

Exam. Code: 0924

Sub. Code: 33562

2056

B.E. (Information Technology)-6th Semester

PCIT-602: Machine Learning

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

1. Attempt the following:-

- (a) What is Machine Learning? Briefly describe its three main paradigms: supervised, unsupervised, and reinforcement learning.
- (b) What is the difference between simple linear regression and multiple linear regression?
- (c) Define overfitting. How does regularization help in addressing it?
- (d) What is a confusion matrix? Define precision and recall.
- (e) What is K-means clustering? State the steps of the K-means algorithm. (5x2)

UNIT - I

- 2. a) Give an overview of machine learning, its related areas, and real-world applications. Name any three popular software tools/frameworks used in machine learning.
- b) Explain simple and multiple linear regression with the normal equation method for parameter estimation. Derive the cost function and its minimization. (4,6)
- 3. a) Explain polynomial regression and nonlinear regression with examples. Under what circumstances should polynomial regression be preferred over simple linear regression?
- b) Describe Gradient Descent for linear regression. How does it differ when applied to multiple regression? Explain the concepts of learning rate and convergence. (2x5)
- 4. a) Explain Logistic Regression for binary classification. Define the decision boundary and the sigmoid function. How is gradient descent applied in logistic regression?
- b) What is multiclass classification? Describe the One-vs-All (OvA) strategy. How is the overfitting problem addressed through cost function regularization in classification?

(6,4)

P.T.O.

(2)

UNIT - II

5. a) Explain K-means and hierarchical clustering algorithms in detail. Compare their time complexity, advantages, and limitations.
b) What is a Hidden Markov Model (HMM)? Explain its components and how it is used in sequence modelling tasks. (6,4)
6. a) Explain Principal Component Analysis (PCA) in detail. How does it achieve dimensionality reduction? Describe its mathematical basis and the steps involved.
b) What is Linear Discriminant Analysis (LDA)? How does it differ from PCA in terms of objective and approach? When should LDA be preferred over PCA? (6,4)
7. a) Describe the following evaluation metrics for classification models: accuracy, precision, recall, F1 score, and log loss. Explain with the help of a confusion matrix.
b) What is the Area Under the ROC Curve (AUC)? How is silhouette analysis used for evaluating clustering models? Briefly explain regression evaluation metrics. (6,4)

x-x-x