INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

QUESTION BANK

Department	**CSE(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)**				
Course Title	**LOGIC PROGRAMMING FOR ARTIFICIAL INTELLIGENCE**				
Course Code	ACAD01				
Program	B.Tech				
Semester	III				
Course Type	Core				
Regulation	BT-23				
Course Structure	Theory			Practical	
	Lecture	Tutorials	Credits	Laboratory	Credits
	3	-	3	0	-
Course Coordinator	Ms. Bidyutlata Sahoo, Assistant Professor				

COURSE OBJECTIVES:

The students will try to learn:

I	The characteristics of Intelligent agents and the way the AI agents plan and act in the real world.
II	Various search strategies and knowledge representation techniques to solve AI problems.
III	The ways of planning and acting in the real world.
IV	Handling uncertainty, reasoning the complex problems and models behind the AI applications.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Illustrate** the ability to design a plan for the real-world problems and mapping it to the digital world.	Understand
CO 2	**Relate** appropriate problem-solving methods to optimize the search results.	Understand
CO 3	**Interpret** uninformed and informed search strategies, and select the appropriate approach for different AI problems.	Understand

CO 4	**Demonstrate** computable functions and predicates in computational system to construct logical expressions.	Understand
CO 5	**Develop** a comprehensive understanding of advanced AI planning strategies and diverse learning paradigms to solve complex problems.	Apply
CO 6	**Examine** the uncertainty in designing AI systems and propose methods for reasoning.	Apply

QUESTION BANK:

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MODULE I				
INTRODUCTION				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1	How would you define Artificial Intelligence to someone who has never heard of it before? How does your definition align with or differ from the definitions provided by leading AI experts?	Understand	The learner will try to **recall** the fundamental aspects of artificial intelligence and **compare** compare them with human intelligence.	CO 1
2	Trace the historical evolution of AI. How have the goals and methods of AI changed from its inception to the present day?	Understand	The learner will try to **recall** the historical development of artificial intelligence and **compare** compare them with human intelligence.	CO 1
3	Compare and contrast the characteristics of a human being with those of an intelligent agent. What similarities and differences can you identify?	Understand	The learner will try to **recall** the characteristics shared by human decision-making processes and intelligent agents, and **understand** the differences in processing speed, data handling, and learning mechanisms that set human reasoning apart from computational models used by intelligent agents.	CO 1

4	Provide real-world examples of intelligent agents and discuss how they exemplify the characteristics of intelligent agents.	Understand	The learner will try to **identify** real-world examples of intelligent agents and analyze how these agents **demonstrate** the fundamental characteristics of intelligent agents.	CO 1
5	Explain the potential impact of AI on various sectors such as healthcare, education, and transportation. What positive and negative effects could arise from widespread AI adoption?	Understand	The learner will **recall** the potential applications of AI and**understand** the positive and negative effects.	CO 1
6	A university plans to introduce a new interdisciplinary course on Artificial Intelligence (AI) that appeals to students from diverse academic backgrounds such as computer science, biology, economics, and philosophy.Considering the diverse academic backgrounds of the students, how should the AI course be structured to provide a comprehensive yet accessible introduction to AI? What foundational topics must be included to ensure that students with varying levels of technical expertise can understand and appreciate the significance of AI?	Apply	—	CO 1
7	Should there be limits on the role AI plays in society, particularly in sensitive areas like surveillance, healthcare, and criminal justice? Who should decide these limits?	Understand	The learner will **recall** the potential roles of AI in sensitive areas and**understand** the need for limits on AI's role in these domains.	CO 1

8	To what extent should intelligent agents be autonomous? Should there always be a human "in the loop," and in what situations might full autonomy be justified?	Understand	The learner will **recall** the current levels of autonomy in intelligent agents and**understand** the implications of having a human "in the loop" versus allowing full autonomy.	CO 1
9	Imagine a company is developing an intelligent virtual assistant that can handle a wide range of customer service tasks, from simple information retrieval to complex troubleshooting.What characteristics should the intelligent virtual assistant possess to effectively handle diverse customer service tasks? How can the assistant be designed to balance autonomy with user control to ensure a satisfactory and efficient user experience?	Apply	—	CO 1
10	Suppose a team of researchers is working on developing AI algorithms to detect fraudulent transactions in real-time in a financial institution. The challenge lies in distinguishing between legitimate but unusual transactions and actual fraud.What problem-solving approaches should be employed to develop effective AI algorithms for real-time fraud detection?	Apply	—	CO 1
PART-B LONG ANSWER QUESTIONS				

1	Define in your own words: (a) intelligence, (b) artificial intelligence, (c) agent, (d) rationality, (e) logical reasoning.	Remember	—	CO 1
2	Is AI a science, or is it engineering? Or neither or both? Explain.	Understand	The learner will **recall** the fundamental aspects of AI and**understand** the arguments for considering AI as a science, engineering, or a combination of both.	CO 1
3	What is Turing Test? How does the Turing Test evaluate a machine's ability to exhibit intelligent behavior equivalent to, or indistinguishable from, that of a human?Explain briefly.	Understand	The learner will try to **recall** the definition and purpose of the Turing Test and **understand** how it assesses a machine's ability to exhibit intelligent behavior by comparing its responses to those of a human in a conversational setting.	CO 1
4	Define Artificial Intelligence and explain various applications of it.	Understand	The learner will **recall** the definition of Artificial Intelligence and **understand** its various applications.	CO 1
5	What are the differences between narrow AI, general AI, and superintelligent AI in terms of technological requirements and potential impact?	Remember	—	CO 1
6	What are the examples of Artificial Intelligence?Explain the term Artificial Intelligence in different dimensions.	Understand	The learner will **recall** the definition of Artificial Intelligence and **understand** the term Artificial Intelligence across different dimensions.	CO 1
7	What is an intelligent agent in the context of artificial intelligence, and how does it function?	Remember	—	CO 1

8	Explain with the help of diagram different types of intelligent agent in accordance to their degree of perceived intelligence and capabilities.	Understand	The learner will **identify** the different types of intelligent agents and **explain** how to illustrate these agents with diagrams.	CO 1
9	What does PEAS stand for and why is it important?	Remember	—	CO 1
10	Illustrate examples of PEAS descriptions for different types of agents, such as a self-driving car, a chess-playing robot, or a virtual personal assistant.	Understand	The learner will try to **recall** the concept of PEAS descriptions for intelligent agents and **understand** how to apply these descriptions to various types of agents.	CO 1
11	Explain the properties of task environment.	Understand	The learner will try to **recall** the key properties of a task environment, and then **understand** how these properties impact the design and functionality of intelligent agents.	CO 1
12	What defines an intelligent agent in artificial intelligence, and what are its core characteristics? Explain briefly.	Understand	The learner will try to **recall** the definition of an intelligent agent in artificial intelligence, and then **understand** its core characteristics.	CO 1
13	What are the primary capabilities of intelligent agents, and how do these capabilities enable them to perform complex tasks autonomously?	Remember	—	CO 1
14	What is problem solving?What are the components are required to solve the problem? Explain briefly.	Understand	The learner will try to **recall** the concept of problem solving and **understand** the essential components required to address a problem.	CO 1

