SRM VALLIAMMAI ENGINEERING COLLEGE

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DEPARTMENT OF INFORMATION TECHNOLOGY

QUESTION BANK

III SEMESTER

IT3462-Artificial Intelligence – 2023

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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	Remember
2.	Name a few applications of AI.	BTL1	Remember
3.	Define an agent.	BTL1	Remember
4.	List the different types of agents.	BTL1	Remember
5.	Relate rational agent with autnomous agent.	BTL2	Understand
6.	List the characteristics of intelligent agent.	BTL1	Remember
7.	Infer real-world situations for intelligent agents.	BTL2	Understand
8.	Explain PEAS with an example.	BTL2	Understand
9.	Explain the structure of intelligent agents	BTL2	Understand
10.	Summarize the different types of intelligent agents.	BTL2	Understand
11.	Outline the properties of environment.	BTL2	Understand
12.	Illustrate the PEAS works in a self-driving car.	BTL2	Understand
13.	Explain goal based agent.	BTL2	Understand
14.	What is meant by utility based agent?	BTL1	Remember
15.	Develop a problem solving agent.	BTL2	Understand
16.	What are the components of well-defined problems?	BTL1	Remember
17.	Define the terms goal formulation and problem formulation.	BTL1	Remember
18.	What is a state space?	BTL1	Remember
19.	How to define the problem as a state space search?	BTL1	Remember
20.	List the steps involved in simple problem solving agent.	BTL1	Remember
21.	Compare toy problems with real world problems.	BTL2	Understand
22.	How will you measure the problem-solving performance?	BTL1	Remember
23.	State on which basis search algorithms are chosen?	BTL1	Remember
24.	List the various uninformed search strategies.	BTL1	Remember
PART – B			
1.	Analyze in detail, the four approaches that are followed in AI. (16)	BTL4	Analyze
2.	Is AI a science, or is it engineering? Or neither or both? Justify your answer. (16)	BTL6	Create
3.	Develop a simple problem solving agent and explain the characteristics in detail. (16)	BTL3	Apply
4.	(i) Explain in detail, Turing Test Approach and Cognitive Modeling Approach. (8) (ii) Assess the effect of "Laws of thought" approach and Rational agent approach. (8)	BTL5	Evaluate
5.	Solve the given problem. Consider a Water Jug 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	BTL6	Create

	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)		
6.	Solve the following Crypt arithmetic problem using constraints satisfaction search procedure. (16) CROSS +ROADS ---------- DANGER ----------	BTL3	Create
7.	(i) Explain tree search algorithm in detail. (8) (ii) Compare breadth first search with depth first search. (8)	BTL5	Evaluate
8.	Discover the PEAS description for the agent shopping the used books in the internet.(16)	BTL4	Analyze
9.	(i) Explain the architecture of learning agents with an example. (8) (ii) Appraise the role of intelligent agents. (8)	BTL5	Evaluate
10.	Discuss the necessary components to define an AI problem with an example. (16)	BTL6	Create
11.	Discover 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)	BTL4	Analyze
12.	Develop the constraint satisfaction procedure to solve the following crypt arithmetic problems: a) TO + GO = OUT (8) b) BASE + BALL = GAMES (8)	BTL3	Apply
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	Analyze
14.	Explain on the parameters to estimate the performance of problem solving algorithms. (16)	BTL5	Evaluate
15.	(i) Choose and explain the applications of an artificial intelligence. (8) (ii) Identify the characteristics of an intelligent agent. (8)	BTL3	Apply

16.	Compare the functionality and performance of BFS with DFS. (16)	BTL4	Analyze
17.	Analyze the different types of intelligent agents in detail. (16)	BTL4	Analyze
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	Remember
2.	Why does one go for heuristics search?	BTL1	Remember
3.	Write the significance of using heuristic function in search algorithms.	BTL1	Remember
4.	What are the advantages of heuristic function?	BTL1	Remember
5.	Compare uninformed search with informed search.	BTL2	Understand
6.	Summarize the facts of blind search.	BTL2	Understand
7.	Interpret the reason for why hill climbing often gets stuck .	BTL2	Understand
8.	What is ridge?	BTL1	Remember
9.	Explain plateau.	BTL2	Understand
10.	Outline the effect of local maximum.	BTL2	Understand
11.	When a heuristic function h is said to be admissible?	BTL2	Understand
12.	Relate admissible heuristic with consistent heuristic.	BTL2	Understand
13.	Illustrate local maxima with respect to search technique.	BTL2	Understand
14.	Define local search.	BTL1	Remember
15.	How can we avoid ridge and plateau in hill climbing?	BTL1	Remember
16.	Name the 2 types of memory bounded heuristic algorithm.	BTL1	Remember
17.	How Recursive Best First Search (RBFS) works?	BTL1	Remember
18.	Demonstrate the basic operations of genetic algorithm.	BTL2	Understand
19.	Infer the examples for partially observable agent environments.	BTL2	Understand
20.	Compare A* with AO* algorithm.	BTL2	Understand
21.	What is online search agent?	BTL1	Remember
22.	Summarize simulated annealing.	BTL1	Remember
23.	What is best first search?	BTL1	Remember
24.	What is genetic algorithm?	BTL1	Remember
PART – B			
1.	Explain the following search technique: a) Greedy best-first search (8) b) A* search (8)	BTL5	Evaluate
2.	Examine the details on genetic algorithm. (16)	BTL4	Analyze
3.	Compare the performance of hill climbing with simulated annealing	BTL4	Analyze

