Artificial Intelligence

Assignment – II | Unit – II (New Syllabus - PU)

1. Intelligent Agents *(5 hours)*

1.1 Agents and Environments

1. Define an agent. What are the core characteristics of an agent?
2. Explain the interaction between agents and environments with suitable examples.
3. How do sensors and actuators play a role in the functioning of an agent? Provide real-world examples.
4. Discuss the following environment types.
   1. Fully observable (vs. partially observable)
   2. Deterministic (vs. stochastic)
   3. Episodic (vs. sequential)
   4. Static (vs. dynamic)
   5. Discrete (vs. continuous)
   6. Single-agent (vs. multi-agent)
5. Discuss the 7 – problem characteristics of the following
   1. Water Jug problem.
   2. Missionaries and Cannibals problem.
   3. N-Queen Problem
   4. 8-Puzzle
   5. City Map

1.2 Concept of Rationality

1.2.1 Performance Measures

6. What is a performance measure? How is it used to evaluate the success of an agent?
7. Provide examples of performance measures for specific agents like a chess-playing robot and a navigation system.

1.2.2 Rationality and Rational Agent

8. Define rationality in the context of intelligent agents.
9. What is the difference between rational and intelligent agents? Illustrate with examples.
10. Explain how rationality depends on performance measures, the agent's knowledge, and its abilities.

1.3 Task Environment and Its Properties

11. What are the properties of task environments? Discuss in detail with examples (e.g., deterministic vs. stochastic, episodic vs. sequential).
12. Describe how the task environment affects the design of an intelligent agent.

13. What is the PEAS framework? Why is it important in defining task environments?
14. Use the PEAS framework to specify task environments for:

- A self-driving car
- A robotic vacuum cleaner
- A stock market trading bot
- An online shopping recommendation system

1.4 Structure of Agents

1.4.1 Agent Programs

15. What is an agent program? How does it relate to an agent architecture?
16. Explain the components of an agent program with examples.
17. What is the role of perception and decision-making in agent programs?

1.4.2 Types of Agent Programs

18. Differentiate between the following types of agent programs:

- Simple reflex agents
- Model-based reflex agents
- Goal-based agents
- Utility-based agents
- Learning agents

19. Discuss the advantages and limitations of each type of agent program.
20. Provide real-world applications of each type of agent program.

1.5 Learning Agents

21. What is a learning agent? Explain its importance in AI.
22. Describe the components of a learning agent with a detailed diagram.
23. Discuss how a learning agent can improve its performance over time.
24. Compare the learning capabilities of learning agents with other types of agents.

Additional Questions for Depth and Critical Thinking

1. What challenges arise when designing intelligent agents for multi-agent systems?
2. Explain the relationship between task environments and agent architectures.
3. How can a single agent operate in multiple-task environments? Provide examples.
4. Discuss the ethical implications of using intelligent agents in critical applications (e.g., healthcare, defense).
5. What role does human-computer interaction play in designing intelligent agents?
6. How do agents deal with uncertainty in partially observable and stochastic environments?

7. Create a case study of a custom intelligent agent (e.g., an agricultural monitoring system) and define its PEAS description, architecture, and task environment properties.
8. Design a flowchart or pseudo-code for a model-based reflex agent in a dynamic environment, such as a traffic control system.