PRACTICE SET

End Semester Examination, December 2025

Program: MCA

Subject: Basics of Machine Learning

Subject Code: 3CITE304

Semester: III

Course Outcomes	**Description**
CO1	Formulate machine learning problems corresponding to different applications: data, model selection, model complexity
CO2	Demonstrate understanding of a range of machine learning algorithms along with their strengths and weaknesses
CO3	Implement machine learning solutions to classification, regression, and clustering problems
CO4	Design and implement various machine learning algorithms in a range of real-world applications
CO5	Evaluate and analyze the performance of a machine learning algorithm or a system based on machine learning algorithm.

Section A (No. of Question 20x 5= 100 Marks)

1. Define machine learning. Also provide a concise explanation of its significance in various fields. [CO1, Unit 1, BTLLOT, Remember]

2. Explain the difference between Artificial intelligence, Machine learning and Data Science. [CO1, Unit -1, BTL LOT, Understand]

3. Enlist the differences between supervised and unsupervised learning with one example of each. [CO2, Unit 1, BTL LOT, Understand]

4. Define a machine learning model. Also differentiate between training data, testing data and validation data.

[CO2, Unit 1, BTL LOT, Understand]

5. Articulate the differences between classification and regression with at least two examples of each.

[CO3, Unit 2, BTL LOT, Apply]

6. Explain Linear Regression in machine learning and also state its types.

[CO3, Unit 2, BTL LOT, Remember]

7. List and explain the challenges in decision tree algorithm.

[CO2, Unit 2, BTL LOT, Understand]

8. Define classification. List various classification algorithms.

[CO3, Unit 2, BTL LOT, Understand]

9. List of different metrics used to construct a decision tree.

[CO2, Unit 2, BTL LOT, Understand]

10. Describe decision tree in machine learning with an example.

[CO2, Unit 3, BTL LOT, Understand]

11. Explain random forest algorithm. Compare the performance of random forest over decision tree. [CO5, Unit 3, BTL LOT, Apply]

12. Explain about support vector machine.

[CO2, Unit 3, BTL LOT, Understand]

13. Define artificial Neural Network. How ANN is different from BNN?

[CO2, Unit 4, BTL LOT, Remember]

14. Explain the architecture of the artificial neural network.

[CO3, Unit 4, BTL LOT, Understand]

15. Explain appropriate problem for Neural Network Learning with its characteristics.

[CO4, Unit 4, BTL LOT, Understand]

16. Describe Expectation Maximization algorithm.

[CO2, Unit 5, BTL LOT, Understand]

17. Describe gradient descent and Delta Rule.

[CO2, Unit 4, BTL LOT, Understand]

18. Define clustering. What are the different types of clustering algorithm?

[CO2, Unit 5, BTL LOT, Remember]

19. Sketch the applications of Machine learning in computer vision.

[CO4, Unit 5, BTL LOT, Apply]

20. Explain Reinforcement learning. [CO2, Unit 5, BTL LOT, Understand]

Section B (No. of Question 17x10= 170 Marks)

23. Classify different types of Machine Learning with examples.

[CO1, Unit 1, BTL LOT, Understand]

24. Calculate the Eigen values and Eigen vectors of the given matrix. $\begin{bmatrix} 5 & -2 & 2 \\ -2 & 5 & 1 \\ 2 & -1 & 5 \end{bmatrix}$ [CO1, Unit 1, BTL HOT, Evaluate]

25. Illustrate the procedure for the computation of the Principle Components of a given data.

[CO1, Unit 1, BTL LOT, Analyze]

Critically evaluate the procedure of computing Principal Components for a given dataset. Explain not only the mathematical steps but also analyze how the choice of scaling, variance retention, and eigenvalue selection impacts the quality of dimensionality reduction. Compare Principal Component Analysis (PCA) with other dimensionality reduction techniques, and justify in which scenarios PCA provides superior insights."

26. Describe the logistic regression model. How is it different from linear regression, and what kind of problems is it suited for? [CO1, Unit 2, BTL LOT, Remember]

    Critically analyze the logistic regression model by explaining its mathematical foundation and practical applications. Compare and contrast it with linear regression in terms of assumptions, output interpretation, and suitability for different types of problems. Evaluate scenarios where logistic regression provides a more robust solution than linear regression, and justify why.

