

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

QUESTION BANK



IV SEMESTER

AD3461 – ARTIFICIAL INTELLIGENCE - I

Regulation – 2023

Academic Year 2025 – 2026 (EVEN)

Prepared by

Dr.R.Thenmozhi, Asso.Prof/AI&DS

Mr.R. Danu, A.P (O.G)/AI&DS



SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE



QUESTION BANK

SUBJECT : AD3461 – Artificial Intelligence - I

YEAR/SEM : II Year / IV Semester

UNIT I INTELLIGENT AGENT			
Introduction to AI – 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	Define an agent.	BTL1	Remember
2	Define Artificial Intelligence (AI).	BTL1	Remember
3	What is the role of agent program?	BTL1	Remember
4	What are the components that define a problem in Artificial Intelligence?	BTL1	Remember
5	What is an agent function? Differentiate an agent function and an agent program.	BTL1	Remember
6	What is meant by Turing test?	BTL1	Remember
7	State the concept of rationality.	BTL1	Remember
8	Give the structure of agent in an environment.	BTL1	Remember
9	List some of the uninformed search techniques.	BTL1	Remember
10	What are the steps involved to solve a problem in AI?	BTL1	Remember
11	List the properties of task environments.	BTL1	Remember
12	What is a task environment? How is it specified?	BTL1	Remember
13	Why problem formulation must follow goal formulation?	BTL2	Understand
14	List down the characteristics of intelligent agent.	BTL2	Understand
15	List any two challenges in designing AI systems.	BTL1	Remember
16	Differentiate between Intelligence and Artificial Intelligence.	BTL2	Understand
17	Give the general model of a learning agent.	BTL2	Understand
18	Compare Deterministic vs Stochastic environment.	BTL2	Understand
19	Give PEAS description for Part picking robot.	BTL2	Understand
20	Differentiate goal-based agents and utility-based agents.	BTL2	Understand
21	Characterize the environment of an agent playing soccer.	BTL2	Understand
22	What is the role of rationality in intelligent agents?	BTL1	Remember

23	Define Turing Test in the context of Artificial Intelligence.	BTL1	Remember
24	Formulate PEAS for an automated taxi driver.	BTL2	Understand
PART-B			
1	Explain the architecture of an intelligent agent. Include a diagram to illustrate the components and their interactions. (16)	BTL3	Apply
2	Explain the PEAS representation framework with suitable examples for various intelligent systems.	BTL4	Apply
3	Explain the structure of a typical intelligent agent with an example. Discuss how the structure influences the agent's performance. (16)	BTL3	Apply
4	Discuss the properties of task environments and explain why they are important for agent design.	BTL3	Apply
5	Explain the concept of rationality in AI agents and analyze how it affects their decision-making process in uncertain environments. (16)	BTL3	Apply

6	Describe the structure of a Goal-Based Agent and explain how it differs from a simple reflex agent. Analyze the implications of these differences in a dynamic environment.	BTL3	Apply
7	Describe the components necessary to define a problem in AI and discuss how each component contribute to the problem-solving process. (16)	BTL3	Apply
8	Consider the water jug problem: You are given two jugs, a 4 gallon one and 3-gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallon of water from the 4-gallon jug? Explain the state space representation and apply an optimal sequence of actions to solve it. (16)	BTL3	Apply
9	Describe the PAES representation for an automated taxi driver, an ATM system, and a medical diagnosis system. Explain each component in the context of the agents. (16)	BTL4	Analyze
10	What is an Intelligent agent? Define and explain the terms percept, percept sequence, agent function, and agent program using the vacuum cleaner example. (16)	BTL4	Analyze
11	Define an agent. Explain the four basic agents that embody the principles underlying intelligent systems with examples. (16)	BTL4	Analyze
12	Explain in detail the uninformed search strategies: Breadth-First Search (BFS), Depth-First Search (DFS), and Uniform Cost Search (UCS). Provide a comparison of their working principles, advantages, and limitations. (16)	BTL4	Analyze
13	List the basic kinds of intelligent agents and explain any two agents with neat schematic diagram. (16)	BTL4	Analyze
14	Explain the concept of the Turing Test and analyze its relevance in evaluating AI systems. Discuss it advantages and disadvantages as a measure of intelligence. (16)	BTL4	Analyze

