7/12/2024 EXTC SEM-V C SCHEME RSA QP CODE: 10065546

Time: 3 Hours **Total Marks: 80**

N.B: 1. Question No 1 is Compulsory
2. Answer any 3 questions from the remaining questions

Q1 Answer any four questions

	a.	State and prove Bayes Theorem.	05
	b.	Define Rayleigh distribution with necessary parameters.	05
	c.	Derive an expression to calculate the variance of random variable.	05
	d.	State central limit theorem. What is the significance of central limit theorem?	05
	e.	What are the types of linear regression?	05
Q2	a.	Define random variable. With examples, discuss the types of Random variables.	10
	b.	There are 3 true coins and 1 false coin with head on both sides. A coin is chosen at random and tossed 4 times. If head occurs all the 4 times, what is the probability that the false coin has been chosen and used?	10
Q3	a.	State and prove Chebyshev inequality.	10
	b.	A Continuous random variable has density function $f(x) = k(1+x)$ where $2 \le x \le 5$. Find $P(X<4)$.	10
Q4	a.	The joint probability distribution of two discrete random variables X and Y is given by $f(x,y) = c(2x+y)$ where X = 0,1,2 and Y = 0,1,2,3. i. Find the value of c ii. find $P(X \ge 1, Y \le 2)$	10
	b.	Define Moment generating function. Find the mean and variance of Binomial distribution using moment generating function.	10
Q5	a.	What are the properties of auto correlation function? Find the auto correlation of a random process $x(t) = A \cos(\omega t + \Theta)$ where A and ω are constants and Θ is a random variable with uniform distribution in $(0, 2\Pi)$.	10
	b.	For linear time invariant system, if input is WSS process, prove that output is also WSS process	10
Q6	a.	If X and are independent random variables with $f(x) = e^{-x}$: $x \ge 0$ and $y=3e^{-3y}$; $y \ge 0$, find $f(z)$ if $z = \frac{x}{y}$.	10
	b.	Find the regression line equation for the following data	10

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14