R22 Regulation *Subject code: 4E4DA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Regular Examinations, July 2024

PROBABILITY THEORY AND STOCHASTIC PROCESSES

(ECE)

Maximum Marks: 60 Date:18.07.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 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	CO	Bloom Tx
	All the following questions carry equal marks (10X1M=10 Marks)		
1.a)	State total probability theorem.	CO1	K2
b)	Suppose AAA and BBB are two events with the following probabilities: P(A)=0.4, P(B)=0.5 and P(A∩B)=0.2. Calculate the probability that either A or B occurs.	CO1	K2
c)	The mean and variance of a binomial distribution are 4 and 2 respectively. Find theprobability mass function of X.	CO2	K1
d)	Write the statement of Chebychev"s inequality.	CO2	K1
e)	Find the joint probability distribution for $p(x,y) = \frac{x+y}{21}; where\ x = 1,2,3\ and\ y = 1,2.$	CO3	K2
f)	Define the statistical Independence of the Random variables	CO3	K1
g)	Define wide sense stationary random processes.	CO4	K1
h)	Prove that the Auto correlation function has maximum value at the origin i.e $\vert RXX(\tau) \vert = RXX(0)$	CO4	K1
i)	Define linear system and derive the expression for output response	CO5	K1
j)	Check whether the function $S(\omega) = \frac{\omega+4}{\omega^2+5}$ is power density or not?	CO5	K2
	Part-B		
	Answer All the following questions. (5X10M=50Marks)		
2	A stack of cards consists of 6red and 5 blue cards. A second stack of cards consists of 9 red cards. A stack is selected at random and 3 of it cards are drawn. If all of them are red, what is the probability that the first stack was selected. [10]	CO1	K3
	OR		
3	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.	CO1	K3

	i) What is the probability that this component is defective? ii) What is the probability that it came from the second box. [10]		
4	(a)Explain Moments about the Origin and Moments about the Mean. [5] (b)For the uniformly distributed Random Variable X, Determine Mean and Variance. [5]	CO2	K3
	OR		
5	A car hire firm has 2 cars. The number of demands for a car on each day is distributed as Poisson variate with mean 0.5. Calculate the proportion of days on which (i) Neither car is used (ii) Some demand is refused. [10]	CO2	K3
6	Explain the properties Joint distribution and density function. [10]	CO3	K3
	OR		
7	The random variables X and Y have joint probability density function $f(x,y) = \begin{cases} 8xy, 0 < x < y < 1 \\ 0, otherwise \end{cases}$ Find i) marginal density functions of X and Y ii) the conditional density function of X given Y iii) Are X and Y independent? [10]	CO3	K3
8	Show that the process $X(t) = Acost + Bsint,\ -\infty < t < \infty$ is a WSS Process where A and B are independent random variables each of which has value -2 with probability 1/3 and a value 1 with probability 2/3. [10]	CO4	K3
	OR		
9	State the properties of Auto Correlation function and prove any four of them. [10]	CO4	K3
10	The auto correlation of a stationary random process is given by $R_{XX}(\tau) = ae^{-b\|t\|}, b > 0$. Find the spectral density function. [10]	CO5	K3
	OR		
11	Prove that Auto correlation function and power spectrum density form a Fourier transform pair. [10]	CO5	K3