SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF INFORMATION TECHNOLOGY

QUESTION BANK

IV SEMESTER

IT3462 ARTIFICIAL INTELLIGENCE

Regulation 2023

Academic Year 2025-2026 (Even Semester)

Prepared by

Dr. K. Revathi, Associate Professor / IT

Dr. D. Sridevi, Associate Professor / IT

SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603203.

DEPARTMENT OF INFORMATION TECHNOLOGY

QUESTION BANK

SUBJECT : IT3462 ARTIFICIAL INTELLIGENCE

SEM/ YEAR : IV / II

UNIT – I INTRODUCTION			
Introduction to Artificial Intelligence- Problem formulation, Problem Definition -Agents and Environments – Concept of Rationality – Nature of Environments – Structure of Agents – Problem Solving Agents – Search Algorithms – Uninformed Search Strategies.			
PART – A			
Q. No.	**Questions**	**BT Level**	**Competence**
1.	**What** is Artificial Intelligence (AI)?	BTL1	Remembering
2.	**Name** a few applications of AI.	BTL1	Remembering
3.	**Define** an agent.	BTL1	Remembering
4.	**List** the different types of agents.	BTL1	Remembering
5.	**Relate** rational agent with autonomous agent.	BTL2	Understanding
6.	**List** the characteristics of an intelligent agent.	BTL1	Remembering
7.	**Infer** real-world situations for intelligent agents.	BTL2	Understanding
8.	**Interpret** PEAS with an example.	BTL2	Understanding
9.	**Show** the structure of intelligent agents.	BTL2	Understanding
10.	**Summarize** the different types of intelligent agents.	BTL2	Understanding
11.	**Outline** the properties of the environment.	BTL2	Understanding
12.	**Illustrate** the PEAS works in a self-driving car.	BTL2	Understanding
13.	**Explain** goal based agent.	BTL2	Understanding
14.	**What** is meant by utility based agent?	BTL1	Remembering
15.	**Demonstrate** a problem solving agent.	BTL2	Understanding
16.	**Recall** the components of well-defined problems.	BTL1	Remembering
17.	**Define** the terms goal formulation and problem formulation.	BTL1	Remembering
18.	**What** is a state space?	BTL1	Remembering
19.	**How** to define the problem as a state space search?	BTL1	Remembering
20.	**Summarize** the steps involved in a simple problem solving agent.	BTL2	Understanding
21.	**Compare** toy problems with real world problems.	BTL2	Understanding
22.	**How** will you measure the problem-solving performance?	BTL1	Remembering
23.	**Which** factors are considered when choosing the appropriate search algorithm?	BTL1	Remembering
24.	**List** the various uninformed search strategies.	BTL1	Remembering

PART – B			
1.	**Analyze** in detail, the four approaches that are followed in AI. (16)	BTL4	Analyzing
2.	Is AI a science, or is it engineering? Or neither or both? **Justify** your answer. (16)	BTL5	Evaluating
3.	**Develop** a simple problem solving agent and explain the characteristics in detail. (16)	BTL3	Applying
4.	(i) **Explain** in detail, Turing Test approach and Cognitive Modeling approach. (8) (ii) **Assess** the effect of the "Laws of Thought" approach and the Rational Agent approach. (8)	BTL5	Evaluating
5.	**Solve** the given problem. You are given two jugs, a 4-gallon one and a 3-gallon one. Neither have any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug? Explicit Assumptions: A jug can be filled from the pump, water can be poured out of a jug onto the ground, water can be poured from one jug to another and that there are no other measuring devices available. Describe the operators involved in it. (16)	BTL6	Creating
6.	**Solve** the following Crypt arithmetic problem using constraints satisfaction search procedure. (16) CROSS +ROADS ---------- DANGER ----------	BTL3	Creating
7.	(i) **Explain** tree search algorithm in detail. (8) (ii) **Compare** breadth first search with depth first search. (8)	BTL5	Evaluating
8.	**Discover** the PEAS description for the agent shopping the used books in the internet.(16)	BTL4	Analyzing
9.	(i) **Explain** the architecture of learning agents with an example. (8) (ii) **Appraise** the role of intelligent agents. (8)	BTL5	Evaluating
10.	**Elaborate** on the necessary components to define an AI problem with an example. (16)	BTL6	Creating
11.	**Identify** the task environment and their characteristics with respect to the following problems: a) Travelling salesman problem (4) b) 8-puzzle problem (4) c) Towers of Hanoi (4) d) Chess (4)	BTL3	Applying
12.	**Design** the constraint satisfaction procedure to solve the following crypt arithmetic problems:	BTL6	Designing

