

# ARTIFICIAL INTELLIGENCE

**Time: 3 Hours**

**Total Marks: 70**

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

1. **Attempt all questions in brief.** 2 x 7 = 14
- What is meant by the term Artificial Intelligence? How it is different from natural intelligence?
  - Discuss Branch-and-bound search algorithm.
  - Differentiate between local search and global search.
  - Transform the following formula to Prenex Normal form  
$$\forall x: \forall y: (\exists z: P(x, z) \cap P(y, z)) \rightarrow \exists u: Q(x, y, u)$$
  - Define forward chaining and backward chaining with example.
  - Explain in brief the concept of reinforcement learning.
  - Write a short note on Support Vector Machine.

## SECTION B

2. **Attempt any three of the following:** 7 x 3 = 21
- What is an intelligent agent? Discuss any two types of intelligent agents.
  - Explain Steepest-ascent hill climbing algorithm. What are the problems with hill climbing algorithm?
  - Describe Hidden Markov model with suitable example. Also discuss its role in probabilistic reasoning.
  - Discuss Maximum-likelihood parameter learning for complete data with discrete models.
  - What do you mean by classification? Discuss the process of classification with the help of a diagram.

## SECTION C

3. **Attempt any one part of the following:** 7 x 1 = 7
- Discuss the historical development of artificial intelligence.
  - For each of the following agents, develop a PEAS description of the task environment:
    - Mathematician's theorem proving assistant
    - Satellite image analysis system
    - Internet book shopping agent
    - Medical diagnosis system
4. **Attempt any one part of the following:** 7 x 1 = 7
- Discuss Simulated Annealing search algorithm with its advantages and disadvantages.
  - What are the steps to define a problem? Explain. Also discuss various components of a problem.

5. Attempt any *one* part of the following: 7 x 1 = 7

- (a) Discuss algorithm of conversion to clause form. Convert the following to clause form using algorithm-

$$\forall x[\mathbf{Brick}(x) \rightarrow (\exists y\{\mathbf{On}(x, y) \cap \neg\mathbf{Pyramid}(y)\} \\ \cap \neg\exists y \{\mathbf{On}(x, y) \cap \mathbf{On}(y, x)\} \\ \cap \forall y\{\neg\mathbf{Brick}(y) \rightarrow \neg\mathbf{Equal}(x, y)\})]$$

- (b) Explain the concept of Alpha-beta pmning. Write Alpha-beta search algorithm.

6. Attempt any one part of the following: 7 x 1 = 7

- (a) Discuss various application domains of machine learning.  
(b) Describe major steps involved in a learning process. Also discuss how learning systems are classified.

7. Attempt any *one* part of the following: 7 x 1 = 7

- (a) What is pattern recognition? Explain various steps involved in the designing of a pattern recognition system with the help of a diagram.  
(b) Explain Nearest Neighbor rule used for classification.