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K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Jan-Feb 2025 ~~Nov – Dec 2024~~ (B. Tech Program: All Branches B. Tech Scheme: II)
Supplementary ~~Regular~~ Examination: TY Semester: V
Course Code: HAIMLC501/ HADSC501 and Course Name: Mathematics in AI&ML/Mathematics in Data Science
Date of Exam: ~~5/12/2024~~ 10/02/2025 Duration: 2.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Prove that the set of all 2nd degree polynomials is not a vector space.		CO1	AP
b)	A random variable X takes values 0, 1 and 2, then check if $P(X=x) = \frac{x+1}{3}$ can be its probability distribution.		CO2	AP
c)	Let x be a continuous random variable with probability distribution function: $f(x) = k\,x(1-x)\ ; 0 \le x \le 1$ Find k and determine a number b such that, $P(x \le b) = P(x \ge b)$		CO2	AP
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Explain trigonometric and frequency distribution graph in detail with an example.		CO3	U
b)	Differentiate between continuous data and discrete data with an example.		CO3	AP
c)	Illustrate Curse of Dimensionality reduction with an example.		CO6	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	a_1) Six guinea pigs injured with 0.5 mg of a medication took on an average 15.4 seconds to fall asleep with an unbiased standard deviation 2.2 seconds, while six other guinea pigs injured with 1.5 mg of a medication took on an average 11.2 seconds to fall asleep with an unbiased standard deviation 2.6 seconds. Use 5% level of significance to test the null hypothesis that the difference in the dosage has no effect. a_2) According to a theory the proportion of a commodity in the four classes		CO2	AP

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	A, B, C, D should be 9:4:2:1. In a survey of 1600 items of this commodity the number in four classes were 882, 432, 168 and 118. Apply χ^2 test to find whether the survey support the theory.			
b)	A survey was conducted asking people about their favorite flavor of ice cream. The results of this survey are displayed on the bar chart. Ice Cream Flavor / Frequency: Chocolate 12; Vanilla 16; Strawberry 5; Mint choc 3; Other 6 a) Use the bar graph to fill in the gaps in the table. b) Calculate the percentage of people surveyed whose favorite flavor is strawberry.		CO3	AP
c)	A company wants to segment its customer base into distinct groups to tailor its marketing strategies. The company has collected data on each customer's annual income (in thousands) and spending score (on a scale of 1 to 100). Initialize K=2 clusters with initial centroids at (15, 39) and (16, 81).The data is as follows. **Customer / Annual Income (k) / Spending Score** 1 / 15 / 39 2 / 16 / 81 3 / 17 / 6 4 / 18 / 77 5 / 19 / 40 6 / 20 / 76		CO4	AP
Q.4	Solve any two questions out of three. (10 marks each)	20		
a)	Calculate the Mean, Median, Mode, Variance, and Standard Suppose we have a dataset representing the test scores of 10 students as follows. Data: 55,60,65,70,75,80,85,85,90,95		CO4	AP

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b)	Using Newton's method find the optimum value of $f(x) = \frac{x^2}{2} - \sin x$; ε = 0.00001		CO5	AP
c)	Using Regula Falsi method find the optimum value of $2x^3-2x-5 = 0$ in the interval [1,2].		CO5	AP

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