	a) TO + GO = OUT (8) b) BASE + BALL = GAMES (8)		
13.	**Examine** the performance of the following uninformed search strategies: a) Iterative deepening depth first search (6) b) Uniform cost search (6) c) Bidirectional search (4)	BTL4	Analyzing
14.	**Explain** on the parameters to estimate the performance of problem solving algorithms. (16)	BTL5	Evaluating
15.	(i) **Choose** and explain the applications of artificial intelligence. (8) (ii) **Identify** the characteristics of an intelligent agent. (8)	BTL3	Applying
16.	**Compare** the functionality and performance of BFS with DFS. (16)	BTL4	Analyzing
17.	**Inspect** the different types of intelligent agents in detail. (16)	BTL4	Analyzing

UNIT – II PROBLEM SOLVING

Informed (Heuristic) Search Strategies – Heuristic functions- Problem solving methods - Local search and optimization problems – Local search in continuous space – Search with non-deterministic actions – Search in partially observable environments – Online search agents and Unknown environments.

PART – A

Q. No.	Questions	BT Level	Competence
1.	**What** is heuristic search?	BTL1	Remembering
2.	**Why** does one go for heuristics search?	BTL1	Remembering
3.	**Infer** the significance of using heuristic function in search algorithms.	BTL2	Understanding
4.	**List** the advantages of heuristic function.	BTL1	Remembering
5.	**Compare** uninformed search with informed search.	BTL2	Understanding
6.	**Outline** the facts of blind search.	BTL2	Understanding
7.	**Interpret** the reason for why hill climbing often gets stuck.	BTL2	Understanding
8.	**What** is meant by ridge?	BTL1	Remembering
9.	**Show** plateau and explain its characteristics.	BTL2	Understanding
10.	**Interpret** the effect of local maximum.	BTL2	Understanding
11.	**When** a heuristic function h is said to be admissible?	BTL1	Remembering
12.	**Relate** admissible heuristic with consistent heuristic.	BTL2	Understanding
13.	**Illustrate** local maxima with respect to search technique.	BTL2	Understanding
14.	**Define** local search.	BTL1	Remembering
15.	**How** can we avoid ridge and plateau in hill climbing?	BTL1	Remembering
16.	**Name** the various types of memory bounded heuristic algorithm.	BTL1	Remembering
17.	**How** Recursive Best First Search (RBFS) works?	BTL1	Remembering
18.	**Demonstrate** the basic operations of genetic algorithm.	BTL2	Understanding
19.	**Infer** the examples for partially observable agent environments.	BTL2	Understanding
20.	**Compare** A* with AO* algorithm.	BTL2	Understanding
21.	**What** is online search agent?	BTL1	Remembering

