**Question Bank**

**Course Name: Elective I(A) - Artificial Intelligence**

**Course Code: CSE10501A**

## Unit I: Fundamentals of AI

Introduction: What is artificial intelligence? The foundations of artificial intelligence, history of artificial intelligence. Intelligent Agents: Agents and environments, good behaviour, the concept of rationality, the nature of environments, the structure of agents. Solving Problems by Searching: Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

| Sr. No. | Questions | Marks | BTL |
|---|---|---|---|
| 1 | Explain the concept of percepts and how they influence an agent's actions. | | 2 |
| 2 | Apply the concept of Artificial Intelligence by illustrating its key characteristics and explain how it differs from traditional computing through examples. | | 3 |
| 3 | Illustrate how an agent adapts to dynamic environments with examples. | | 3 |
| 4 | Compare the effectiveness of informed versus uninformed search strategies in large data sets. | | 2 |
| 5 | Illustrate how an intelligent agent could function in a dynamic environment like a smart home. | | 3 |
| 6 | Explain the A* algorithm, providing its pseudo-code and applying it to solve a real-life problem, such as finding the shortest driving route between two cities in a road network | | 3 |
| 7 | Compare the foundations of AI with those of traditional programming. | | 2 |
| 8 | Illustrate a real-world application where AI is used effectively | | 3 |
| 9 | Apply the knowledge of intelligent agents to identify their presence in everyday technology with specific examples. | | 3 |

## Unit II:

Logical Agents: Knowledge-based agents, WUMPUS world, logic, propositional logic, propositional theorem proving, effective propositional model checking, agents based on propositional logic. First-Order Logic: Representation revisited, syntax and semantics of first-order logic, using first-order logic, knowledge engineering in first-order logic. Inference in First-Order Logic: Propositional vs. first-order inference, unification and lifting, forward chaining, backward chaining.

| Sr. No. | Questions | Marks | BTL |
|---|---|---|---|
| 1 | Describe the Wumpus World environment and its significance in studying logical agents. | | 2 |
| 2 | Compare the expressiveness of first-order logic with propositional logic. | | 3 |
| 3 | Apply the concept of knowledge-based agents to design a simple reasoning system for a smart home that decides when to turn lights on or off. | | 3 |
| 4 | Discuss how a logical agent can determine the safe path in a WUMPUS world using the percepts available. | | 3 |
| 5 | Apply propositional logic to design a simple rule-based system for managing traffic lights at an intersection. | | 3 |
| 6 | Illustrate the working of an agent that uses propositional logic to control a robotic arm in a manufacturing unit. | | 3 |
| 7 | Differentiate between propositional and first-order inference by solving a problem using both methods. | | 4 |
| 8 | Solve a scenario where a logical agent in the WUMPUS world uses propositional logic to deduce the location of the gold. | | 3 |
| 9 | Illustrate the steps of backward chaining to infer the prerequisites for enrolling in a specific course. | | 3 |

**Unit III: Planning and Knowledge Representation**

**Planning:** Classical planning, algorithms for planning as state-space search, planning graphs, time, schedules, and resources, hierarchical planning, planning, and acting in nondeterministic domains, multiagent planning.

**Knowledge Representation:** Ontological engineering, categories and objects, events, mental events and mental objects, reasoning systems for categories, reasoning with default information, the internet shopping world.

**Prolog:** Facts, Rules, Clauses, Lists, Logical Operators, Prolog Program for Relations, List Operations, Prolog for artificial intelligence

| Sr. No. | Questions | Marks | BTL |
|---|---|---|---|
| 1 | Discuss the concept of decentralized planning and provide an example scenario where it is used | | 2 |
| 2 | Use a planning graph to demonstrate how to identify the shortest path in a scheduling scenario. | | 2 |
| 3 | Create plan for a self-driving car to navigate uncertain traffic conditions. | | 3 |
| 4 | Build a hierarchical plan for a multi-step task, such as organizing a conference. | | 4 |
| 5 | Illustrate the use of ontology to model the structure of an e- | | 4 |

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|---|---|---|---|
| | commerce website. | | |
| 6 | Use knowledge representation techniques to create a recommendation system for an online bookstore. | | 4 |
| 7 | Write a Prolog program to perform operations on lists, such as finding the length or reversing a list. | | 4 |
| 8 | Write a Prolog program to represent family relationships using facts and rules. | | 4 |
| 9 | Write a Prolog program to merge two lists into a single sorted list. | | 4 |

**Unit IV: Uncertain Reasoning**

**Quantifying Uncertainty:** Acting under uncertainty, basic probability notation, inference using full joint distributions, independence, Bayes' rule, and its use, the Wumpus world revisited.

**Probabilistic Reasoning:** Representing knowledge in an uncertain domain, the semantics of Bayesian networks, time and uncertainty, inference in temporal models, hidden Markov models.

| Sr. No. | Questions | Marks | BTL |
|---|---|---|---|
| 1 | Apply knowledge representation techniques to model uncertainty in weather prediction | | 3 |
| 2 | Use a Bayesian network to infer the probability of a student passing an exam based on preparation and attendance. | | 3 |
| 3 | Identify the main components of a hidden Markov model (HMM) and explain how they work together to model sequential data. | | 2 |
| 4 | Apply an HMM to recognize patterns in speech signals for a speech recognition system. | | 3 |
| 5 | Construct a Bayesian network to represent the relationships between symptoms and diseases in a medical diagnosis system | | 4 |
| 6 | Solve a spam detection problem by using Bayes' rule to classify emails as spam or not spam. | | 4 |
| 7 | Explain how to test for independence between two events in a dataset representing customer purchases. | | 2 |
| 8 | Illustrate how to choose the best action in a game scenario where the outcome of moves depends on probabilistic events. | | 3 |
| 91 | Explain the concept of independence to simplify a probability calculation for events such as rolling two dice. | | 2 |