15	What are the key advantages of using intelligent agents in various applications, such as automation, data analysis, and customer service?	Remember	—	CO 1
16	Define and explain some of the main disadvantages or challenges associated with deploying intelligent agents, especially in critical or sensitive applications?	Remember	—	CO 1
17	Define Artificial Intelligence and outline few advantages and disadvantages.	Understand	The learner will **recall** the definition of Artificial Intelligence and **understand** its advantages and disadvantages.	CO 1
18	"Surely computers cannot be intelligent—they can do only what their programmers tell them." Is the latter statement true, and does it imply the former? Justify.	Understand	The learner will try to **recall** the statement that computers can only do what their programmers tell them, and **understand** whether this implies that computers cannot be intelligent.	CO 1
19	How could introspection—reporting on one's inner thoughts—be inaccurate? Could I be wrong about what I'm thinking? Discuss.	Understand	The learner will try to **recall** the concept of introspection and **understand** how it can lead to inaccuracies in reporting one's inner thoughts.	CO 1
20	Define the following terms: a) act humanly b) think humanly c) act ratioanlly d) act rationally	Remember	—	CO 1
PART-C SHORT ANSWER QUESTIONS				
1	What do you understand by Artificial Intelligence?	Remember	—	CO 1
2	Define Artificial Intelligence and what is the need of AI?	Remember	—	CO 1
3	Can Machine Think? how.	Remember	—	CO 1
4	What is Turing test?	Remember	—	CO 1

5	List various approaches of Artificial Intelligence.	Remember	—	CO 1
6	What are the advantages and disadvantages of Artificial Intelligence?	Remember	—	CO 1
7	Give some real-world applications of AI.	Remember	—	CO 1
8	How Artificial intelligence, Machine Learning, and Deep Learning differ from each other?	Remember	—	CO 1
9	What is the intelligent agent in AI, and where are they used?	Remember	—	CO 1
10	What is Strong AI, and how is it different from the Weak AI?	Remember	—	CO 1
11	What are the different components of the Expert System?	Remember	—	CO 1
12	What is the use of computer vision in AI?	Remember	—	CO 1
13	What do you mean by knowledge representation in AI?	Remember	—	CO 1
14	List the salient features of an agent.	Remember	—	CO 1
15	Give any two definitions of AI .	Remember	—	CO 1
16	What are the benefits of Machine Learning?	Remember	—	CO 1
17	What is agent and explain the structure of an agent.	Remember	—	CO 1
18	What do you mean by PEAS?	Remember	—	CO 1
19	Comapre between Simple reflex agent and model based reflex agent.	Understand	The learner will try to **recall** then concept of different types of agent and then **comapre** between simple reflex agent and model based agent.	CO 1

20	Mention the steps to slove a problem using Artificial Intelligence.	Remember	—	CO 1
MODULE II				
PRODUCTION SYSTEMS				
PART-A PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1	What are the challenges associated with defining the state space for problems with large or infinite states, such as chess or Go? How can these challenges be addressed to ensure effective search and solution finding?	Understand	The learner will try to **identify** the challenges of defining state spaces for problems with large or infinite states and then **interpret** strategies for overcoming these challenges to enable efficient search and problem-solving.	CO 2
2	In a production system with a large number of rules, how can the system efficiently manage rule selection and application to avoid combinatorial explosion? What methods can be employed to optimize rule execution?	Understand	The learner will **explain** how a production system can efficiently manage rule selection and application in the presence of a large rule set, and **describe** methods to optimize rule execution to prevent combinatorial explosion.	CO 2
3	How do you handle uncertainties and incomplete information when modeling real-world problems for AI applications? What strategies can be implemented to ensure robust problem-solving in unpredictable environments?	Apply	The learner will **demonstrate** how to handle uncertainties and incomplete information in AI models for real-world problems and **apply** strategies that ensure robust problem-solving in unpredictable environments.	CO 2
4	Suggest approaches for incorporating learning mechanisms into a production system to improve its adaptability over time.	Understand	The learner will **describe** approaches for incorporating learning mechanisms into a production system and **interpret** to enhance its adaptability over time.	CO 2

5	A robot needs to navigate through a complex warehouse environment to pick items from shelves. The warehouse layout is not fixed, as new shelves are frequently added and items are often moved.In a constantly changing environment like this warehouse, how should the robot's navigation problem be defined as a state space search?	Apply	The learner will **apply** state space search techniques to **define** a robot's navigation problem in a dynamic warehouse environment, considering factors such as changing layouts, new shelves, and item movement.	CO 2
6	A logistics company wants to optimize the delivery routes for its fleet of trucks to minimize fuel consumption and delivery times. The trucks operate in a city with varying traffic conditions, road closures, and delivery priorities.Given the dynamic nature of urban traffic and the need for real-time decision-making, how can the problem of route optimization be effectively represented as a state space search?	Apply	The learner will **apply** state space search techniques to represent and **solve** the route optimization problem for a logistics company	CO 2
7	An automated customer service chatbot is designed to handle a wide range of customer inquiries, from account issues to technical support. The chatbot must operate efficiently, providing accurate responses without significant delays.In designing the rule base for the chatbot, how should the production system be structured to handle a diverse set of inquiries efficiently?	Apply	The learner will **apply** production system design principles to structure an efficient rule base for an automated customer service chatbot and **solve** diverse range of inquiries accurately and without delays.	CO 2

8	Imagine a financial institution is developing an AI system to predict stock market trends. The market is highly volatile and influenced by numerous unpredictable factors, including global events, political changes, and economic indicators.Considering the problem characteristics such as volatility, non-linearity, and external influences, what approach should the AI system use to model and predict stock market trends?	Apply	The learner will **apply** appropriate AI modeling approaches to predict stock market trends for a financial institution and **solve** diverse range of financial problems.	CO 2
9	Suppose a manufacturing plant uses a production system to automate quality control. The system needs to detect defects in products on an assembly line and make real-time decisions to sort or discard defective items.How should the production system be designed to handle real-time defect detection and decision-making on a fast-moving assembly line?	Apply	The learner will **apply** production system design principles to **create** system capable of real-time defect detection and decision-making on a fast-moving assembly line in a manufacturing plant.	CO 2
10	If a drone delivery service relies on a search program to find the shortest path through a city's airspace while avoiding restricted zones and minimizing energy consumption. Then considering the constraints of restricted zones, varying wind conditions, and energy limitations, what are the primary challenges in designing a search program for pathfinding?	Apply	The learner will **apply** pathfinding and search algorithms to design a program for a drone delivery service and **solve** various challenges such as restricted zones, varying wind conditions, and energy limitations.	CO 2