22.	**Summarize** on simulated annealing.	BTL2	Understanding
23.	**What** is best first search?	BTL1	Remembering
24.	**What** is genetic algorithm?	BTL1	Remembering
	PART – B		
1.	**Explain** the following search techniques: i) Greedy best-first search (8) ii) A* search (8)	BTL5	Evaluating
2.	**Examine** the details on genetic algorithm. (16)	BTL4	Analyzing
3.	**Compare** the performance of hill climbing with simulated annealing algorithms. (16)	BTL4	Analyzing
4.	**Explain** greedy local search with an example in detail. (16)	BTL5	Evaluating
5.	**Identify** the use of simulated annealing and local beam search in solving any real world problem. (16)	BTL3	Applying
6.	**Assess** the memory bounded heuristic algorithms with necessary examples. (16)	BTL4	Analyzing
7.	**Inspect** the A* search and give the proof of optimality of A*. (16)	BTL4	Analyzing
8.	**Examine** the AO* algorithm with necessary illustrations. (16)	BTL4	Analyzing
9.	(i) **Develop** an A* search and explain how it reduces the total cost with an example. (8) (ii) **Identify** the importance of hill climbing algorithm with an example. (8)	BTL3	Applying
10.	**Identify** the problems encountered during hill climbing and explain the ways available to deal with these problems. (16)	BTL3	Applying
11.	**Appraise** the blind search strategies with necessary examples. (16)	BTL5	Evaluating
12.	**Compare** blind search with heuristic search by sighting any two example for each strategies. (16)	BTL5	Evaluating
13.	**Assess** in detail the various heuristic search strategies available with necessary examples. (16)	BTL4	Analyzing
14.	**Analyze** the Best First Search (BFS) algorithm with suitable example. (16)	BTL4	Analyzing
15.	**Solve** that the 8 puzzle states are divided into two disjoints sets such that, any state is reachable from any other state in the same set, while no state is reachable from any state in the other set. (16)	BTL3	Applying
16.	**Elaborate** the details on online search agents. (16)	BTL6	Creating
17.	**Discover** the details of generating AND-OR graphs for searching in a nondeterministic environments. (16)	BTL4	Analyzing

UNIT III GAME PLAYING AND CSP			
Game theory – Optimal decisions in games – Alpha-Beta Pruning -Expert systems-Inference-Rules – Monte-carlo tree search – Stochastic games – Partially observable games – Constraint Satisfaction Problems – Constraint propagation – Backtracking search for CSP – Local search for CSP – Structure of CSP.			
PART – A			
Q. No.	**Questions**	**BT Level**	**Competence**
1.	**Relate** game theory in artificial intelligence with agents.	BTL2	Understanding
2.	**Where** is game theory used in AI?	BTL1	Remembering
3.	**Infer** the characteristics of game theory.	BTL2	Understanding
4.	**Illustrate** the function of optimal decision gaming.	BTL2	Understanding
5.	**How** are optimal decisions made?	BTL1	Remembering
6.	**Define** alpha-beta pruning.	BTL1	Remembering
7.	**How** is alpha beta algorithm utilized in artificial intelligence?	BTL1	Remembering
8.	**What** is Monte Carlo tree search used for?	BTL1	Remembering
9.	**List** the four steps of Monte Carlo tree search.	BTL1	Remembering
10.	**Interpret** the advantages of Monte Carlo search.	BTL2	Understanding
11.	**Summarize** on stochastic games.	BTL2	Understanding
12.	**What** is CSP in artificial intelligence?	BTL1	Remembering
13.	**Recall** the CSP algorithm.	BTL1	Remembering
14.	**Infer** examples for CSP.	BTL2	Understanding
15.	**What** is meant by backtracking search?	BTL1	Remembering
16.	**What** is local search for CSP?	BTL1	Remembering
17.	**Name** the components of game playing.	BTL1	Remembering
18.	**Demonstrate** the formula for game playing using optimal strategy.	BTL2	Understanding
19.	**Classify** the constraints.	BTL2	Understanding
20.	**Illustrate** the constraint graph for crypt-arithmetic problem.	BTL2	Understanding
21.	**What** is constraint propagation?	BTL1	Remembering
22.	**How** are constraints propagated in forward checking?	BTL1	Remembering
23.	**Define** the terms node consistency, arc consistency and path consistency.	BTL1	Remembering
24.	**Which** search method is used in backtracking?	BTL1	Remembering
PART – B			
1.	(i) **Identify** the role of game theory in AI and explain. (8) (ii) **Develop** an optimal decisions for own choice of gaming scenario. (8)	BTL3	Applying
2.	**Experiment** on adaptation of expert systems in gaming with necessary illustration. (16)	BTL3	Applying
3.	(i) **Examine** the concept of game tree with illustration. (8) (ii) **Inspect** the stochastic games in detail. (8)	BTL4	Analyzing
4.	**Analyze** the algorithm of Minimax decisions with respect to Tic-Tac-Toe game. (16)	BTL4	Analyzing

