R18 Regulation *Subject code: 2P4DE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, July 2024

PROBABILITY THEORY AND STOCHASTIC PROCESS

(ECE)

Maximum Marks: 70 Date:27.07.2024 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	Define probability of the event with an example.	1	L1
2	State Bayes' theorem.	1	L1
3	State the central limit theorem	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 $R_{xx}(\tau)= 25+(4/1+6\tau^2)$ 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)			
11	a)State and Prove the Total Probability. [5M] b) 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. [5M]	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	1	L2

	probability of 0.45 of transmitting a 0, if a signal is sent. 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 [10M]		
13	a) Explain Probability Density Function and Mention its properties [5M] b) A random variable X has a pdf [5M] $f_X(x) = \begin{cases} C(1-x^4) & \text{for } -1 \le x \le 1 \\ 0 & \text{Otherwise} \end{cases}$ i) Find C ii) P ($\lvert x \rvert < 1/2$) iii) $F_X(x)$	2	L2
	OR		
14	a) Explain characteristic function. [5M] b) If X is a uniform random variable in $-5 \le x \le 5$. Find E[X], E[X^2], E[2X+5], E[$(X+1)^2$] E[(3x-4)/5] [5M]	2	L2
15	a) 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. [5M] b) State properties of joint probability density function. [5M]	3	L2
	OR		
16	a) 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]. [5M] b) State central limit theorem. [5M]	3	L2
17	a) Define autocorrelation function of a random process. Write its properties and prove any four of them. [5M] b) Explain the concept of time average and ergodicity. Write the conditions for a random process to be ergodic in mean and autocorrelation [5M]	4	L2
	OR		
18	a) Define cross correlation function of a random process. Write its properties and prove any four of them. [5M] b) Explain in brief the concepts of stationary random processes. [5M]	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