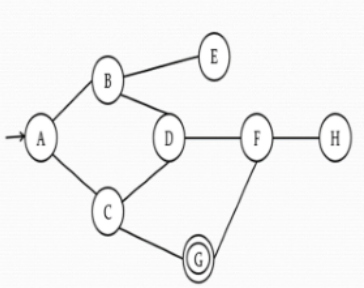
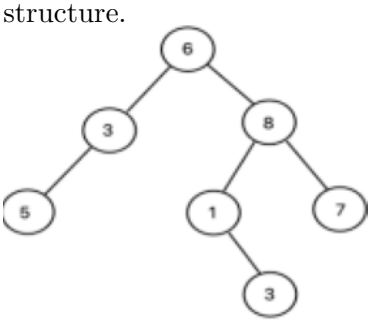
PART-B LONG ANSWER QUESTIONS				
1	What is a state space? List and explain the key components that make up a state space search when defining a problem.	Understand	The learner will **recall**the definition of a state space and **understand** the key components involved in state space search when defining a problem.	CO 2
2	Explain how a problem can be represented as a state space search. What are the advantages and disadvantages of this representation, and how does it help in formulating a solution strategy?	Understand	The learner will **recall** how a problem can be represented as a state space search and **identify** the advantages and disadvantages of this representation.	CO 2
3	What is a Production System? List and explain different classes of production system.	Understand	The learner will **recall**the concept of production systems and **identify** the different classes of production systems	CO 2
4	Describe how a production system works in solving a problem. Illustrate with the help of an example.	Understand	The learner will **recall** the functioning of a production system in solving a problem and **understand** its application by illustrating with an example.	CO 2
5	Explain the primary characteristics of problems that are solved using AI search techniques.	Understand	The learner will try to **recall** the primary characteristics of problems addressed by AI search techniques and **understand** how these characteristics influence the selection and application of search methods.	CO 2
6	Explain the distinct characteristics of a production system.	Understand	The learner will **recall** the distinct characteristics of a production system and **understand** how these features differentiate it from other problem-solving approaches.	CO 2

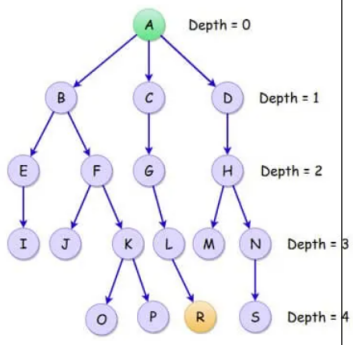
7	List and explain some of the common issues encountered in the design of search programs. What challenges might arise when implementing these search algorithms?	Understand	The learner will try to **recall** some common issues encountered in the design of search programs and **understand** the challenges that arise when implementing search algorithms.	CO 2
8	Explain the main challenges in designing effective search programs in AI.Provide examples to support your explanation.	Understand	The learner will try to **recall** the main challenges in designing effective search programs in AI and **Demonstrate** how these challenges impact the development and performance of search algorithms.	CO 2
9	Define problem. Explain the state space representation method of a problem with an example.	Understand	The learner will try to **recall** the definition of a problem and **Demonstrate** the state space representation method used to model it.	CO 2
10	Discuss water jug problem using production system with appropriate solution.	Apply	The learner will try to **recall** the water jug problem and **solve** it using a production system.	CO 2
11	Discuss the different characteristics of the problem which need to be analysed to select an appropriate method for solving.	Understand	The learner will try to **recall** the various characteristics of a problem that need to be analyzed and **understand** how these characteristics influence the selection of an appropriate method for solving it.	CO 2
12	You are given 2 jugs of cap 4L and 3L each. Neither of the jugs have any measuring markers on them. There is a pump that can be used to fill jugs with water. How can you get exactly 2L of water in 4L jug? Formulate the problem in state space and draw complete diagram.	Understand	The learner will try to **recall** the water jug problem and **demonstrate** with the help of diagram.	CO 2

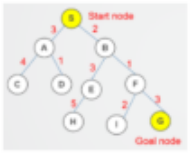
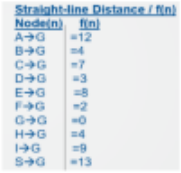
13	Illustrate the 8-puzzle problem using standard formulation.	Understand	The learner will try to **recall** the 8-puzzle problem and **demonstrate** its standard formulation by illustrating the problem with a detailed diagram.	CO 2
14	Three missionaries and three cannibals want to cross a river. There is a boat on their side of the river that can be used by either one or two person. How should they use this boat to cross the river in such a way that cannibals never outnumber missionaries on either of the river? If the cannibals ever outnumber the missionaries (on either bank) then the missionaries will be eaten. How can they all cross over without anyone being eaten? Formulate the state space representation and find the solution.	Understand	The learner will try to **recall** the missinaries and cannibals problem and **demonstrate** its standard formulation by illustrating the problem with state space search.	CO 2
15	How will you measure the performance of search algorithm?	Remember	—	CO 2
16	What are the four components to define a problem? Define them.	Remember	—	CO 2
17	Why problem formulation must follow goal formulation?	Remember	—	CO 2
18	What is Artificial Intelligence? List and explain various problem Characteristics.	Understand	The learner will **recall** the definition of Artificial Intelligence and **identify** various problem characteristics by listing and explaining key features such as complexity, state space, goal formulation, and constraints.	CO 2

19	What is state space search? Explain with the help of an example.	Understand	The learner will try to **recall** the concept of state space search and **identify** how it is applied by explaining the process with an example.	CO 2
20	Define state space search. Formulate the state space representation for the given problems: i) The vacuume world problem ii) Pegs and Disks problem. iii) 8-puzzle problem.	Understand	The learner will try to **recall** the state space representation and **understand** how to define it for various examples.	CO 2
PART-C SHORT ANSWER QUESTIONS				
1	What is a state space in the context of search algorithms?	Remember	—	CO 2
2	Define the term ”initial state” in state space search.	Remember	—	CO 2
3	What is a production system in artificial intelligence?	Remember	—	CO 2
4	Define a ”production rule” in the context of production systems.	Remember	—	CO 2
5	What is meant by the term ”problem space” in problem-solving?	Remember	—	CO 2
6	What does ”solution space” refer to in the context of problem characteristics?	Remember	—	CO 2
7	What do you mean by the term ”rule-based system”?	Remember	—	CO 2
8	Define ”working memory” in a production system.	Remember	—	CO 2
9	Define optimality, completeness in the context of search algorithms.	Remember	—	CO 2
10	What is the role of inference rules in a production system?	Remember	—	CO 2
11	Define rule execution in the context of production systems.	Remember	—	CO 2