5.	**Evaluate** the performance of alpha-beta pruning for chess game. (16)	BTL5	Evaluating
6.	**Identify** the significance of pruning system. Explain the alpha beta pruning with an appropriate example. Explain how it is advantageous than min-max algorithm. (16)	BTL3	Applying
7.	**Solve** n-Queens problem using backtracking method. Explain the algorithm and draw the state space tree that is generated. (16)	BTL3	Applying
8.	**Develop** a simple back tracking algorithm for constraint satisfaction problems. (16)	BTL3	Applying
9.	**Compose** a Monte-Carlo tree search algorithm for performing modern video games. (16)	BTL6	Creating
10.	(i) **Apply** the constraint propagation in any real-world scenario and explain. (8) (ii) **Build** the structure of the CSP in detail. (8)	BTL3	Applying
11.	**Survey** the details of stochastic games with a neat diagram. (16)	BTL4	Analyzing
12.	**Explain** in detail, the significance of partially observable games with an example. (16)	BTL5	Evaluating
13.	**Assess** the usage of inference rules in game play. (16)	BTL5	Evaluating
14.	**Explain** how CSP is formulated as a search problem with necessary examples. (16)	BTL5	Evaluating
15.	**Compare** minimax algorithm with alpha beta pruning. (16)	BTL4	Analyzing
16.	(i) **Elaborate** on the types of constraints. (8) (ii) **Discuss** the local search for CSP in detail. (8)	BTL6	Creating
17.	**Examine** the steps involved in Monte Carlo search with an example. (16)	BTL4	Analyzing

UNIT – IV LOGICAL AGENTS

Knowledge-based agents – Propositional logic – Propositional theorem proving – Propositional model checking – Agents based on propositional logic – First-order logic – Syntax and semantics – Knowledge representation and engineering – Inferences in first-order logic – Forward Chaining and Backward Chaining- Genetic Algorithms.

PART – A

Q. No.	Questions	BT Level	Competence
1.	**What** is propositional logic?	BTL1	Remembering
2.	**Compare** propositional logic with predicate logic.	BTL2	Understanding
3.	**Define** a tautology in propositional logic.	BTL1	Remembering
4.	**Why** is propositional theorem proving important in knowledge-based agents?	BTL1	Remembering
5.	**List** the steps involved in propositional model checking.	BTL1	Remembering
6.	**Name** the methods used for propositional theorem proving.	BTL1	Remembering
7.	**Illustrate** the correct description for a satisfiable formula in propositional logic.	BTL2	Understanding
8.	**Classify** the various types of truth values in propositional logic.	BTL2	Understanding