	algorithms. (16)		
4.	Explain greedy local search with an example in detail. (16)	BTL5	Evaluate
5.	Identify the use of simulated annealing and local beam search in solving any real world problem. (16)	BTL3	Apply
6.	Analyze the memory bounded heuristic algorithms with examples. (16)	BTL4	Analyze
7.	Inspect the A* search and give the proof of optimality of A*. (16)	BTL4	Analyze
8.	Examine the AO* algorithm with necessary illustrations. (16)	BTL4	Analyze
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	Apply
10.	Identify the problems encountered during hill climbing and explain the ways available to deal with these problems. (16)	BTL3	Apply
11.	Interpret the blind search strategies with necessary examples. (16)	BTL5	Evaluate
12.	Compare blind search with heuristic search by sighting any two example for each strategies. (16)	BTL5	Evaluate
13.	Assess in detail the various heuristic search strategies available with necessary examples. (16)	BTL4	Analyze
14.	Analyze the Best First Search (BFS) algorithm with suitable example. (16)	BTL4	Analyze
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	Apply
16.	Elaborate the details on online search agents. (16)	BTL6	Create
17.	Discover the details of generating AND-OR graphs for searching in a nondeterministic environments. (16)	BTL4	Analyze

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	Understand
2.	Where is game theory used in AI?	BTL1	Remember
3.	Infer the characteristics of game theory.	BTL2	Understand
4.	Illustrate the function of optimal decision gaming.	BTL2	Understand

5.	How are optimal decisions made?	BTL1	Remember
6.	Define alpha-beta pruning.	BTL1	Remember
7.	What is alpha beta algorithm in artificial intelligence?	BTL1	Remember
8.	What is Monte Carlo tree search used for?	BTL1	Remember
9.	Name the four steps of Monte Carlo tree search.	BTL1	Remember
10.	Interpret the advantages of Monte Carlo search.	BTL2	Understand
11.	Summarize on stochastic games.	BTL2	Understand
12.	What is CSP in artificial intelligence?	BTL1	Remember
13.	What is CSP algorithm?	BTL1	Remember
14.	Infer examples for CSP.	BTL2	Understand
15.	What is backtracking search?	BTL1	Remember
16.	What is local search for CSP?	BTL1	Remember
17.	Summarize the components of game playing.	BTL2	Understand
18.	Demonstrate the formula for game playing using optimal strategy.	BTL2	Understand
19.	Classify the constraints.	BTL2	Understand
20.	Illustrate the constraint graph for crypt-arithmetic problem.	BTL2	Understand
21.	What is constraint propagation?	BTL1	Remember
22.	How are constraints propagated in forward checking?	BTL1	Remember
23.	Define the terms node consistency, arc consistency and path consistency.	BTL1	Remember
24.	Which search method is used in backtracking?	BTL1	Remember
	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	Apply
2.	Experiment on adaptation of expert systems in gaming with necessary illustration. (16)	BTL3	Apply
3.	(i) Examine the concept of game tree with illustration. (8) (ii) Inspect the stochastic games in detail. (8)	BTL4	Analyze
4.	Analyze the algorithm of Minimax decisions with respect to Tic-Tac-Toe game. (16)	BTL4	Analyze
5.	Evaluate the performance of alpha-beta pruning for chess game. (16)	BTL5	Evaluate
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	Apply
7.	Solve n-Queens problem using backtracking method. Explain the algorithm and draw the state space tree that is generated. (16)	BTL3	Apply
8.	Develop a simple back tracking algorithm for constraint satisfaction problems. (16)	BTL3	Apply