12	What do you mean by production cycle.	Remember	—	CO 2
13	What do you understand by problem formulation in problem-solving?	Remember	—	CO 2
14	Define state representation in the context of problem characteristics.?	Remember	—	CO 2
15	What is conflict resolution in a production system?	Remember	—	CO 2
16	What does production system architecture refer to?	Remember	—	CO 2
17	Define branching facto" in the context of search programs.	Remember	—	CO 2
18	What does heuristic function mean in the design of search algorithms?	Remember	—	CO 2
19	What is the meaning of search depth in search algorithms?	Remember	—	CO 2
20	How does a state space search algorithm determine if a goal state has been reached?	Remember	—	CO 2

MODULE III				
PROBLEM-SOLVING METHODS AND KNOWLEDGE REPRESENTATION				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				
1	Explain the Breadth-First Search (BFS) algorithm and provide its pseudocode. Using BFS, find the shortest path from node A to node G in the given graph where nodes are labeled from A to H. Clearly illustrate each step of the BFS traversal with appropriate diagrams and data structures at each stage. 	Apply	The learner will try to **understand** uninformed search and **solve** the given problem using breadth first search technique.	CO 3
2	What is Depth First Search? Write the algorithm for DFS. For the given tree apply depth first search traversal algorithm to find the shortest path from 6 to 7. While traversing the tree neatly draw all the steps with appropriate data structure. 	Apply	The learner will try to **understand** uninformed search and **solve** the given problem using breadth depth first search technique.	CO 3

3	Describe the Iterative Deepening Depth-First Search (IDDFS) algorithm. Provide its algorithm and discuss two advantages and two disadvantages. Given the following tree structure, use IDDFS to find the shortest path from node A to node R. Illustrate each step of the traversal process, clearly showing the data structures used. 	Apply	The learner will try to **understand** uninformed search and **solve** the given problem using iterative deepening depth first search technique.	CO 3

4	How does the Best-First Search algorithm prioritize node exploration, and how does it differ from other search algorithms like Depth-First Search and Breadth-First Search in terms of efficiency and heuristic usage? Apply Best first search on the given tree to find the shortest path from S to G and calculate the total path cost. [Note: Here straightline distances are given from each node to the goal node .]   	Apply	The learner will try to **understand** informed search and **solve** the given problem using Best first search technique.	CO 3

5	Imagine an AI-based travel planner aims to suggest the most scenic route for road trips across different states, balancing travel time and scenic value. The planner must use available data on road conditions, scenic spots, and user preferences.What heuristics can be developed to guide the search for the most scenic route that also minimizes travel time? Discuss the trade-offs between heuristic accuracy and computational efficiency in this context.	Understand	The learner will try to **recall** the AI-based travel planner's goal of suggesting the most scenic route while balancing travel time and scenic value, and **demonstrate** the heuristics that can be developed to guide the search.	CO 3
6	Represent the following facts in predicate logic: "All humans are mortal," "Socrates is a human." Demonstrate how these representations can be used to infer that "Socrates is mortal." What are the advantages and challenges of using predicate logic for knowledge representation in AI?	Apply	The learner will try to **understand** the facts and **solve** the problem using in predicate logic.	CO 4
7	Consider a knowledge base representing a hierarchy of animals, where "Birds are animals," "Penguins are birds," and "Penguins cannot fly." How can instance relationships (e.g., "Tweety is a penguin") and ISA relationships be represented in predicate logic to infer valid conclusions about Tweety's characteristics?	Apply	The learner will try to **understand** the facts and **solve** the problem using in predicate logic.	CO 4

8	Using the resolution method, prove the following: "All men are mortal," "Socrates is a man," therefore, "Socrates is mortal." Discuss the strengths and limitations of the resolution method in automated theorem proving.	Apply	The learner will try to **understand** the facts and **solve** the problem using resolution method in predicate logic.	CO 4
9	A knowledge-based system for medical diagnosis needs to represent facts such as "Patients with high fever and cough might have the flu" and "Patients with flu need rest and fluids." How can these medical facts be represented in predicate logic to enable automated reasoning? Discuss the benefits and limitations of using predicate logic for representing and inferring medical knowledge in the system.	Apply	The learner will try to **understand** the facts and **solve** the problem using predicate logic.	CO 4
10	Suppose a smart home system is designed to automate various household functions based on rules such as "If it is evening and the room is dark, turn on the lights." How can computable functions and predicates be utilized in the smart home system to represent and automate these rules? Discuss the design of a logic-based framework that allows dynamic decision-making based on sensor inputs and user preferences.	Understand	The learner will try to **recall** the rule in the context of a smart home system and **understand** how computable functions and predicates can be utilized to represent and automate these rules.	CO 4

PART-B LONG ANSWER QUESTIONS				
1	What are uninformed search strategies. List and describe the main types of uninformed search strategies and their key characteristics.	Remember	—	CO 3
2	Compare and contrast uninformed and informed search strategies. How do they differ in terms of their approach to exploring the search space, and in what situations is one preferred over the other?	Understand	The learner will try to **recall** the differences between uninformed and informed search strategies and then **understand** their respective approaches to exploring the search space.	CO 3
3	Write A* algorithm. Explain with an example.	Understand	The learner will try to **recall** the A* algorithm and **demonstrate** how it works by explaining its steps with an example.	CO 3
4	What are local search algorithms? Identify and describe the main types of local search algorithms used to solve optimization problems.	Remember	—	CO 3
5	Explain the following uniformed search strategies with the help of example. i) Iterative deepening depth first search ii) Bidirectional search	Understand	The learner will try to **recall** the concept of uniformed search strategies then **demonstrate** how each strategy works.	CO 3
6	Explain Means-Ends Analysis Algorithm with suitable example.	Understand	The learner will try to **recall** the concept of Means-Ends Analysis algorithm and **understand** how it is applied by explaining its steps with a suitable example.	CO 3

