*R20 Regulation* *Subject code: 3P4DA*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech IV Semester Supplementary Examinations, December 2024

### PROBABILITY THEORY AND STOCHASTIC PROCESSES
**(Electronics & Communication Engineering)**

***Maximum Marks: 70*** Date:03.12.2024 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) | CO | Bloom Tx |
|---|---|---|---|
| 1 | What is the condition for a function to be a random variable? | 1 | L1 |
| 2 | Clearly explain about certainty and uncertainty with suitable example. | 1 | L1 |
| 3 | Define Gaussian random variable. | 2 | L1 |
| 4 | Write two properties of joint distribution function of random variables? | 2 | L1 |
| 5 | Define covariance function. | 3 | L1 |
| 6 | Auto correlation function of a stationary random process is $R_{xx}(t)= 25+(4/1+6t^2)$ Find its variance. | 3 | L1 |
| 7 | Explain about stationary process. | 4 | L1 |
| 8 | Write short notes on wide sense stationary random process. | 4 | L1 |
| 9 | Write the expression for power spectral density. | 5 | L1 |
| 10 | State Wiener-Khintchine relation. | 5 | L1 |

**Part-B**

| Answer All the following questions. | (5X10M=50Marks) | CO | Bloom Tx |
|---|---|---|---|
| 11 | A) State and prove total probability' theorem. [6M]<br>B) Coin A has a probability of head =1/4 and coin B is a fair coin. Each coin is flipped four times. If X is the number of heads resulting from coin and Y denotes the same from coin B, what is the probability for X=Y? [4M] | 1 | L2 |
| | OR | | |
| 12 | A) State and prove Total probability Theorem [5M]<br>B) Define the term independent events. State the conditions for Independence of [5M]<br>i) any two events A and B<br>ii) Anythree events A,B and C | 1 | L2 |
| 13 | A) A random variable X uniformly distributed in the interval (0, π/2). Consider the transformation Y=sinx, obtain the pdf of Y. [5M] | 2 | L2 |

| | | | |
|---|---|---|---|
| | B) Find the value of the constant k so that [5M]<br>$f_X(x) = \begin{cases} Kx^2(1-x^3) & \text{for } 0<x<1 \\ 0 & \text{elsewhere} \end{cases}$ | | |
| | OR | | |
| 14 | A) Prove that the variance of weighted sum of N random variables equals the weighted sum of all their covariances. [5M]<br>B) For the uniformly distributed Random Variable X, Determine [5M]<br>i) Moment generating function<br>ii) Mean and Variance | 2 | L2 |
| 15 | A) Define and explain joint density function of two random variables X and Y [5M]<br>B) State properties of joint probability distribution function [5M] | 3 | L2 |
| | OR | | |
| 16 | If Independent Random Variables X and Y both of zero mean, have variance 20 and 8 respectively, find the correlation coefficient between the random Variables X+Y and X-Y. [10M] | 3 | L2 |
| 17 | Define the terms: (i) Random process. (ii) Stationary random process. (iii) Wide sense stationary random process. (iv) Ergodic random process. [10M] | 4 | L2 |
| | OR | | |
| 18 | A) What is the probability distribution function of the sum of two random variables [4M]<br>B) Give the classification of random processes [6M] | 4 | L2 |
| 19 | A) Compare and contrast Auto and cross correlations [5M]<br>B) Derive the relationship between cross-power spectrum and cross-correlation function. [5M] | 5 | L2 |
| | OR | | |
| 20 | Explain about cross power spectrum density and its properties with proofs. [10M] | 5 | L2 |