R20 Regulation *Subject code:* **3P4DA**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular Examinations, July 2022

PROBABILITY THEORY AND STOCHASTIC PROCESSES
(ELECTRONICS & COMMUNICATION ENGINEERING)

Maximum Marks: 70 Date:20.07.2022 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 Define independent events.

2 Define sample space and give an example.

3 The mean and standard deviation of binomial distribution are 5 and 2. Find the distribution function.

4 If $f(x) = \begin{cases} Kxe^{-x}, x > 0 \\ 0 \quad , elsewhere \end{cases}$ is the probability density function of a random variable X, then find 'K'.

5 Define moment generating function for continuous random variables.

6 Define Moments about the origin and central moments.

7 Define wide sense stationary process.

8 Define ergodic process.

9 Write down any two properties of cross-correlation function.

10 Define white noise.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 A car rental agency has 18 compact cars and 12 intermediate size cars. If four of the cars randomly selected for a safety check, what is the probability of getting two of each kind? [10]

OR

12 A bag 'A'contains contains 2 white and 3 red balls and a bag 'B' contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag B. [10]

13 A random variable X has the following probability distribution. [10]

X= x	0	1	2	3	4	5	6	7	8
P(x)	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$

(i) Find the value of a (ii) Evaluate $P(X < 4)$, $P(0 < X < 4)$
(iii) Find the distribution function of X.
(iv) Find mean and variance of X.

OR

14 Derive mean, variance of uniform distribution. [10]

15 The joint probability density function of X and Y is given by $f(x, y) = e^{-(x+y)},\ x > 0$ $and\ y > 0$, find the probability density function of $U = \frac{X+Y}{2}$. [10]

OR

16 For the triangular distribution

$$f(x) = \begin{cases} x, & 0 \le x < 1 \\ 2 - x, & 1 \le x < 2 \\ 0, & otherwise \end{cases}$$

find the mean, variance and the moment generating function. [10]

17 Show that the random process $X(t) = A\, Cos(\omega t + \theta)$ is wide sense stationary if A & ω are constants and θ is uniformly distributed random variable in (0, 2π). [10]

OR

18 Find the cross-correlation function of $W(t) = A(t) + B(t)$ & $Z(t) = A(t) - B(t)$, where A(t) and B(t) are statistically independent random variables with zero means and autocorrelation function $R_{AA}|\tau| = e^{-|\tau|}, -\infty < \tau < \infty$, $R_{BB}|\tau| = 3\,e^{-|\tau|}, -\infty < \tau < \infty$ respectively. [10]

19 Prove that the power spectrum and autocorrelation of random process form a Fourier transform pair. [10]

OR

20 Explain about cross power spectrum density and its properties with proofs. [10]