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

CLASS: MTECH/PREPHD   SEMESTER : I
BRANCH: CSE   SESSION : MO/2022

SUBJECT: CS506 MACHINE LEARNING

TIME: 3:00 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.

Q.1(a) Elaborate upon the definition of Machine Learning, and in which situations is its use justified/ better? [5]
        Illustrate with examples
Q.1(b) Illustrate the steps of designing a learning system, explaining about data, target function and [5]
        approximation/ learning algorithm.

Q.2(a) Why is SVM known as a large margin classifier?   [5]

X1	X2	y
1	0	-1
1	-2	-1
2	-1	-1
3	3	+1
4	-2	-1
4	3	+1
5	3	+1
6	2	+1

Apply SVM to evaluate and select the best decision boundary from the following hyperplanes: $\{(-1, 0, 2), (-2, \frac{1}{2}, 1)\}$.

Q.2(b) Describe how principal component analysis is applied for feature reduction?   [5]

Q.3(a) Formulate the steps of Decision Tree classifier model building. What is Decision Tree pruning? [5]
Q.3(b) Given a single neuron (sigmoid function), two inputs, no bias, and one training example: {x1=1, x2=1, [5]
        y=1}, w1=0.4, w2=0.6, learning rate=0.5. Compute the new values for w1 and w2 after one iteration
        of backpropagation.

Q.4(a) Explain the hierarchical clustering algorithm with an example.   [5]
Q.4(b) A= [3, 20, 4, 70, 41, 13, 57, 89, 5, 10]. Let K=2, Initial means are m1=3, m2=20   [5]
        Compute the elements in clusters C1 and C2 after two iterations of K-Means algorithm and the total
        cost (computed as Sum squared error)

Q.5(a) What is soft clustering? Summarize the steps of Expectation maximization algorithm.   [5]
Q.5(b) Evaluate the working of a bagging ensemble with a suitable example   [5]

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