fomulate the value of *E(x)*?
3. Outline discrete random process. Give an example for it.
4. Devise the properties of auto correlation function.
5. If *X(t)* is a WSS process and if *Y(t)*= $\int_{-\infty}^{\infty} h(u)X(t-u)du$, then formulate $R_{XY}(\tau) = R_{XY}(\tau) * h(\tau)$.
6. State Axioms of Probability.
7. Define covariance.
8. Define random telegraph signal process.
9. State Winear–Khinchine theorem.
10. If *X(t)* is a WSS process and if *Y(t)*=$\int_{-\infty}^{\infty} h(u)X(t-u)du$, then formulate $R_{XY}(\tau) = R_{XY}(\tau) * h(\tau)$.
11. State Axioms of Probability.

12. Let X and Y be random variables with joint density function $f(x,y)=2-x-y$ in $0\leq x<y\leq 1$,fomulate the value of $E(x)$?

13. Outline discrete random process. Give an example for it.

14. State Winear–Khinchine theorem.

15. Describe a linear system.

PART – B (3 x 10= 30 Marks)

(Answer any three of the following questions)

16. A random variable X has the following probability distribution:

x	0	1	2	3	4	5	6	7
$P(x)$	0	k	$2k$	$3k$	$3k$	k^2	$2k^2$	$7k^2+k$

Find (i) the value of k, (ii) $P(1.5 < X < 4.5 \,/\, X > 2\,)$ and (iii) the smallest value of λ for which $P(X \leq \lambda\,) > \frac{1}{2}$. (10)

17. X is a normal random variable with mean 1 and variance 4. Find the density function of Y where $Y = 2\,X^2 + 1$. (10)

18. Discuss the stationarity of the random process $X(t) = A\cos(\omega_0\, t + \theta)$ if A and ω_0 are constants and θ is uniformly distributed random variable in $(0, 2\pi)$. (10)

19. State and Prove Wiener-Khintchine theorem, and hence find the power Spectral density of a WSS process *X(t)* which has an autocorrelation

$$R_{xx}(\tau) = A_0\left[1 - \frac{|\tau|}{T}\right], \quad -T\leq \tau \leq T.$$ (10)

20. Given the power spectral density of the continuous process, $\dfrac{\omega^2+2}{\omega^4+13\omega^2+36}$.

Find the mean square value of the process. (10)