Enroll No................. Roll No....................

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Department of Computer Science & Engineering

School of Engineering Sciences & Technology

Odd Semester Examination-2022

Paper Name: Mathematics-III **Paper Code: BTCSE-311**

Time: 3 Hours **Maximum Marks: 75**

Note: Mobile Phones or programmable calculator or any equipment with memory are not allowed inside the examination hall. Follow proper numbering for answering the questions.

Attempt all questions from section A (7*5=35), Any four questions from section B (4*10=40).

Abbreviations used:

CO-Course Outcomes

CO1. Understand the nature and characteristics of random variables, random function and hence define random process.

CO2. Present the statistical averages of random processes.

CO3. Investigate random processes to analyze various random experiments

CO4. Develop methods that will be useful in computing the probabilities of events which involves numerical attributes consisting of certain outcomes of various random experiments.

CO5. Evaluate the probabilities and average of interest in the design of system involving randomness

BL-Bloom's Taxonomy Levels

(1. Remembering, 2. Understanding, 3. Applying, 4. Analysing, 5. Evaluating, 6. Creating.)

Section-A (Attempt all questions 7*5=35 Marks)

Q.N.	Question	Marks	CO	BL
1	If X is a discrete random variable with the probability function. $f(x)=\begin{cases}\dfrac{1}{x(x+1)} & if\ x=1,2,3...\\ 0, & otherwise\end{cases}$ Show that the mean does not exist.	5	CO1	L3
2	If $\{X(t)\}$ is a random process with $\mu(t)=8$ and autocorrelation $R(t_1, t_2)= 64+10e^{-2\lvert t_1-t_2\rvert}$, then find mean and variance.	5	CO5	L5
3	State and prove Mean Ergodic Theorem.	5	CO3	L1
4	A wholesaler in apples claims that only 4% of the apples supplied by him are defective. A random sample of 600 apples contained 36 defective apples. Test the claim of the wholesaler at 5% level of significance.	5	CO4	L5
5	The probability mass function of a variate X is <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(X)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table> Find P(X<4) and P(X>4).	5	CO2	L5

6	Two dice are tossed once. Find the probability of getting an even number on the first die or a total of 8.	5	CO1	L4
7	The joint probability distribution of X and Y is $f(x,y)=\frac{1}{27}(2x+y),\ x=0,1,2\ \ and\ \ y=0,1,2$. Find the marginal distributions.	5	CO3	L5

Section- B (Attempt any four questions 4*10=40 Marks)

Q.N.	Question	Marks	CO	BL
1	A survey was conducted to find the supplies of the consumer durables for the market. It was found that the three major companies A,B and C have market share of 35%, 25% and 40% resp. out of which 2%, 1% and 3% are not upto the satisfaction. A consumer buys a product and is dissatisfied with it. What is the probability that it might be from the company C ?	10	CO1	L3
2	A random process $\{X(t)\}$ has the probability distribution $P\{X(t)=x\}=\begin{cases}\frac{(at)^{x-1}}{(1+at)^{x+1}}, & x=1,2,3...\\ \frac{at}{1+at}, & x=0\end{cases}$ Show that the process is not stationary.	10	CO5	L5
3	The heights of college students in a city are normally distributed with S.D. 6 cms. A sample of 1000 students has mean height 158 cms. Test the hypothesis that the mean height of college students in the city is 160 cms.	10	CO4	L3
4	Let X and Y be jointly distributed with pdf $f(x,y)=\begin{cases}\frac{1}{4}(1+xy), \lvert x\rvert<1, \lvert y\rvert<1\\ 0, \quad otherwise\end{cases}$ Show that X and Y are not dependent.	10	CO3	L5
5	Find the distribution function of the total number of heads obtained in four tosses of a balanced coin.	10	CO2	L5
6	In an experiment of throwing a fair six-faced dice, the random process $\{X(t)\}$ is defined as $X(t)=\begin{cases}\sin\pi t, if\ odd\ number\ shows\ up\\ 2t, if\ even\ number\ shows\ up\end{cases}$ Find $E\{X(t)\}$ at t = 0.25. Also find probability distribution function at t = 0.25.	10	C05	L4