9.	**Compare** truth tables with semantic table for model checking.	BTL2	Understanding
10.	**Contrast** propositional resolution with model checking techniques.	BTL2	Understanding
11.	**Outline** how a knowledge-based agent can utilize propositional logic for decision-making.	BTL2	Understanding
12.	**Infer** the role of knowledge bases in propositional agents.	BTL2	Understanding
13.	**Demonstrate** the advantages of using propositional logic in knowledge representation.	BTL2	Understanding
14.	**What** is the syntax of first-order logic?	BTL1	Remembering
15.	**How** does the semantics of first-order logic define meaning?	BTL1	Remembering
16.	**Illustrate** a universal quantifier in first-order logic.	BTL2	Understanding
17.	**Interpret** the main differences between propositional logic and first-order logic.	BTL2	Understanding
18.	**Outline** the significance of two primary inference methods in first-order logic.	BTL2	Understanding
19.	**Compare** forward chaining with backward chaining.	BTL2	Understanding
20.	**State** the role of genetic algorithms in knowledge representation.	BTL1	Remembering
21.	**Define** forward chaining.	BTL1	Remembering
22.	**What** is meant by backward chaining?	BTL1	Remembering
23.	**How** is predicate logic helpful in knowledge representation?	BTL1	Remembering
24.	**Define** semantic networks.	BTL1	Remembering
	PART – B		
1.	**Choose** the appropriate model-checking technique for verifying the truth of a given proposition and justify your choice. (16)	BTL3	Applying
2.	**Apply** propositional theorem proving techniques to solve a logical expression of your choice. (16)	BTL3	Applying
3.	**Design** a knowledge-based agent capable of solving a simple logical puzzle using propositional logic. (16)	BTL6	Creating
4.	(i) **Discover** a real world application where the knowledge representation and engineering can significantly enhance the performance of an intelligent agent, and justify your choice. (8) (ii) **Analyze** the role of semantics in ensuring the correctness of inferences in first-order logic. (8)	BTL4	Analyzing
5.	**Construct** a truth table to analyze the validity of a complex propositional logic statement. (16)	BTL3	Applying
6.	**Identify** the limitations of propositional logic in representing complex knowledge structures. (16)	BTL3	Applying
7.	**Solve** a reasoning problem using forward chaining in first-order logic. (16)	BTL3	Applying
8.	(i) **Classify** the various components of first-order logic and explain their roles in knowledge representation. (8) (ii) **Compare** genetic algorithms with traditional search algorithms	BTL4	Analyzing

	in terms of their approach and effectiveness for optimization problems. (8)		
9.	**Assess** the differences between propositional logic and first-order logic in terms of their syntax and semantics. (16)	BTL4	Analyzing
10.	**Categorize** the different types of knowledge representation techniques and explain how they support reasoning. (16)	BTL4	Analyzing
11.	**Compare** propositional logic-based agents with first-order logic-based agents in terms of their applicability and efficiency. (16)	BTL4	Analyzing
12.	**Contrast** the processes of propositional model checking with propositional theorem proving. (16)	BTL4	Analyzing
13.	(i) **Identify** the key differences between forward chaining and backward chaining in the context of first-order logic. (8) (ii) **Solve** a logical inference problem using forward chaining in first-order logic. (8)	BTL3	Applying
14.	**Compare** genetic algorithms with logical reasoning techniques in terms of problem-solving approaches. (16)	BTL4	Analyzing
15.	**Inspect** the key steps involved in implementing a genetic algorithm and explain their significance. (16)	BTL4	Analyzing
16.	**Explain** the role of semantics in first-order logic for representing and reasoning about real-world scenarios. (16)	BTL5	Evaluating
17.	(i) **Apply** the concept of propositional logic to represent the knowledge of a simple agent navigating a grid world. (8) (ii) **Choose** a suitable propositional theorem proving method and explain how it can be used to prove a given logical statement. (8)	BTL3	Applying

UNIT – V KNOWLEDGE REPRESENTATION AND PLANNING

Ontological engineering – Categories and objects – Events – Mental objects and modal logic –Reasoning systems for categories – Reasoning with default information – Classical planning –Algorithms for classical planning – Heuristics for planning – Hierarchical planning – Non-deterministic domains – Time, schedule, and resources – Analysis.

PART – A

Q. No.	Questions	BT Level	Competence
1.	**What** is ontological engineering, and why is it important in AI?	BTL1	Remembering
2.	**How** are categories used in reasoning systems?	BTL1	Remembering
3.	**Define** a mental object in the context of modal logic.	BTL1	Remembering
4.	**Why** are events critical in understanding dynamic systems?	BTL1	Remembering
5.	**Outline** the key elements of a reasoning system for categories.	BTL2	Understanding
6.	**Illustrate** the types of default reasoning techniques.	BTL2	Understanding
7.	**Demonstrate** a classical planning algorithm and briefly describe its use.	BTL2	Understanding
8.	**Classify** the different types of heuristics used in planning.	BTL2	Understanding

