

6435

Exam.Code:0920  
Sub. Code: 6441

2054  
B.E. (Computer Science and Engineering)  
Eighth Semester  
Elective – IV  
CS-802C: Machine Learning and Computational Intelligence

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

- a) How do machine learning models handle different types of features, such as numerical, categorical, and text?
- b) In binary classification, what are some common metrics used to assess the performance of a classification model?
- c) Compare and contrast the theoretical aspects of generalization and regularization in machine learning.
- d) Discuss strategies for preventing overfitting in regression models.
- e) Contrast the differences between hierarchical clustering and k-means clustering. (5x2)

**UNIT - I**

- II. a) What is feature selection, and why is it important in machine learning? Discuss common methods used for feature selection and their impact on model efficiency and accuracy.  
b) Compare the advantages and disadvantages of using geometric, logical, and probabilistic models in various machine learning tasks. Consider factors such as interpretability, scalability, and robustness. (2x5)
- III. Discuss the phenomenon of overfitting in regression models. Identify common catalysts for overfitting and explain how they can lead to poor generalization performance. Propose strategies for detecting and mitigating overfitting in regression analysis. (10)

P.T.O.

(2)

- IV. a) Explain the concept of Kernel methods in SVMs. How do they allow SVMs to handle non-linearity in data?  
b) What problem does Regularized Regression aim to solve, and how do L1 and L2 regularization techniques differ in their approach? (2x5)

**UNIT - II**

- V. a) Explain the key steps of the k-means clustering algorithm and how it partitions data into distinct clusters based on distance metrics.  
b) Explain the concept of decision trees in machine learning and how they recursively partition the feature space to make predictions. (2x5)
- VI. Explain the concept of probabilistic models with hidden variables. Discuss how the Expectation-Maximization (EM) algorithm is used to estimate the parameters of such models in the presence of hidden variables. Provide a detailed explanation of the EM algorithm and its iterative steps. (10)
- VII. a) Explain the concepts of bagging and boosting in machine learning. How do these ensemble methods combine multiple models to improve predictive performance?  
b) Describe the fundamentals of deep learning and its significance in modern machine learning research. (2x5)