15	What is an Agent? How does it interact with environment? Explain. (6) What is informed search technique? Explain any one in detail. (10)	BTL4	Analyze
16	Explain in detail the uninformed search strategies: Depth-First Search (DFS), Iterative Deepening Depth-First Search (IDDFS), and Depth-Limited Search (DLS). Discuss their methodologies, applications, and limitations. (16)	BTL4	Analyze
17	Explain the differences between Uninformed Search and Informed Search algorithms, and analyse their effectiveness in a specific problem-solving scenario. (16)	BTL4	Analyze

UNIT II PROBLEM SOLVING

Informed (Heuristic) Search Strategies – Heuristic Functions – 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	Define Greedy BFS.	BTL1	Remember
2	List the various search strategies.	BTL1	Remember
3	List the various informed search strategies.	BTL1	Remember
4	Define A* search.	BTL1	Remember
5	What is Recursive BFS?	BTL1	Remember
6	What is local search?	BTL1	Remember
7	Define Global minimum and Global maximum.	BTL1	Remember
8	Define annealing.	BTL1	Remember
9	What is an online search agent?	BTL1	Remember
10	State any two properties of A* search.	BTL2	Understand
11	What is heuristic search strategy?	BTL1	Remember
12	What is the advantage of heuristic function?	BTL1	Remember
13	Define the effect of heuristic accuracy on performance.	BTL2	Understand
14	What is the use of online search agent?	BTL2	Understand
15	Differentiate greedy search and A* search.	BTL2	Understand
16	Define local search and mention one advantage.	BTL1	Understand
17	What do you mean by local maxima with respect to search technique.	BTL2	Understand
18	Define Hill climbing search.	BTL2	Understand
19	Define variants of hill climbing search.	BTL2	Understand
20	State the reason when hill climbing often gets stuck.	BTL2	Understand
21	Define heuristic search with an example.	BTL1	Remember

22	What is the difference between informed and uninformed search methods?	BTL2	Understand
23	What is Heuristic Function?	BTL2	Understand
24	What are the things that agents know in online search problem?	BTL2	Understand
PART-B			
1	Explain the working of hill climbing algorithm with suitable example. (16)	BTL3	Apply
2	Explain various local search algorithm in detail. (16)	BTL3	Apply
3	Explain various informed or heuristic search technique in detail. (16)	BTL3	Apply
4	Explain how you would implement a heuristic function for a specific problem, such as the 8-puzzle problem. (16)	BTL3	Apply
5	Discuss on Online Search Agents that uses depth-first exploration. (16)	BTL3	Apply
6	Describe how you would use the Best-First Search algorithm to navigate a maze. (16)	BTL3	Apply
7	Compare BFS, DFS, and Uniform Cost Search with respect to completeness, optimality, and time complexity.	BTL3	Apply
8	Explain Hill Climbing and Simulated Annealing algorithms with neat sketches.	BTL3	Apply
9	Explain in detail about A* algorithm with suitable example. (16)	BTL4	Analyze
10	Explain in details about variants of A* algorithm. (16)	BTL4	Analyze
11	Explain the types of hill climbing techniques. (16)	BTL4	Analyze
12	Explain the performance of online search algorithm in an unknown environment. (16)	BTL4	Analyze
13	Discuss Greedy BFS and Recursive BFS with suitable example in detail. (16)	BTL4	Analyze
14	Discuss how searching is done in non-deterministic and partially observable environment. (16)	BTL4	Analyze
15	<ul style="list-style-type: none"> i. What is heuristic search technique in AI? How does heuristics search works? Explain its advantages and disadvantages. (8) ii. Describe the local search algorithm with neat sketch (8) 	BTL4	Analyze
16	<ul style="list-style-type: none"> i. Explain the steps involved in formulating problems with example. (10) ii. Write a short note on genetic algorithm. (6) 	BTL4	Analyze
17	Elaborate on the need for local search algorithms and discuss any one algorithm in detail. (16)	BTL4	Analyze