7	What is backtracking search in AI? Describe the fundamental principles of backtracking and how it is applied to problem-solving.	Understand	The learner will try to **recall** the concept of backtracking search in AI and **understand** its fundamental principles by describing how it systematically explores possible solutions to a problem.	CO 3
8	Write AO* algorithm. Explain with an example.	Understand	The learner will try to **recall** the AO* algorithm and **demonstrate** how it works by explaining its steps with an example.	CO 3
9	Discuss BFS and DFS with the help of an example. Also discuss the advantages and disadvantages.	Understand	The learner will try to **recall** the concepts of Breadth-First Search (BFS) and Depth-First Search (DFS) and **demonstrate** their application by discussing each with an example.	CO 3
10	Discuss hill climbing algorithm. What are the disadvantages of the algorithm.	Understand	The learner will try to **recall** the hill-climbing algorithm and **demonstrate** its working principles and application.	CO 3
11	What is predicate logic, and how is it used to represent simple facts in AI? Describe the basic components of predicate logic, including predicates, terms, and quantifiers.	Understand	The learner will try to **recall** the definition of predicate logic and **understand** how it is used to represent simple facts in AI.	CO 4
12	Define instance and ISA relationships in predicate logic. How are these relationships represented in logical statements? Provide examples to illustrate.	Understand	The learner will try to **recall** the definitions of instance and ISA relationships in predicate logic and **understand** how these relationships are represented in logical statements.	CO 4

13	Describe the significance of computable functions and predicates in AI. How do they contribute to the formulation and solving of problems within a logical framework?	Understand	The learner will try to **recall** the significance of computable functions and predicates in AI and **understand** how they contribute to formulating and solving problems within a logical framework.	CO 4
14	Explain the importance of well-formed formulas (Wff) in predicate logic. How do the properties of Wff ensure the correctness and consistency of logical statements?	Understand	The learner will try to **recall** the importance of well-formed formulas (Wff) in predicate logic and **understand** how the properties of Wff ensure the correctness and consistency of logical statements.	CO 4
15	Discuss the role of clausal forms in logic. Provide examples to illustrate the conversion process.	Understand	The learner will try to **recall** the role of clausal forms (CNF and DNF) in logic and **demonstrate** the process of converting logical statements into clausal forms.	CO 4
16	Convert the following statements into predicate logic using appropriate connectives: i) All students like football. ii)Some student like football. iii)Every person has a father. iv)There is a man and he is the father of Ram. v)All dancers love to dance. vi)Everyone who sings and plays an instrument loves to dance. vii)Ram teaches math if and only if Ram doesnot teach java.	Apply	The learner will try to **recall** the process of converting natural language statements into predicate logic using appropriate logical connectives and **construct** various statements formally.	CO 4

17	Convert the following predicate logic formula into its Prenex Normal Form: $\neg\forall x\exists y(P(x,y)\vee\neg\exists z Q(y,z))$ Explain each step of your conversion process, including any necessary transformations to handle negations and quantifiers.	Apply	The learner will try to **demonstrate** the concept of predicate logic and then **construct** the problem to its equivalent prenex normal form.	CO 4
18	Convert the following predicate logic formula into its Conjunctive Normal Form (CNF): $\neg(P(x)\vee\neg(Q(x)\wedge R(x)))$ Explain each step of your conversion process, including any necessary transformations to handle negations and connectives.	Apply	The learner will try to **demonstrate** the concept of predicate logic and then **construct** the problem to its equivalent conjuctive normal form.	CO 4
19	Convert the following predicate logic formula into its Conjunctive Normal Form (CNF): $\forall x\exists y(P(x,y)\wedge\neg Q(y)\vee R(x))$ Explain each step of your conversion process, including any necessary transformations to handle negations and quantifiers.	Apply	The learner will try to **demonstrate** the concept of predicate logic and then **construct** the problem to its equivalent conjuctive normal form.	CO 4
20	What is resolution in predicate logic? Explain how the resolution process is used to infer conclusions from a set of logical statements.	Understand	The learner will try to **recall** the concept of resolution in predicate logic and **understand** how the resolution process is applied to infer conclusions from a set of logical statements.	CO 4
PART-C SHORT ANSWER QUESTIONS				
1	What is a problem-solving method?	Remember	—	CO 3
2	Define ”algorithm” in the context of problem-solving methods.	Remember	—	CO 3
3	What does ”search space” refer to in problem-solving?	Remember	—	CO 3

4	Define blind search.	Remember	—	CO 3
5	What is uniform cost search in uninformed search methods?	Remember	—	CO 3
6	Define "A* search" in the context of informed search strategies.	Remember	—	CO 3
7	What is a "heuristic" in problem-solving?	Remember	—	CO 3
8	Define heuristic function in the context of search algorithms.	Remember	—	CO 3
9	Define backtracking algorithm.	Remember	—	CO 3
10	Define time and space complexity in the context of search algorithms.	Remember	—	CO 3
11	What is a predicate in predicate logic?	Remember	—	CO 4
12	Define atomic formula in predicate logic.	Remember	—	CO 4
13	What does "ISA relationship" represent in predicate logic?	Remember	—	CO 4
14	Define instance relationship.	Remember	—	CO 4
15	Define "well-formed formula" (Wff).	Remember	—	CO 4
16	What does conjunctive normal form(CNF) refer to?	Remember	—	CO 4
17	What is conversion to clausal form?	Remember	—	CO 4
18	Define transformation to CNF.	Remember	—	CO 4
19	What is "resolution" in predicate logic?	Remember	—	CO 4
20	Define resolution principle.	Remember	—	CO 4
MODULE IV				
PLANNING AND LEARNING				
PART A- PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS				

1	If an AI-based robot is designed to perform tasks in a warehouse, such as picking up items, avoiding obstacles, and delivering them to specific locations. Then how can state-space search be used to plan the sequence of actions the robot should take? What are the challenges of representing the problem in a state-space framework, and how can the robot's actions be optimized to minimize time and avoid collisions?	Apply	The learner will try to **apply** state-space search techniques to **plan** and optimize the sequence of actions for a warehouse robot, addressing challenges in representing the problem and minimizing time while avoiding collisions.	CO 5
2	Imagine you are developing an AI system to manage the tasks of a smart home, such as cooking, cleaning, and managing energy consumption. Apply the principles of partial-order planning to create a plan that allows these tasks to be performed concurrently where possible. Explain how you would identify independent tasks, determine constraints, and construct a plan that optimizes for time and energy efficiency.	Apply	The learner will try to **apply** partial-order planning principles to **develop** a plan for managing smart home tasks, explaining how to identify independent tasks, determine constraints, and construct a plan that optimizes for time and energy efficiency.	CO 5
3	Given a dataset of customer behaviours, how would you apply different types of learning (supervised, unsupervised, reinforcement) to develop a recommendation system?	Understand	The learner will try to **apply** different types of learning (supervised, unsupervised, reinforcement) to a dataset of customer behaviors, and **analyze** how each type contributes to developing an effective recommendation system.	CO 5

