Supplimentary
Exam

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

Feb Decober 2024

(B.Tech) Program: Computer Engineering/IT/EXTC/AIDS Scheme II
Examination: TY   Semester: V
Course Code: HAIMLC501/HDSC501 and   Course Name: Mathematics for AIML/
Mathematics for Data Science

Date of Exam: 22-07-2024   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.

		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Q If A = $\begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$ then find the Eigen values of $A^3 + 5A + 6I$.		CO1	A
ii)	Find the probability that a random variable having the standard normal distribution will take a value between 0.87 and 1.28.		CO2	A
iii)	List out types of Quantitative data.		CO3	U
iv)	How to plot a Stem and Leaf plot?		CO3	U
v)	Explain Exploratory data analysis.		CO4	U
vi)	Find first two iterations for Newton's Method to find the optimum value of $f(x) = 12x - 3x^4 - 2x^6$, when $x_0 = 1$.		CO5	A
vii)	Explain the Bisection Method process to solve optimization problem.		CO5	U
viii)	What is dimensionality reduction?		CO6	U
Q.2	Solve any four questions out of six.	16		
i)	Solve the following system of equations using Gauss Jacobi's Method. $15x + y + z = 17,$ $2x + 15y + z = 18,$ $x + 2y + 15z = 18$		CO1	A
ii)	In sampling a large number of parts manufactured by a machine the mean number of defectives in a sample of 20 is 2. Out of 100 such samples, how many would you expect to contain 3 defectives using Poisson distribution?		CO2	U
iii)	Analyze the data given below to get variance and standard deviation and state type of data. 5,9,8,12,6,10,6,8		CO3	A
iv)	How to deal with the missing data in data cleaning process? Explain.		CO4	U

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Feb-Mar 2024

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v)	Using Newton's Method find the optimum value of $f(x) = 12x - 3x^4 - 2x^6$, $\epsilon = 0.00001$.		CO5	A
vi)	Write a short note on the Factor Analysis.		CO6	U
Q.3	Solve any two questions out of three.	16		
i)	Find the dimension and basis for the four fundamental subspaces for $A = \begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{bmatrix}_{3\times4}$		CO1	A
ii)	Use the K-mean algorithm and Euclidian distance to cluster the following 8 examples into 3 clusters. A1(2,10),A2(2,5),A3(8,4),A4(5,8),A5(7,5),A6(6,4),A7(1,2), A8(4,9))		CO4	A
iii)	Using Bisection method optimize the value of $x^2 - 3x - 3 = 0$		CO5	A
Q.4	Solve any two questions out of three.	16		
i)	Tests made on breaking strength of 10 pieces of a metal wire gave the following results 578 572 570 568 572 570 570 572 596 584 in kgs Test if the breaking strength of the metal wire can be assumed to be 577 kg.		CO2	A
ii)	The table shows the percentage attendance of a group at a dance school over the period of a year.		CO3	A
iii)	Given the following data use PCA to reduce the dimension from 2 to1.		CO6	U

For Q.4 ii):

Month	J	F	M	A	M	J	J	A	S	O	N	D
Attendance %	94	95	96	99	98	98	92	86	98	96	94	93

Draw a time series graph to show above data.

For Q.4 iii):

Feature	Example1	Example2	Example3	Example4
x	4	8	13	7
y	11	4	5	14

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