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KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR
23AM28BS301

II.B. Tech. I. Semester Supplementary Examinations, June- 2025

MATHEMATICAL AND STATISTICAL FOUNDATIONS

(AIML)

Time: 3 Hours

Max.Marks:60

Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

PART-A		(10Marks)															
Q.No	Questions	Marks	BTL														
1.a)	Find the product of divisors of 54.	1	1														
1.b)	What are Fermat numbers.	1	2														
1.c)	Write down the properties of Correlation coefficient.	1	1														
1.d)	What are mean and variances of Binomial distribution.	1	2														
1.e)	Define Normal distribution	1	1														
1.f)	State Central limit theorem.	1	2														
1.g)	Define Type – I and Type – II error.	1	2														
1.h)	Define interval Estimation.	1	1														
1.i)	Define stochastic process.	1	2														
1.j)	Define Regular Stochastic Matrix.	1	1														
PART-B		(50Marks)															
Q.No	Questions	Marks	BTL														
2. a)	Find all possible solutions of $9x \equiv 6(\text{mod } 15)$.	5M	3														
b)	Using Chinese remainder theorem, solve the system of linear congruences $x \equiv 2(\text{mod } 3); x \equiv 3(\text{mod } 5); x \equiv 2(\text{mod } 7)$.	5M	4														
OR																	
3. a)	Find the GCD of 750 and 900 using Euclidian Algorithm.	5M	4														
b)	State and prove Fundamental theorem of arithmetic.	5M	3														
4. a)	Given that $P(X=2)=9P(X=4)+ 90P(X=4)$ for a Poisson variate X. Find (i) $P(X<2)$ (ii) $P(X>4)$.	5M	3														
b)	Calculate the regression line of Y on X from the data given below, then estimate the likely demand when price is 20 Rs. <table border="1"><tr><td>Price(X)</td><td>10</td><td>12</td><td>13</td><td>12</td><td>16</td><td>15</td></tr><tr><td>Demand(y)</td><td>40</td><td>38</td><td>43</td><td>45</td><td>37</td><td>43</td></tr></table>	Price(X)	10	12	13	12	16	15	Demand(y)	40	38	43	45	37	43	5M	3
Price(X)	10	12	13	12	16	15											
Demand(y)	40	38	43	45	37	43											
OR																	
5. a)	If a random variable X has the following probability	5M	3														

	function																				
	<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><td>7</td></tr><tr><td>P(X)</td><td>0</td><td>K</td><td>2K</td><td>2K</td><td>3K</td><td>K²</td><td>2K²</td><td>7K²+K</td></tr></table>	X	0	1	2	3	4	5	6	7	P(X)	0	K	2K	2K	3K	K ²	2K ²	7K ² +K		
X	0	1	2	3	4	5	6	7													
P(X)	0	K	2K	2K	3K	K ²	2K ²	7K ² +K													
	(i)K (ii)P(X<6), P(X>=6), P(0<X<5) (iii)Mean, Variance.																				
b)	Fit a straight line $y= a+ bx$ to the following data by the method of least squares. <table><tr><td>X</td><td>0</td><td>1</td><td>3</td><td>6</td><td>8</td></tr><tr><td>Y</td><td>1</td><td>3</td><td>2</td><td>5</td><td>4</td></tr></table>	X	0	1	3	6	8	Y	1	3	2	5	4	5M	3						
X	0	1	3	6	8																
Y	1	3	2	5	4																
6.	In a normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution.	10M	4																		
OR																					
7.	If the population is consisting of 3, 7, 9, 11, 15 i) List all possible samples of size 2 that can be taken without replacement from the finite population. ii) Calculate the mean of each of the sampling distribution of means. iii) Find the standard deviation of sampling distribution of means	10M	4																		
8. a)	A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38.	5M	3																		
b)	In a random sample of 160 workers exposed to a certain amount of radiation, 24 experienced some ill effects. Construct a 99% confidence interval for the corresponding true percentage.	5M	4																		
OR																					
9. a)	A random sample of six steel beams has a mean compressive strength of 58.392 p.s.i(pounds per square inch) with a standard deviation of 648 p.s.i. Use this information and the level of significance 0.05 to test whether the true average compressive strength of the steel from which this sample came is 58.000 p.s.i.	5M	4																		
b)	In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat eaters are equally popular in the state as 1% level of significance?	5M	3																		
10.a)	The transition probability matrix of a Markov Chain is	5M	3																		

	given by $\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$ Is the Matrix Irreducible?		
b)	a) Define Regular Stochastic Matrix b) What is Matrix of transition Probability? Explain the steps to construct such a matrix.	5M	4
OR			
11.	If the transition probability of market shares of three brands A, B and C is $\begin{bmatrix} 0.4 & 0.3 & 0.3 \\ 0.8 & 0.1 & 0.1 \\ 0.35 & 0.25 & 0.4 \end{bmatrix}$ and the initial market shares are 50%, 25% and 25%. Find i) The market shares in second and third periods. ii) The limiting probabilities.	10M	4

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