9.	Compose a Monte-Carlo tree search algorithm for performing modern video games. (16)	BTL6	Create
10.	(i) Apply the constraint propagation in any real-world scenario and explain. (8) (ii) Build the structure the CSP in detail. (8)	BTL3	Apply
11.	Survey the details of stochastics games with a neat diagram. (16)	BTL4	Analyze
12.	Explain in detail, the significance of partially observable games with an example. (16)	BTL5	Evaluate
13.	Assess the usage of inference rules in game play. (16)	BTL5	Evaluate
14.	Explain how CSP is formulated as a search problem with necessary examples. (16)	BTL5	Evaluate
15.	Compare minimax algorithm with alpha beta pruning. (16)	BTL4	Analyze
16.	(i) Elaborate on the types of constraints. (8) (ii) Discuss the local search for CSP in detail. (8)	BTL6	Create
17.	Examine the steps involved in Monte Carlo search with an example. (16)	BTL4	Analyze

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	Remember
2.	How does propositional logic differ from predicate logic?	BTL1	Remember
3.	Define a tautology in propositional logic.	BTL1	Remember
4.	Why is propositional theorem proving important in knowledge-based agents?	BTL1	Remember
5.	List the steps involved in propositional model checking.	BTL1	Remember
6.	Name two methods used for propositional theorem proving.	BTL1	Remember
7.	Select the correct description for a satisfiable formula in propositional logic.	BTL2	Understand
8.	Classify the various types of truth values in propositional logic.	BTL2	Understand
9.	Compare truth tables with semantic table for model checking.	BTL2	Understand
10.	Contrast propositional resolution and model checking techniques.	BTL2	Understand
11.	Outline how a knowledge-based agent can utilize propositional logic for decision-making.	BTL2	Understand
12.	Outline the role of knowledge bases in propositional agents.	BTL2	Understand

13.	Explain the advantages of using propositional logic in knowledge representation.	BTL2	Understand
14.	What is the syntax of first-order logic?	BTL1	Remember
15.	How does the semantics of first-order logic define meaning?	BTL1	Remember
16.	Define a universal quantifier in first-order logic.	BTL2	Understand
17.	List the main differences between propositional logic and first-order logic.	BTL2	Understand
18.	Identify the two primary inference methods in first-order logic.	BTL2	Understand
19.	Compare forward chaining and backward chaining with examples.	BTL2	Understand
20.	State the role of genetic algorithms in knowledge representation.	BTL1	Remember
21.	Define forward chaining.	BTL1	Remember
22.	What is meant by backward chaining?	BTL1	Remember
23.	How is predicate logic helpful in knowledge representation?	BTL1	Remember
24.	Define semantic networks.	BTL1	Remember
	PART – B		
1.	Choose the appropriate model-checking technique for verifying the truth of a given proposition and justify your choice. (16)	BTL3	Apply
2.	Apply propositional theorem proving techniques to solve a given logical expression. (16)	BTL3	Apply
3.	Develop a knowledge-based agent capable of solving a simple logical puzzle using propositional logic. (16)	BTL6	Create
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	Analyze
5.	Construct a truth table to analyze the validity of a complex propositional logic statement. (16)	BTL3	Apply
6.	Identify the limitations of propositional logic in representing complex knowledge structures. (16)	BTL3	Apply
7.	Solve a reasoning problem using Forward Chaining in first-order logic. (16)	BTL3	Apply
8.	Explain in detail, the key phases in a Software Process Assessment, highlighting their significance in evaluating and enhancing Software Development Processes. (16)	BTL5	Evaluate
9.	(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 in	BTL4	Analyze

	terms of their approach and effectiveness for optimization problems. (8)		
10.	Select the suitable inference mechanism between Backward Chaining and Forward Chaining for a given scenario, and explain your choice. (16)	BTL6	Create
11.	Analyze the differences between propositional logic and first-order logic in terms of their syntax and semantics. (16)	BTL4	Analyze
12.	Categorize the different types of knowledge representation techniques and explain how they support reasoning. (16)	BTL4	Analyze
13.	Compare propositional logic-based agents with first-order logic-based agents in terms of their applicability and efficiency. (16)	BTL4	Analyze
14.	Contrast the processes of propositional model checking with propositional theorem proving. (16)	BTL4	Analyze
15.	(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	Apply
16.	Compare genetic algorithms with logical reasoning techniques in terms of problem-solving approaches. (16)	BTL4	Analyze
17.	Inspect the key steps involved in implementing a genetic algorithm and explain their significance. (16)	BTL4	Analyze
18.	Explain the role of semantics in first-order logic for representing and reasoning about real-world scenarios. (16)	BTL5	Evaluate
19.	(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	Apply
20.	(i) Develop a set of rules using propositional logic for an agent that decides whether to move forward, turn, or stop based on its environment. (8) (ii) Construct a truth table for a given propositional model and demonstrate how it can be used in model checking. (8)	BTL6	Create