4	A self-driving car needs to learn optimal driving strategies by interacting with its environment, such as traffic conditions, road signs, and pedestrian behaviours. How can reinforcement learning be applied to enable the car to learn from these interactions and improve its driving policy over time? Discuss the key challenges in designing the reward function and managing exploration versus exploitation in a safety-critical environment.	Apply	The learner will try to **apply** reinforcement learning to enable a self-driving car to optimize its driving strategies through interactions with its environment, and **analyze** the challenges of designing the reward function and balancing exploration versus exploitation in a safety-critical context.	CO 5
5	Imagine a financial institution uses AI to predict stock prices based on historical data and market trends. How can neural networks and genetic algorithms be combined to improve the accuracy of stock price predictions?	Apply	The learner will try to **apply** neural networks and genetic algorithms to enhance the accuracy of stock price predictions, and **evaluate** how their combination improves predictive performance.	CO 5

6	A home automation system is designed to manage multiple household tasks, such as cleaning, cooking, and laundry. These tasks can be performed concurrently but must be coordinated to avoid conflicts (e.g., the oven should not be preheated while the cooking pot is on the stove).How can partial-order planning be utilized to schedule and coordinate these tasks effectively? Discuss the benefits of partial-order planning in handling tasks that can be performed in parallel and managing constraints to avoid conflicts.	Apply	The learner will try to **recall** the concept of partial-order planning and **apply** it to a home automation system managing.	CO 5
7	A smart kitchen assistant is being developed to help users prepare meals by managing a sequence of cooking tasks. The system must handle different recipes, cooking times, and user preferences.How should a plan generation system be designed to create and manage cooking plans for a smart kitchen assistant? Consider how the system should prioritize tasks, adapt to varying recipes, and handle user preferences. What challenges might arise in generating efficient and user-friendly cooking plans, and how can they be addressed?	Apply	The learner will **design** a plan generation system for a smart kitchen assistant **solve** various challenges in creating efficient and user-friendly cooking plans and proposing solutions.	CO 5

8	Imagine a social media platform wants to group users based on their interests and interactions to provide targeted content recommendations. What clustering techniques are most suitable for grouping users with similar interests and interactions on a social media platform? Discuss the challenges of clustering high-dimensional and dynamic user data. How can the quality of the clusters be evaluated, and how should the results be used to enhance user experience?	Understand	The learner will try to **recall** various clustering techniques and **understand** their application to group users on a social media platform based on interests and interactions.	CO 5
9	How would you combine neural network learning with genetic algorithms to evolve an optimal trading strategy for stock market predictions?	Understand	The learner will try to **explain** how to combine neural network learning with genetic algorithms to evolve an optimal trading strategy for stock market predictions, and **describe** the benefits of integrating these approaches.	CO 5

10	A robotic system is designed to perform complex assembly tasks in a manufacturing plant. The robot must learn to adapt its actions based on feedback from its environment to improve efficiency and accuracy. How can reinforcement learning be applied to enable the robot to learn and improve its assembly tasks over time? Discuss the design of the reward function, the balance between exploration and exploitation, and the challenges in training the robot in a real-world manufacturing environment.	Apply	The learner will **apply** reinforcement learning to enable a robotic system and **analyze** the design of the reward function, the balance between exploration and exploitation, and the challenges of training the robot in a real-world manufacturing environment.	CO 5
PART-B LONG ANSWER QUESTIONS				
1	Define the concept of state-space search in the context of planning. How does state-space search contribute to finding a solution in AI planning problems?	Remember	—	CO5
2	Explain the process of state-space search in AI planning. What are the main differences between forward and backward state-space search methods, and how do they affect the planning strategy?	Understand	The learner will try to **recall** the process of state-space search in AI planning and **understand** the main differences between forward and backward state-space search methods.	CO 5
3	In a task scheduling scenario where certain tasks can be performed concurrently, how would you apply partial-order planning to optimize the schedule?	Apply	The learner will try to **recall** the concept of partial-order planning and **apply** it to optimize a schedule in a task scheduling scenario where tasks can be performed concurrently.	CO 5

4	Illustrate how partial-order planning allows for more flexible action sequences compared to total-order planning. Why is this flexibility beneficial in dynamic environments?	Understand	The learner will try to **recall** the principles of partial-order planning and **understand** how to use them to optimize a schedule in a task scheduling scenario where tasks can be performed concurrently.	CO 5
5	Define a planning graph. What are the main components and stages involved in constructing a planning graph for a given problem?	Remember	—	CO 5
6	Illustrate the role of planning graphs in optimizing search strategies within AI planning. How do planning graphs help in identifying possible actions and states more efficiently than traditional search methods?	Understand	The learner will try to **recall** the role of planning graphs in optimizing search strategies within AI planning and **demonstrate** how planning graphs improve the efficiency.	CO 5
7	List the challenges associated with planning and acting in real-world environments. What are some typical scenarios where these challenges become prominent?	Remember	—	CO 5
8	Explain how AI systems handle the complexities of planning and acting in dynamic and unpredictable real-world environments. How do these systems integrate real-time data and adapt to changes in the environment?	Understand	The learner will try to **recall** how AI systems handle the complexities of planning and acting in dynamic and unpredictable real-world environments and **understand** how these systems integrate real-time data and adapt to changes.	CO 5
9	What are plan generation systems in AI, and what are their fundamental components?	Remember	—	CO 5

10	Discuss how plan generation systems work to create feasible plans in AI. What are the common algorithms or techniques used in these systems.	Understand	The learner will try to **recall** how plan generation systems work and **understand** the common algorithms or techniques used in these systems.	CO 5
11	What are the different types of learning in AI? Provide brief definitions for each type.	Remember	—	CO 5
12	Compare and contrast supervised learning, unsupervised learning, and reinforcement learning. How do these learning types differ in their approach to data utilization and model training?	Understand	The learner will try to **recall** the concept of different types of learning and **contrast** their distinct approaches to data utilization and model training.	CO 5
13	Define the term discovery. What are some examples of discovery techniques used in machine learning?	Remember	—	CO 5
14	Explain how discovery is utilized in AI to uncover hidden patterns in data. What is the significance of discovery processes in enhancing the capabilities of machine learning models?	Understand	The learner will try to **recall** the concept discovery is utilized in AI to uncover hidden patterns in data and **understand** the significance of discovery processes in enhancing the capabilities of machine learning models.	CO 5
15	What is clustering in machine learning? List the various clustering algorithms commonly used.	Remember	—	CO 5
16	How would you use clustering algorithms to segment customers into distinct groups based on their purchasing behaviours for targeted marketing?	Understand	The learner will try to **recall** the concept of clustering algorithms and then **demonstrate** the process of applying these algorithms for targeted marketing.	CO 5