9.	**Compare** hierarchical planning with classical planning.	BTL2	Understanding
10.	**Contrast** deterministic and non-deterministic planning domains.	BTL2	Understanding
11.	**Infer** the role of time in scheduling and resource allocation.	BTL2	Understanding
12.	**Outline** the basic steps involved in classical planning.	BTL2	Understanding
13.	**Interpret** the significance of modal logic in handling mental objects.	BTL2	Understanding
14.	**What** are non-deterministic domains, and how do they differ from deterministic ones?	BTL1	Remembering
15.	**How** does hierarchical planning improve efficiency in solving complex problems?	BTL1	Remembering
16.	**Define** a heuristic and its role in classical planning.	BTL1	Remembering
17.	**Why** is reasoning with default information challenging?	BTL1	Remembering
18.	**Name** the algorithms commonly used in classical planning.	BTL1	Remembering
19.	**Explain** a method to analyze time and resource constraints in planning.	BTL2	Understanding
20.	**Summarize** the relationship between events and mental objects in a reasoning system.	BTL2	Understanding
21.	**Recall** the components of a planning system.	BTL1	Remembering
22.	**What** is meant by hierarchical planning?	BTL1	Remembering
23.	**Show** how planning in blocks world problem is executed.	BTL2	Understanding
24.	**How** to detect when a solution has found in planning?	BTL1	Remembering
	PART – B		
1.	**Apply** the principles of ontological engineering to design a knowledge representation system for a medical diagnosis application (16)	BTL3	Applying
2.	**Choose** appropriate algorithms for classical planning in a robot navigation system and justify your selection. (16)	BTL6	Creating
3.	**Develop** a reasoning system that integrates default information to handle incomplete data scenarios. (16)	BTL3	Applying
4.	**Compose** a hierarchical planning model for a supply chain management problem, specifying each planning layer. (16)	BTL6	Creating
5.	**Identify** the differences between mental objects and modal logic, illustrating their respective roles in AI reasoning systems. (16)	BTL3	Applying
6.	**Solve** a scheduling problem using heuristics for planning and demonstrate the steps of your solution. (16)	BTL3	Applying
7.	**Discover** an appropriate approach to handle non-deterministic domains in AI planning and explain in detail. (16)	BTL4	Analyzing
8.	**Analyze** the impact of reasoning with categories in ontology-based decision-making systems. (16)	BTL4	Analyzing
9.	(i) **Contrast** the methods for reasoning with categories in deterministic versus non-deterministic environments, using examples. (8)	BTL4	Analyzing

	(ii) **Examine** the role of heuristics in optimizing planning algorithms, providing examples of commonly used heuristics. (8)		
10.	**Assess** the different types of events in a temporal reasoning system, providing examples for each type.(16)	BTL5	Evaluating
11.	**Compare** classical planning algorithms with heuristics-based planning approaches in terms of efficiency and scalability.(16)	BTL4	Analyzing
12.	**Contrast** hierarchical planning with flat planning approaches, emphasizing their applications and limitations. (16)	BTL4	Analyzing
13.	**Distinguish** between time, schedule, and resources in the context of planning and resource allocation systems. (16)	BTL4	Analyzing
14.	(i) **Apply** modal logic to represent and reason about mental objects, providing examples from real-world scenarios. (8) (ii) **Choose** a reasoning system suitable for categories and justify its application in a given knowledge-based system. (8)	BTL3	Applying
15.	**Examine** the role of ontological categories in enhancing reasoning capabilities in expert systems. (16)	BTL4	Analyzing
16.	(i) **Develop** an algorithm for classical planning in a non-deterministic domain, explaining its effectiveness and challenges. (8) (ii) **Construct** a hierarchical planning model for solving a logistics scheduling problem and outline its benefits. (8)	BTL6	Creating
17.	(i) **Solve** a classical planning problem using heuristics, detailing the step-by-step process and its computational implications. (8) (ii) **Select** an appropriate method for analyzing time, schedules, and resources in complex projects, and evaluate its limitations. (8)	BTL3	Applying
18.	(i) **Discover** the key differences between reasoning with default information and reasoning with complete information, with examples. (8) (ii) **Analyze** the impact of using ontological categories and objects on the performance of an AI reasoning system. (8)	BTL4	Analyzing

Prepared by **Verified by** **HoD/IT**