Artificial Intelligence and Machine Learning

Maximum Marks: 100
Time Allowed: 3 Hours

Instructions:

- All questions are compulsory.
- The marks for each question are indicated.
- Write clear and concise answers.

Section A: Short Answer Questions (2 x 10 = 20 Marks)

(Answer all questions in brief.)

1. Define Artificial Intelligence and explain its relationship with Machine Learning.
2. What are the properties of an environment in an AI system?
3. Briefly describe the 8-puzzle problem and its significance in AI.
4. Write two advantages of the Breadth-First Search algorithm.
5. Differentiate between Forward and Backward Chaining.
6. Explain "Validity" in Propositional Logic.
7. What is a knowledge base agent? Provide an example.
8. List the components of an Expert System.
9. What is the need for Machine Learning in today's world?
10. Define TensorFlow and give one of its applications.

Section B: Medium Answer Questions (10 x 5 = 50 Marks)

(Answer any five questions in detail.)

1. **Module 1:** Explain the structure of an intelligent agent with the help of a diagram and examples.
2. **Module 2:** Describe the steps involved in the Hill Climbing search algorithm and mention its limitations.
3. **Module 3:** Explain Propositional Logic with an example of syntax, semantics, and inference rules.
4. **Module 4:** Describe the characteristics and applications of an Expert System.
5. **Module 5:** Compare and contrast Supervised and Unsupervised Learning with examples.
6. **Module 6:** Explain the basic data structures in TensorFlow and their usage in implementing Machine Learning algorithms.

Section C: Long Answer Questions (2 x 15 = 30 Marks)

(Answer any two questions in depth.)

1. **Module 1:** Discuss the types of agents in Artificial Intelligence. Explain the difference between Problem-solving agents and Goal-based agents with examples.
2. **Module 2:** Solve the Crypt Arithmetic problem for SEND + MORE = MONEY and explain the steps involved.
3. **Module 3:** Explain First-Order Logic, including quantifiers, nested quantifiers, and its use in the Kinship domain.
4. **Module 5:** Write a detailed note on the Decision Tree algorithm. Explain its working with a real-world example.