BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B. TECH. **SEMESTER : VI**
BRANCH: CSE **SESSION : SP/2023**

SUBJECT: IT340 MACHINE LEARNING

TIME: 3 HOURS **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Demonstrate the phases of a machine learning process model with a suitable block diagram. Justify "Patterns are local and model is global for an entire dataset".	[5]	1,3	2,5
Q.1(b)	Examine the importance of the regression model in exploratory data analysis. Using an appropriate illustration, discuss the principle of least squares in linear regression models.	[5]	2,3	4, 6
Q.2(a)	Considering the dataset given below, demonstrate the procedure for finding the best splitting attribute in decision tree-based classification.	[5]	1,3	2

Height (cm)	Weight (kg)	Class
172	74	F
169	91	M
184	86	M
156	51	F
176	79	F

Q.2(b)	Using an appropriate illustration, demonstrate how a support vector machine can be used to classify linear data. Enumerate the advantages and disadvantages of support vector machine.	[5]	2,3	2
Q.3(a)	Solve the following classification problem with the perceptron learning rule. Apply each input vector in order, for as many repetitions as it takes to ensure that the problem is solved. Assume initial weight and bias as zero. $\left\{\mathbf{p}_1 = \begin{bmatrix}2\\2\end{bmatrix}, t_1 = 0\right\}\left\{\mathbf{p}_2 = \begin{bmatrix}1\\-2\end{bmatrix}, t_2 = 1\right\}\left\{\mathbf{p}_3 = \begin{bmatrix}-2\\2\end{bmatrix}, t_3 = 0\right\}\left\{\mathbf{p}_4 = \begin{bmatrix}-1\\1\end{bmatrix}, t_4 = 1\right\}$	[5]	2,3	6
Q.3(b)	Demonstrate the functioning of the gradient descent algorithm with an appropriate illustration. Give a brief discussion on vanishing gradient.	[5]	2,4	2,6
Q.4(a)	Utilize the k-means algorithm and Euclidean distance to cluster the following points into three clusters and determine their centers after two iterations. A1= (2,10), A2= (2,5), A3= (8,4), A4=(5,8), A5=(7,5), A6=(6,4), A7=(1,2), A8=(4,9)	[5]	3,4	5
Q.4(b)	Given the following distance matrix, generate a dendrogram using the hierarchical agglomerative single and complete linkage algorithm.	[5]	3,4	6

Item	A	B	C	D	E
A	0				
B	8	0			
C	2	6	0		
D	5	4	8	0	
E	10	9	1	7	0

Q.5(a)	Give a detailed discussion on the significance of diversity in ensemble learning.	[5]	3,5	6
Q.5(b)	Using suitable illustrations, compare various ensemble methods like bagging, boosting, and stacking.	[5]	3,5	5

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