Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

**Question Paper Code : 30029**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fourth Semester

Artificial Intelligence and Data Science

AL 3451 — MACHINE LEARNING

(Common to Computer Science and Business Systems)

(Regulations 2021)

Time : Three hours                                      Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What do you mean by hypothesis space?

2.   List few applications of Machine learning.

3.   What is a gradient? How Gradient-Descent is useful in Machine learning?

4.   Compare and contrast linear regression and logistic regression.

5.   Distinguish between Bagging and Boosting.

6.   Define voting.

7.   List few activation functions.

8.   What is a hyperparameter? List few hyperparameters.

9.   Give the use of Mc Neman's test.

10.  What is meant by Bootstrapping?

PART B — (5 × 13 = 65 marks)

11.  (a)   Elaborate on PAC Learning. Give an example.

Or

    (b)   (i)   Discuss in detail about Bias-variance tradeoff.                (6)

          (ii)  Explain about VC dimension.                                    (7)

12. (a) Explain about how optimal Hyperplane differs from other Hyperplanes. Elaborate on how SVM is able to achieve this?

Or

(b) Explain the process of constructing CART (Classification And Regression Tree) with a suitable example.

13. (a) Explain about EM algorithm with suitable examples.

Or

(b) Explain the weighted K-nearest Neighbor algorithm with a suitable sketch.

14. (a) Discuss in detail about Backpropagation concept in ANN.

Or

(b) Elaborate on :
   (i) Regularization
   (ii) Drop-outs
   (iii) Batch Normalization
   (iv) Vanishing gradient

15. (a) (i) Elaborate on cross-validation approach. (8)
       (ii) When do you decide on resampling? Explain. (5)

Or

(b) Represent and discuss the various methods of measuring Classifier performance.

PART C — (1 × 15 = 15 marks)

16. (a) Perform a feedforward operation in a Multi-Layer Perception and conclude the result. This given MLP consists of an Input, one hidden, and an Output layer. The input layer has 4 neurons, the hidden layer has 2 neurons, the output layer has a single neuron, and the Learning rate is 0.8.

$X_1$   $X_2$   $X_3$   $X_4$   $O_{Desired}$
1       1       0       1       1
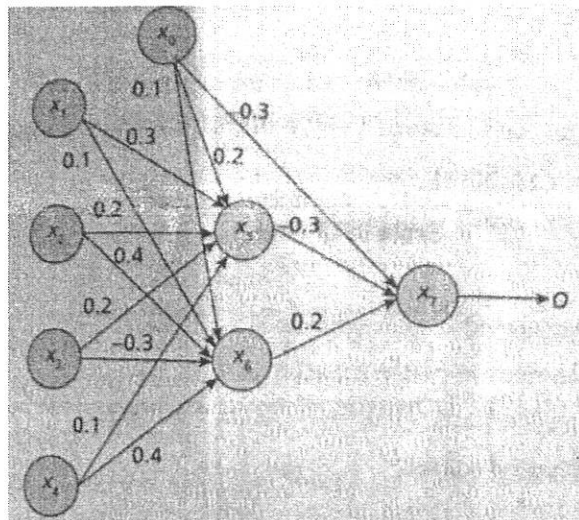


Or

(b) Cluster the following data set using the k-means algorithm with an initial value of objects 2 and 5 with the coordinate values (4,6) and (12,4) as initial seeds.

| OBJECTS | X-coordinate | Y-coordinate |
|---------|--------------|--------------|
| 1 | 2 | 4 |
| 2 | 4 | 6 |
| 3 | 6 | 8 |
| 4 | 10 | 4 |
| 5 | 12 | 4 |