UNIT III GAME PLAYING AND CSP

Game theory – Optimal decisions in games – Alpha-beta search – 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	What is a game?	BTL1	Remember
2	What is Nash equilibrium?	BTL1	Remember
3	What is a game tree?	BTL1	Remember
4	What is a ply in game tree?	BTL1	Remember
5	What is minimax algorithm?	BTL1	Remember
6	What is alpha beta pruning?	BTL1	Remember
7	What is constraint satisfaction Problem.	BTL1	Remember
8	Define forward checking and backtracking in CSP.	BTL1	Remember
9	Give applications of game theory.	BTL1	Remember
10	What are stochastic games?	BTL1	Remember
11	Define knowledge representation.	BTL1	Remember
12	List the types of constraints in CSP.	BTL1	Remember
13	What do you mean by constrain propagation?	BTL2	Understand
14	How do we represent the structure of problems in CSP.	BTL2	Understand
15	Define Cycle Cutset.	BTL2	Understand
16	List the types of assignments in CSP.	BTL2	Understand
17	What is Tree Decomposition.	BTL2	Understand

18	Define Conflict directed back jumping	BTL2	Understand
19	How can minimax also be extended for game of chance.	BTL2	Understand
20	What are semantic networks?	BTL2	Understand
21	Justify why we cannot use traditional min max for games with an element of chance, such as backgammon.	BTL2	Understand
22	Write the components of a game.	BTL2	Understand
23	Mention any two limitations of propositional logic.	BTL1	Remember
24	Distinguish between forward chaining and backward chaining.	BTL2	Understand

PART-B

1	Describe about Constraint Satisfaction Problem with an algorithm for solving cryptarithmic problem. (16)	BTL3	Apply
2	How minmax procedure can be modified to play multiplayer games in detail. (16)	BTL3	Apply
3	Explain first-order predicate logic with examples and describe how it supports AI reasoning.(16)	BTL3	Apply

4	Describe the components of an expert system and explain its working with a suitable illustration.	BTL3	Apply
---	---	------	-------

5	Explain minmax game playing algorithm in detail with suitable example. (16)	BTL3	Apply
6	Explain alpha beta pruning in detail with an example. (16)	BTL3	Apply
7	Explain in detail about constraint propagation. (16)	BTL3	Apply
8	Discuss about backtracking in constraint satisfaction problem. (16)	BTL3	Apply
9	What are partially observable games? How are they solved in a deterministic environment? (16)	BTL4	Analyze
10	Brief on map-coloring problem as CSP and explain with an example. (16)	BTL4	Analyze
11	Brief on Min-Max algorithm and also discuss the need for alpha-beta pruning. (16)	BTL4	Analyze
12	Explain the constraint satisfaction problem and the variations on constraint satisfaction problem with example. (16)	BTL4	Analyze
13	i. Write short notes on Monte-Carlo search. (6) ii. Define local consistency. What are the different types of local consistency? Explain any two.	BTL4	Analyze
14	i. How does alpha beta search algorithm differ from Minmax algorithm. Analyze. (6) ii. Explain the concept of game theory and its role in artificial intelligence. Discuss the process of making optimal decisions in games with suitable example. (10)	BTL4	Analyze
15	Briefly describe the structure of problem in constraint satisfaction problem. (16)	BTL4	Analyze
16	Explain in detail about local search in constraint satisfaction problem, (16)	BTL4	Analyze
17	What are stochastic games? Explain their characteristics and strategies for decision-making with examples. (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 – Backward chaining – Resolution.

PART – A

Q.No	Questions	BT Level	Competence
1	What is a Knowledge-Based Agent?	BTL1	Remember
2	What is Horn clause and Definite Clause?	BTL1	Remember
3	Name two standard quantifiers.	BTL1	Remember
4	What is the purpose of a cost function in machine learning?	BTL1	Remember
5	What is the purpose of unification?	BTL1	Remember
6	Define meta rules.	BTL1	Remember
7	Define atomic and complex sentences.	BTL1	Remember
8	Define first-order definite clause.	BTL1	Remember

9	State the generalized modus ponens.	BTL1	Remember
10	What is Skolemisation?	BTL1	Remember
11	List various inference rules in propositional logic.	BTL1	Remember
12	List various inference rules in predicate logic.	BTL1	Remember
13	What is resolution?	BTL2	Understand
14	Define overfitting.	BTL2	Understand
15	Give the grammar to represent predicate logic.	BTL2	Understand
16	Distinguish between propositional logic and predicate logic.	BTL2	Understand
17	Differentiate forward and backward chaining.	BTL2	Understand
18	Represent the following sentence in predicate form: "All the children like sweets."	BTL2	Understand
19	Define causal and diagnostic rules with an example.	BTL2	Understand
20	Define supervised learning with an example.	BTL2	Understand
21	Give two differences between classification and regression.	BTL2	Understand
22	Define the terms belief state and state estimation.	BTL2	Understand
23	Some people like every vegetable. Convert it to First order logic.	BTL2	Understand
24	What are the three levels in describing knowledge-based agent?	BTL2	Understand

