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

CLASS: MTECH/PrePhD **SEMESTER : I**
BRANCH: AIML **SESSION : MO/2024**

SUBJECT: AI502 ADVANCED CONCEPTS OF SUPERVISED 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)	Describe the KNN algorithm. Apply KNN (K=3) using Euclidean distance for the data point X = (74, 0) for the given dataset, and predict the label.	[5]	1	2

S. No	F1	F2	Label
1	84	2	1
2	60	1	1
3	29	1	1
4	76	2	1
5	70	0	1
6	79	1	1
7	72	1	0
8	28	0	0
9	20	1	0
10	46	0	0

Q.1(b)	Derive the expression for Naïve Bayes' classifier for a feature vector X with n features and a categorical classification label y.	[5]	1	5
Q.2(a)	Support vector machine is a constrained optimization problem. Justify your answer by mathematical justification.	[5]	2	5
Q.2(b)	Discuss the following : (i) Feature selection (ii) Overfitting and pruning in Decision trees	[5]	2	2
Q.3(a)	Explain the back-propagation algorithm for learning model parameters in a neural network.	[5]	3	2
Q.3(b)	Given a single neuron (sigmoid function), two inputs, no bias, and one training example: {x1=1, x2=1, y=1}, w1=0.4, w2=0.6, learning rate=0.5. Compute the new values for w1 and w2 after one iteration of gradient descent of backpropagation.	[5]	3	3
Q.4(a)	Illustrate the working of EM algorithm with the help of an example.	[5]	4	3
Q.4(b)	What is semi supervised learning? Explain its importance with any real-world application.	[5]	4	5
Q.5(a)	Explain the bagging algorithm of ensemble learning. Illustrate with an example.	[5]	5	3
Q.5(b)	Summarize the working of the Adaboost algorithm.	[5]	5	3

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