17	What is analogy-based learning in AI? Provide an example that illustrates the concept of analogy-based reasoning.	Remember	—	CO 5
18	Discuss how analogy-based learning can be applied to solve problems in AI. What are the advantages of using analogy-based methods compared to other learning strategies?	Understand	The learner will try to **recall** how analogy-based learning can be applied to solve problems in AI and **understand** the advantages of using analogy-based methods compared to other learning strategies.	CO 5
19	Explain how neural networks and genetic algorithms are used to model and solve complex problems. What are the primary differences in their approach to learning and optimization?	Understand	The learner will try to **recall** the concept neural networks and genetic algorithms are used to model and solve complex problems and **demonstrate** the primary differences in their approach to learning and optimization.	CO 5
20	Describe how reinforcement learning works in the context of decision-making processes.	Understand	The learner will try to **recall** the significance of reinforcement learning and then **demonstrate** its application in optimizing decisions.	CO 5
PART-C SHORT ANSWER QUESTIONS				
1	What is a state-space search in planning?	Remember	—	CO 5
2	What is partial-order planning?	Remember	—	CO 5
3	Define partial-order plan.	Remember	—	CO 5
4	What does ordering constraints mean in partial-order planning?	Remember	—	CO 5
5	What is a planning graph?	Remember	—	CO 5
6	Define ”level” in a planning graph.	Remember	—	CO 5
7	What does ”plan extraction” refer to in the context of planning graphs?	Remember	—	CO 5

8	What is meant by planning in the real world?	Remember	—	CO 5
9	Define acting in the context of real-world planning.	Remember	—	CO 5
10	Define automated planning in plan generation systems.	Remember	—	CO 5
11	Define supervised learning.	Remember	—	CO 5
12	What does unsupervised learning mean?	Remember	—	CO 5
13	What is discovery in the context of machine learning?	Remember	—	CO 5
14	Define knowledge discovery.	Remember	—	CO 5
15	Define Clustering.	Remember	—	CO 5
16	What does cluster analysis mean?	Remember	—	CO 5
17	Define genetic algorithm.	Remember	—	CO 5
18	What does neural learning involve?	Remember	—	CO 5
19	What is reinforcement learning?	Remember	—	CO 5
20	What does reward signal refer to in reinforcement learning?	Remember	—	CO 5
MODULE V				
UNCERTAIN KNOWLEDGE AND REASONING				
PART A-PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)				

1	Suppose a smart assistant is designed to provide recommendations based on user preferences and evolving context, such as changing weather conditions and user activity. How can non-monotonic reasoning be applied to update recommendations as new information becomes available? Discuss the challenges and benefits of implementing non-monotonic reasoning in ensuring that the assistant adapts to changes without losing previous valid conclusions.	Understand	The learner will try to **recall** how non-monotonic reasoning can be applied to update recommendations in a smart assistant based on user preferences and evolving contexts and **demonstrate** the challenges and benefits of implementing this reasoning approach.	CO 6
2	Consider a knowledge base where rules about bird species are defined. For example, "If an animal is a bird, then it can usually fly," with exceptions for "penguins" and "ostriches." Apply default logic to represent this scenario and demonstrate how non-monotonic reasoning would handle the addition of a new rule stating that "a bird in a cage cannot fly." Show the changes in the knowledge base and reasoning process.	Apply	The learner will try to **understand** the default logic which is used to represent a knowledge base with rules and **experiment** non-monotonic reasoning handles the addition of new rules.	CO 6

3	Suppose you have a problem-solving AI that operates in a domain with rapidly changing information, such as financial markets. Apply the concept of augmenting a problem-solver with non-monotonic reasoning capabilities to enhance its decision-making process. Describe the steps involved in integrating these capabilities and provide a specific example of how this augmentation would improve the AI's performance in predicting market trends.	Apply	The learner will try to **recall** how augmenting a problem-solver with non-monotonic reasoning capabilities can enhance decision-making in rapidly changing domains, such as financial markets, and **build** the steps involved in integrating these capabilities.	CO 6
4	Given a dataset of customer purchase history, apply basic probability principles to predict the likelihood of a new customer purchasing a particular product. Use conditional probability to refine your predictions based on additional demographic information. Describe the process and rationale behind your approach.	Apply	The learner will try to **understand** the basic probability principles and **solve** by using conditional probability.	CO 6

5	An AI system is developed for speech recognition, where the goal is to transcribe spoken language into text. How can Hidden Markov Models (HMMs) be used to model and decode the sequence of spoken words from acoustic signals? Discuss the advantages of HMMs in handling speech variability and noise and consider the challenges in training and applying these models for accurate speech recognition.	Understand	The learner will try to **recall** the concept of Hidden Markov Models (HMMs) and **understand** their advantages and challenges.	CO 6
6	A financial advisory AI provides investment recommendations based on a set of rules and historical data, but market conditions can change rapidly, invalidating previous recommendations. In the context of rapidly changing financial markets, how can non-monotonic reasoning be used to update investment recommendations when new data becomes available? Discuss the advantages of non-monotonic reasoning in adapting to market fluctuations and the potential challenges in maintaining the relevance and accuracy of the recommendations.	Understand	The learner will try to **recall** the concept of non-monotonic reasoning and **understand** its advantages and challenges.	CO 6

7	Given a Bayesian network representing an e-commerce recommendation system with nodes for user preferences, product attributes, and purchase history, apply inference techniques to predict the likelihood of a user purchasing a newly introduced product. Use both exact and approximate inference methods and compare their results in terms of accuracy and computational efficiency.	Apply	The learner will try to **recall** the concept of Bayesian networks **apply** the application of inference techniques to assess the likelihood of a user purchasing a newly introduced product.	CO 6
8	An AI healthcare assistant uses probabilistic reasoning to provide personalized treatment recommendations based on patient symptoms and medical history. How can probabilistic reasoning enhance the healthcare assistant's ability to offer personalized and accurate treatment recommendations?	Apply	The learner will try to **apply** probabilistic reasoning to enhance an AI healthcare assistant's ability to offer personalized and accurate treatment recommendations, and **evaluate** how this approach improves decision-making based on patient symptoms and medical history.	CO 6