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	Remember
2.	How are categories used in reasoning systems?	BTL1	Remember
3.	Define a mental object in the context of modal logic.	BTL1	Remember
4.	Why are events critical in understanding dynamic systems?	BTL1	Remember
5.	Outline the key elements of a reasoning system for categories.	BTL2	Understand
6.	Illustrate the two types of default reasoning techniques.	BTL2	Understand
7.	Explain a classical planning algorithm and briefly describe its use.	BTL2	Understand
8.	Classify the different types of heuristics used in planning.	BTL2	Understand
9.	Compare hierarchical planning with classical planning.	BTL2	Understand
10.	Contrast deterministic and non-deterministic planning domains.	BTL2	Understand
11.	Demonstrate the role of time in scheduling and resource allocation.	BTL2	Understand
12.	Outline the basic steps involved in classical planning.	BTL2	Understand
13.	Relate the significance of modal logic in handling mental objects.	BTL1	Remember
14.	What are non-deterministic domains, and how do they differ from deterministic ones?	BTL1	Remember
15.	How does hierarchical planning improve efficiency in solving complex problems?	BTL1	Remember
16.	Define a heuristic and its role in classical planning.	BTL1	Remember
17.	Why is reasoning with default information challenging?	BTL1	Remember
18.	List the three algorithms commonly used in classical planning.	BTL1	Remember
19.	Demonstrate a method to analyze time and resource constraints in planning.	BTL2	Understand
20.	Explain the relationship between events and mental objects in a reasoning system.	BTL2	Understand
21.	List the components of a planning system.	BTL1	Remember
22.	What is hierarchical planning?	BTL1	Remember
23.	Infer how planning in blocks world problem is executed?	BTL2	Understand
24.	How to detect when a solution has found in planning?	BTL1	Remember
	PART – B		
1.	Apply the principles of ontological engineering to design a knowledge representation system for a medical diagnosis application (16)	BTL3	Apply
2.	Choose appropriate algorithms for classical planning in a robot navigation system and justify your selection. (16)	BTL6	Create
3.	Develop a reasoning system that integrates default information to handle incomplete data scenarios. (16)	BTL3	Apply
4.	Construct a hierarchical planning model for a supply chain management problem, specifying each planning layer. (16)	BTL6	Create
5.	Identify the differences between mental objects and modal logic,	BTL3	Apply

	illustrating their respective roles in AI reasoning systems. (16)		
6.	Solve a scheduling problem using heuristics for planning and demonstrate the steps in your solution. (16)	BTL3	Apply
7.	Discover an appropriate approach to handle non-deterministic domains in AI planning and explain your choice. (16)	BTL4	Analyze
8.	Analyze the impact of reasoning with categories in ontology-based decision-making systems. (16)	BTL4	Analyze
9.	(i) Contrast the methods for reasoning with categories in deterministic versus non-deterministic environments, using examples. (8) (ii) Examine the role of heuristics in optimizing planning algorithms, providing examples of commonly used heuristics. (8)	BTL4	Analyze
10.	Assess the different types of events in a temporal reasoning system, providing examples for each type.(16)	BTL5	Evaluate
11.	Compare classical planning algorithms with heuristics-based planning approaches in terms of efficiency and scalability.(16)	BTL4	Analyze
12.	Contrast hierarchical planning and flat planning approaches, emphasizing their applications and limitations. (16)	BTL5	Evaluate
13.	Distinguish between time, schedule, and resources in the context of planning and resource allocation systems . (16)	BTL4	Analyze
14.	Identify the key components of reasoning systems for categories and explain their significance in AI.(16)	BTL3	Apply
15.	(i) Inspect the concept of Software Process Assessment in Configuration Management and their role in version control during software development. (8) (ii) Distinguish between the responsibilities of software developers and Configuration Management personnel in maintaining code integrity and version control. (8)	BTL4	Analyze
16.	(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	Apply
17.	Examine the role of ontological categories in enhancing reasoning capabilities in expert systems. (16)	BTL4	Analyze
18.	(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)	BTL4	Analyze
19.	(i) Solve a classical planning problem using heuristics, detailing the step-by-step process and its computational implications. (8)	BTL3	Apply

	(ii) Select an appropriate method for analyzing time, schedules, and resources in complex projects, and evaluate its limitations. (8)		
20.	(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	Analyze
21.	(i) Classify events in a non-deterministic domain based on their predictability and relevance to planning tasks. (8) (ii)Compare classical and hierarchical planning approaches, highlighting their use cases, advantages, and disadvantages. (8)	BTL4	Analyze

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