

9. (a) Describe the architecture of an RBF network. What are the key components of an RBF network ? Discuss.
- (b) What is the Expectation-Maximization (EM) algorithm and what is its primary purpose in machine learning ? Discuss.

Roll No. ....

Total Pages : 04

**CCMTE/D-23** **24057**  
MACHINE LEARNING USING PYTHON  
MT-CSE-20-13(i)

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) What is the purpose of the raise statement in Python ? Provide an example.
- (b) Explain the concept of reshaping a NumPy array.
- (c) How does a decision tree handle missing data during the training phase ?
- (d) Discuss the trade-off between too much and too little inductive bias in machine learning models.

**Unit I**

2. (a) Explain the difference between a runtime error and a syntax error in Python. What is the purpose of the try, except, else, and finally blocks in exception handling ?

- (b) What is the purpose of the map function in Python ? Explain the syntax of the map function and provide an example.
3. (a) What is a tuple ? Write a function that takes a tuple as input and returns a new tuple containing only the unique elements from the original tuple.  
(b) Write a Python script to read the contents of a text file. How can you read a specific number of characters from a file in Python ?

## Unit II

4. (a) What are some advantages of using NumPy in numerical computing compared to standard Python lists ? How can you perform element-wise comparison between two NumPy arrays ? Discuss.  
(b) What is k-Nearest Neighbors (k-NN) and how does it work in machine learning ? How do you standardize or normalize features in scikit-learn before applying k-NN ? Discuss.
5. (a) Create a histogram using Matplotlib and specify the number of bins. How can you add labels and a title to a histogram in Matplotlib ? Discuss.  
(b) What is the difference between linear regression and logistic regression ? How can you handle categorical features in regression models using scikit-learn ? Provide an example of encoding categorical features.

## Unit III

6. (a) Define overfitting and underfitting in the context of machine learning. How does the choice of hyperparameters influence the risk of overfitting or underfitting ?  
(b) Define and distinguish between terms such as features, labels, training data and testing data in the context of machine learning.
7. (a) What is inductive bias ? How does feature engineering contribute to the inductive bias of a machine learning model ?  
(b) What is decision tree learning and how does it contribute to machine learning algorithms ? Explain the main components of a decision tree. How is a decision tree constructed ? Discuss.

## Unit IV

8. (a) How does Bayes' theorem play a crucial role in Bayesian learning ? Define prior, likelihood and posterior probabilities in the context of Bayesian learning. How does Bayesian learning update beliefs with new evidence or data ? Discuss.  
(b) What is the Mistake Bound Model of Learning and what is its primary purpose ? How does the Mistake Bound Model quantify the learning performance of an algorithm ?