PART-B

1	What is conjunctive normal form? Illustrate and explain the procedure to convert sentences into conjunctive normal form with a neat example. Depict real images where it could be applied. (16)	BTL3	Apply
---	---	-------------	--------------

2	Explain the working of Decision Tree algorithm with an example and discuss impurity measures.	BTL3	Apply
3	<p>i. Brief on the concept of resolution and explain the propositional resolution algorithm. (7)</p> <p>ii. Prove the following axioms using the resolution algorithm. (9)</p> <ul style="list-style-type: none"> • All hounds how! At night. • Anyone who has any cats will not have any mice. • Light sleepers do not have anything which howls at night. • John has either a cat or a bound. • (conclusion) If John is a light sleeper, then John does not have any mice. 	BTL3	Apply

4	<p>Give the rules of inference in propositional logic. (9)</p> <p>Which rule of inference is used in each argument below? (7)</p> <p>Alice is a Math major and a CSI major. Therefore, Jerry is a math major.</p> <p>Jerry is a Math major and a CSI major. Therefore, Jerry is a math major.</p> <p>If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.</p> <p>If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.</p> <p>If I go swimming, then I will stay in the sun too long. If I stay in the sun too long, then I will sunburn. Therefore, if I go swimming, then I will sunburn.</p>	BTL3	Apply
5	<p>Describe forward chaining and backward chaining algorithms in detail. Apply both the algorithms to prove that “West is a Criminal.” (16)</p>	BTL3	Apply

6	<p>Express the following statements as predicates:</p> <ul style="list-style-type: none"> • All people who are not poor and are smart are happy • Those people who read are not stupid. • John can read and is wealthy. • Happy people having exciting lives. <p>Skolemize the above statements if required and prove the following by resolution: “Can anyone be found with an exciting life?” (Assume \sim stupid \equiv smart, wealthy \equiv \simpoor). (16)</p>	BTL3	Apply
7	<p>Explain unification algorithm used for reasoning under predicate logic with an example. (16)</p>	BTL3	Apply
8	<p>Explain the steps involved in knowledge engineering process. (16)</p>	BTL3	Apply
9	<p>Describe the steps involved in training a neural network and explain gradient descent in detail.</p>	BTL4	Analyze
10	<p>Discuss the Knowledge Engineering Process with proper illustration. Depict the concept of forward chaining. (16)</p>	BTL4	Analyze
11	<p>Describe the procedure for converting a sentence into CNF with an example. (16)</p>	BTL4	Analyze
12	<p>i. Explain standard quantifiers of first-order logic with examples. (9)</p> <p>ii. Give the five logical connectives used to construct complex sentences and give the formal grammar of propositional logic. (7)</p>	BTL4	Analyze
13	<p>Explain inferencing process in first order predicate logic. Apply both the algorithm to prove that “West is Criminal”. (16)</p>	BTL4	Analyze
14	<p>i. Write the algorithm for deciding entailment in propositional logic. (8) ii)Explain the concepts of resolution in detail. (8)</p>	BTL4	Analyze
15	<p>i. Explain the completeness of proof of resolution. (8)</p> <p>ii. What are the steps to convert FOL to Normal Form? Explain each step. (8)</p>	BTL4	Analyze
16	<p>Explain in detail the inference in the First order logic (FOL). (16)</p>	BTL4	Analyze
17	<p>i. Discuss the propositional theorem proving in detail. (6)</p> <p>ii. Explain the knowledge-based agents in detail with neat sketch. (10)</p>	BTL4	Analyze

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.

