R20 Regulation *Subject code: 3P4DA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, June 2026

PROBABILITY THEORY AND STOCHASTIC PROCESS

(ECE)

Maximum Marks: 70 Date: 08.06.2026 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.
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)		Marks	CO	BTL
1	Define probability of the event with an example.	2M	1	L1
2	State Bayes' theorem.	2M	1	L1
3	State the central limit theorem	2M	2	L1
4	Distinguish between joint distribution and marginal distribution.	2M	2	L1
5	Define the joint moments about the origin.	2M	3	L1
6	Define skew and coefficient of skewness.	2M	3	L1
7	Write about second order stationary process.	2M	4	L1
8	Write on Gaussian random process.	2M	4	L1
9	Write the expression for power spectral density.	2M	5	L1
10	Find auto correlation function for $S_{XX}(\omega) = \frac{8}{(9+\omega^2)^2}$	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	A shipment of components consists of 3 identical boxes. One box contains 2000 components of which 25% are defective, the second box has 5000 components of which 20% are defective and third box contains 2000 components of which are 600 are defective. A box is selected at random and a component is removed at random from the box. i) What is the probability that this component is defective? ii) What is the probability that it came from the second box.	10M	1	L2
	OR			
12	A binary communication channel carries data as one of two types of signals denoted by 0 and 1. Owing to noise, a transmitted 0 is sometimes received as 1 and a transmitted 1 is sometimes received as 0. For a given channel, assume a probability of 0.94 that a transmitted 0 is correctly received as 0 and a probability of 0.91 that a transmitted 1 is received as a 1. Further assume a probability of 0.45 of transmitting a 0, if a signal is sent.	10M	1	L2

	Determine: i)Probability that a 1 is received ii)Probability that a 0 was received iii)Probability that a 1 was transmitted, given that a 1 was received iv)Probability that a 0 was transmitted, given that a 0 was received v)Probability of error			
13	Find the value of the constant k so that $f_X(x) = \begin{cases} Kx^2(1-x^3) & \text{for } 0<x<1 \\ 0 & \text{elsewhere} \end{cases}$	10M	2	L2
	OR			
14	State and prove any two properties of joint probability distribution function	10M	2	L2
15	Explain Moments about the Origin and Moments about the Mean.	10M	3	L2
	OR			
16	Two statistically independent random variables X and Y have mean values E[X] = 2 and E[Y] = 4. They have second moments $E[X^2] = 8$ and $E[Y^2] = 25$. Find Variance of W = 3X-Y.	10M	3	L2
17	Explain the concept of time average and ergodicity. Write the conditions for a random process to be ergodic in mean and autocorrelation.	10M	4	L2
	OR			
18	Define cross correlation function of a random process. Write its properties and prove any four of them.	10M	4	L2
19	State and prove Wiener –Khinchine relation.	10M	5	L2
	OR			
20	Explain about cross power spectrum density and its properties with proofs	10M	5	L2