27. Elaborate Entropy and information gain in ID3 algorithm with an example.

[CO4, Unit 2, BTL LOT, Understand]

28. Explain the capabilities and limitation of ID3 algorithm.

[CO2, Unit 2, BTL LOT, Understand]

Critically evaluate the ID3 decision tree algorithm by analyzing its strengths and weaknesses in handling different types of datasets. Discuss how issues such as overfitting, bias toward attributes with many values, and lack of pruning affect its performance. Compare ID3 with advanced algorithms like C4.5 or CART, and justify scenarios where ID3 remains a practical choice despite its limitations.

29. Categorized supervised learning. Explain the steps involved in supervised learning. [CO2, Unit 2, BTL HOT, Analyze]
30. Formulate how Support Vector Machine can be used for classification of linearly separable data. Discuss its strength and weaknesses. [CO3, Unit 3, BTL HOT, Create]
31. List out merits and demerits of various kernels in Support Vector Machines. [CO4, Unit 3, BTL LOT, Remember]
32. Write short notes on: [CO2, Unit 3, BTL HOT, Remember]
    a) Underfitting c) Overfillting
    b) Multicollinearity d) Outliers
33. Demonstrate Back propagation algorithm for learning in multilayer network. [CO4, Unit 4, BTL LOT, Apply]
34. Compare and contrast various activation functions in neural networks. [CO2, Unit 4, BTL HOT, Analyze]
35. Define Perceptron. Explain the working of a perceptron with a neat diagram. [CO4, Unit 4, BTL LOT, Analyze]
36. Discuss Recurrent Networks. Compare Feed-Forward Neural Networks vs Recurrent Neural Networks [CO4, Unit 4, BTL LOT, Analyze]
37. Describe unsupervised learning with an example. Write the advantages and disadvantages of unsupervised learning. [CO4, Unit 5, BTL HOT, Create]
38. Explain the working of K means clustering algorithm. List any three real world problem where K means clustering can be applied. [CO4, Unit 5, BTL LOT, Understand
39. Describe K-nearest Neighbour learning Algorithm for continues valued target function. [CO4, Unit 5, BTL LOT, Understand]

    Critically analyze the K-nearest Neighbour (KNN) algorithm for regression. Explain its mathematical formulation for continuous targets, and evaluate how distance metrics, k selection, and weighting schemes influence bias–variance trade-offs and prediction stability. Compare KNN regression with parametric methods (e.g., linear regression) and non-

parametric alternatives (e.g., decision tree regression), and justify contexts where KNN provides superior performance or fails.

Section C (No. of Question 5x 20= 100 Marks)

40. Illustrate the concept of unsupervised learning to a real-world scenario. Provide an example of a problem that falls under this category. [CO4, Unit 1, BTL HOT, Analyze]

41. Design a Logistic Regression problem with multiple variables. Why do we use Regression Analysis? Classify different types of Regression algorithm.

[CO4, Unit 2, BTL HOT, Create]

42. Consider a dataset of students containing features such as CGPA, instructiveness, practical knowledge, and communication skills. Discuss how a classification model can be used to predict whether a student will get a job offer. [CO4, Unit 3, BTL HOT, Apply]

43. Analyze the role of Artificial Neural Networks (ANN) in solving complex real-world problems. Compare their advantages and disadvantages with traditional algorithms.

[CO4, Unit 4, BTL HOT, Analyze]

44. Explain with examples how Machine Learning techniques are utilized in computer vision, speech recognition, and natural language processing applications.

[CO5, Unit 4, BTL HOT, Analyze]

Summary Sheet:

CO Wise

CO	Q. No	Marks
CO1	1, 2, 21, 22, 23, 24	50
CO2	3, 4, 7, 10, 12, 13, 16, 17, 19, 20, 26, 27, 30, 32	95
CO3	5, 6, 8, 14, 20, 28	30
CO4	15, 18, 25, 29, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41	170
CO5	11, 42	25
Total		**370**

Unit Wise

Unit	Q. No	Marks
Unit 1	1, 2, 3, 4, 21, 22	70
Unit 2	5, 6, 7, 8, 9, 24, 25, 26, 27	85
Unit 3	10, 11, 12, 28, 29, 30, 40	65
Unit 4	13, 14, 15, 16, 31, 32, 33, 34, 41	80
Unit 5	17, 18, 19, 20, 35, 36, 37, 42	70
Total		**370**

Blooms Taxonomy Level (BTL) Wise

BTL	Q. No	Marks
LOT	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,23, 24, 25, 26, 29, 31, 33, 34, 36, 37	210
HOT	22, 27, 28, 30, 32, 35, 38, 39, 40, 41, 42	160
Total		**370**

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Disclaimer: - This is a Practice Set. The Question in End term examination will differ from the Practice set. This Practice set is meant for practice only.