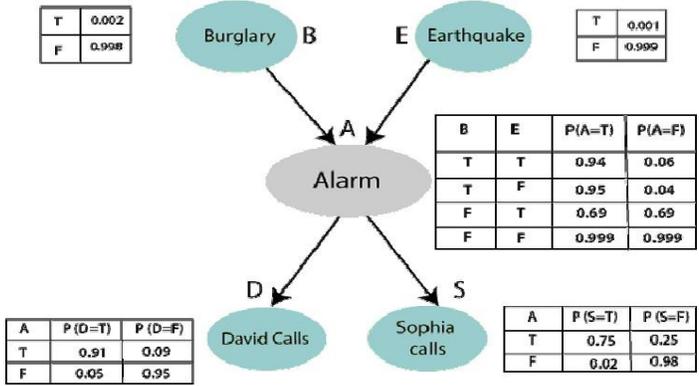
PART – A

Q.No	Questions	BT Level	Competence
1	Define Dempster-Shafer theory.	BTL1	Remember
2	Define Bayes Theorem.	BTL1	Remember
3	Define Uncertainty.	BTL1	Remember
4	State Bayes rule.	BTL1	Remember
5	What is reasoning?	BTL1	Remember
6	Define prior probability.	BTL1	Remember
7	State the types of approximation methods.	BTL1	Remember
8	What is causal networks?	BTL1	Remember
9	Why does uncertainty arise?	BTL1	Remember
10	What is Baye’s rule? Mention its use.	BTL1	Remember
11	Mention any two applications of NLP.	BTL1	Remember
12	What is the purpose of relational probability models?	BTL1	Remember
13	Justify the purpose of Bayesian networks.	BTL2	Understand
14	Give the full specification of Bayesian Network.	BTL2	Understand
15	What do you mean by hybrid Bayesian network?	BTL2	Understand
16	Define tokenization in text preprocessing.	BTL2	Understand
17	State the types of inference in Bayesian network.	BTL2	Understand
18	Differentiate syntax analysis and semantic analysis.	BTL2	Understand
19	What is Naïve Bayes algorithm.	BTL2	Understand
20	What is Natural Language Processing?	BTL2	Understand
21	What is meant by Joint probability and conditional probability.	BTL2	Understand
22	List the components of a Bayesian Network.	BTL2	Understand
23	Mention some applications of Bayes’ theorem.	BTL2	Understand
24	What type of graph is used to represent a Bayesian Network?	BTL2	Understand

PART-B

1	Define uncertain knowledge, prior probability and conditional probability. State Bayes theorem. How is it useful for decision making under uncertainty. Explain belief network briefly. (16)	BTL3	Apply
2	i. Explain in detail about Bayesian Inference. (8) ii. Describe the Bayesian network in detail. (8)	BTL3	Apply
3	Describe Naïve Bayes algorithm in detail with suitable example. (16)	BTL3	Apply

4	How does direct sampling methods help in approximate inference?	BTL4	Analyze
5	Explain the stages of NLP pipeline and discuss the importance of feature extraction methods like TF-IDF and word embeddings.	BTL3	Apply

6	Describe the action under uncertainty with suitable example in detail. (16)	BTL3	Apply
7	Discuss machine translation systems in detail and compare rule-based and statistical MT approaches.	BTL3	Apply
8	<p>i. Calculate the probability that alarm has sounded, but there is neither a burglary, nor an earthquake occurred, and David and Sophia both called the Harry. (10)</p>  <p>ii. Discuss the applications of Bayesian Network in detail. (6)</p>	BTL3	Apply

9	What is Bayesian network? Explain the method for constructing Bayesian networks. (16)	BTL4	Analyze
10	<p>i. What are the ways to understand the semantics of Bayesian Networks? (8)</p> <p>ii. Discuss the exact inference in Bayesian networks. (8)</p>	BTL4	Analyze
11	How does direct sampling methods help in approximate inference?	BTL4	Analyze
12	Briefly explain exact inference in Bayesian Networks. (16)	BTL4	Analyze
13	Design a Bayesian belief network for the diagnosis of car's electrical system. (16)	BTL4	Analyze
14	What is Bayesian Network? How Bayesian network is used to represent knowledge in uncertain domain. (16)	BTL4	Analyze
15	Explain the method of performing exact inference in detail. (16)	BTL4	Analyze
16	Explain the method of performing approximate inference in detail. (16)	BTL4	Analyze
17.	<p>i. Describe in detail about causal network. (8)</p> <p>ii. How to represent knowledge in an uncertain domain. (8)</p>	BTL4	Analyze

