JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2024

B.Tech- VI Semester (ECE)

COURSE CODE(CREDITS): 19B1WEC636 (3) MAX. MARKS: 25

COURSE NAME: Machine Learning for Data Analysis

COURSE INSTRUCTORS: Dr. Alok Kumar MAX. TIME: 1 Hour 30 Minutes

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Note: (a)*All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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Q.1 Show the steps involved in training the SVM model and determining the decision boundary when a given dataset having two classes that are linearly separable. Also derive the equation for the decision boundary in terms of the support vectors. [CO2, CO3] **[4 Marks]**

Q.2 Given a dataset with two features and two classes, apply the KNN algorithm to classify a new data point using k=3. The training dataset consists of the following points:

Data Point	**Class**
(2,3)	Class A
(4,6)	Class A
(5.7)	Class A
(8,6)	Class B
(9,9)	Class B
(7,5)	Class B

Determine the class label of a new data point with features (x1, x2) = (6, 8) using the Euclidean distance metric. Discuss the importance of choosing the value of k in KNN. How does the choice of k affect the model's performance? [CO3] **[4 Marks]**

Q.3 What is the curse of dimensionality, and why is it a concern in machine learning? How does the curse of dimensionality impact distance-based algorithms? [CO1, CO2] **[4 Marks]**

Q.4 Explain the kernel trick in SVM and its significance in dealing with high-dimensional data. How does the kernel trick allow SVM to implicitly map the data into a higher-dimensional space without explicitly computing the feature transformation? [CO2] **[4 Marks]**

Q.5 What are the steps involved in the PCA algorithm? How are the principal components computed from the covariance matrix? Find the covariance matrix for the given dataset.

Feature	Example 1	Example 2	Example 3	Example 4
X	4	8	13	7
Y	11	4	5	14

[CO3] **[4 Marks]**

Q.6 What is variance in the context of machine learning models? How does high variance affect a model's performance? Explain the bias-variance tradeoff. [CO1, CO2] **[3 Marks]**

Q.7 What role does feature selection/extraction play in improving the interpretability of machine learning models? [CO1, CO2] **[2 Marks]**