



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 2025

PROBABILITY THEORY AND STOCHASTIC PROCESS (ECE)

Maximum Marks: 70

Date: 16.12.2025

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	Write the significance of mathematical model of experiments.	2M	1	L1
2	Write the properties of probability density function.	2M	1	L1
3	Write about the Rayleigh density and distribution function.	2M	2	L1
4	Define skew and coefficient of skewness.	2M	2	L1
5	Write about linear transformations of Gaussian random variables.	2M	3	L1
6	Distinguish between point conditioning and interval conditioning.	2M	3	L1
7	Write about stationary process.	2M	4	L1
8	Write on wide sense stationary random process.	2M	4	L1
9	Write the expression for power spectral density.	2M	5	L1
10	Write properties of cross power density spectrum.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Write the classical and axiomatic definitions of Probability and for a three digit decimal number chosen at random, find the probability that exactly K digits are greater than and equal to 5, for $0 < K < 3$.	10M	1	L2
OR				
12	You (A) and two others (B and C) each toss a fair coin in a two-step gambling game. In step1 the person whose toss is not a match to either of other two is "odd man out". Only the remaining two whose coins match go on to step2 to resolve the ultimate winner. a) What is the probability that you will advance to step2 after the first toss? b) What is the probability you will be out after the first toss? c) What is the probability that no one will be out after the first toss?	10M	1	L2
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	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	2	L2
OR		10M	3	L2
15	Given the transformation $y = \cos x$ where x be a uniformly distributed random variable in the interval $(-\pi, \pi)$. Find $f_y(y)$ and $E[y]$.			
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	Derive the relation between PSDs of input and output random process of an LTI system.	10M	5	L2
OR				
20	Explain about cross power spectrum density and its properties with proofs.	10M	5	L2