9	Suppose a traffic management system needs to predict and manage traffic flow patterns throughout the day, considering factors like rush hours and special events. How can temporal models be used to forecast and manage traffic flow patterns effectively? Discuss the challenges of incorporating time-dependent factors and dynamic events into the traffic management system and evaluate the potential benefits of using temporal models for optimizing traffic control strategies.	Understand	The learner will try to **choose** temporal models to forecast and manage traffic flow patterns, addressing challenges in incorporating time-dependent factors and dynamic events, and **evaluate** the benefits of these models for optimizing traffic control strategies.	CO 6
10	An AI-based speech recognition system must transcribe audio recordings of conversations where speakers have varying accents and speaking styles. How can Hidden Markov Models (HMMs) be applied to improve the accuracy of speech recognition in the presence of diverse accents and speaking styles? Discuss the advantages of HMMs in modelling speech sequences and the challenges of training and applying these models to achieve accurate transcription in real-world scenarios.	Understand	The learner will try to **recall** the concept of Hidden Markov Models (HMMs) and **understand** the benefits and challenges associated with HMMs in this context.	CO 6
PART-B LONG ANSWER QUESTIONS				
1	Define non-monotonic reasoning. What distinguishes non-monotonic reasoning from monotonic reasoning?	Remember	—	CO 6

2	Explain how non-monotonic reasoning can be applied to AI systems that must handle changing information or incomplete data. What are some real-world scenarios where non-monotonic reasoning is particularly useful?	Understand	The learner will try to **recall** the concept of non-monotonic reasoning and then **demonstrate** the practical applications of this approach in real-world scenarios.	CO 6
3	List and briefly describe different logical frameworks used for non-monotonic reasoning. What are the key characteristics of each framework?	Remember	—	CO 6
4	Compare and contrast default logic and circumscription as two approaches to non-monotonic reasoning. What are the key differences in how these logics handle uncertainty and exceptions, and what are their respective advantages?	Understand	The learner will try to **recall** the the principles of default logic and circumscription and then **demonstrate** the key differences in how these logics handle uncertainty and exceptions.	CO 6
5	List common implementation challenges in developing non-monotonic reasoning systems. What are some of the technical issues that need to be addressed?	Remember	—	CO 6
6	Explain how the computational complexity of non-monotonic reasoning affects the design and deployment of AI systems. What strategies can be employed to mitigate these challenges, and how do these strategies impact system performance?	Understand	The learner will try to **recall** the concept of computational complexity of non-monotonic reasoning and then **summarize** the strategies employed to address these challenges.	CO 6

7	What does it mean to augment a problem-solver? List some techniques used for this augmentation.	Remember	—	CO 6
8	Explain how augmenting a problem-solver with non-monotonic reasoning capabilities can enhance its effectiveness. Provide an example of a problem-solver that benefits from this augmentation and describe how its performance is improved.	Understand	The learner will try to **recall** the concept of augmenting a problem-solver with non-monotonic reasoning and then**demonstrate** the specific benefits of this augmentation.	CO 6
9	Define probability and its importance in reasoning under uncertainty in AI. What are some basic concepts of probability theory that are essential for AI?	Remember	—	CO 6
10	Describe how probability theory is used to manage uncertainty in AI. What are the differences between frequentist and Bayesian interpretations of probability, and how do these differences impact their use in AI models?	Understand	The learner will try to **recall** the concept of probability theory which is used to manage uncertainty and then**understand** the differences between frequentist and Bayesian interpretations of probability.	CO 6
11	What is probabilistic reasoning in AI? Identify the main types of probabilistic reasoning methods used in AI systems.	Remember	—	CO 6
12	Describe how probabilistic reasoning is applied to decision-making in AI. Why is probabilistic reasoning considered more flexible than deterministic reasoning, particularly in uncertain environments?	Understand	The learner will try to **recall** the concept of probabilistic reasoning and then**understand** why it is considered more flexible than deterministic reasoning.	CO 6

13	How would you construct a Bayesian network to diagnose a car's engine problem based on observable symptoms (like noise or smoke) and potential underlying causes (like a faulty battery or oil leak)?	Apply	The learner will try to **recall** the process of constructing a Bayesian network and **understand** how to use observable symptoms and potential underlying causes to build the network.	CO 6
14	Discuss how Bayesian networks are used to model probabilistic relationships between variables. What are the steps involved in constructing a Bayesian network for a given problem? Illustrate with the help of an example.	Understand	The learner will try to **recall** the concept of Bayesian networks and then**demonstrate** the steps involved in constructing a Bayesian network for a given problem.	CO 6
15	What are the different types of inferences that can be performed in Bayesian networks? Provide examples of each type.	Remember	—	CO 6
16	Explain the process of inference in Bayesian networks. How do exact and approximate inference methods differ and in what scenarios might one be preferred over the other?	Understand	The learner will try to **recall** the the process of performing inference in Bayesian networks and **understand** the differences between exact and approximate inference methods.	CO 6
17	Explain the following terms: a) Temporal model b) Bayesian Network	Understand	The learner will try to **recall** the definitions of temporal models and Bayesian networks and **understand** their applications in AI.	CO 6
18	Describe how temporal models are used to predict sequences of events or states over time. What challenges do temporal dependencies introduce, and how are they addressed in model design?	Understand	The learner will try to **recall** the concept of temporal models and then **demonstrate** the challenges introduced by temporal dependencies.	CO 6

19	Define Hidden Markov Models and list their core components. What are the assumptions underlying HMMs?	Remember	—	CO 6
20	Explain how Hidden Markov Models are used for sequence prediction and pattern recognition. How do HMMs handle uncertainty in the state observation process, and what are their limitations?	Understand	The learner will try to **recall** the concept of Hidden Markov Models (HMMs) and **understand** how HMMs manage uncertainty in the state observation process.	CO 6
PART-C SHORT ANSWER QUESTIONS				
1	What is non-monotonic reasoning in symbolic logic?	Remember	—	CO 6
2	Define default reasoning.	Remember	—	CO 6
3	What does ”monotonicity” refer to in the context of reasoning?	Remember	—	CO 6
4	Define computational complexity in the context of implementing non-monotonic reasoning.	Remember	—	CO 6
5	What does scalability refer to in the implementation of reasoning systems?	Remember	—	CO 6
6	What does augmenting a problem-solver mean?	Remember	—	CO 6
7	What is adaptive reasoning in problem-solving?	Remember	—	CO 6
8	Define enhancement in the context of improving a problem-solving system.	Remember	—	CO 6
9	What is probability in the context of uncertainty?	Remember	—	CO 6
10	Define random variable in probability theory.	Remember	—	CO 6
11	What is probabilistic reasoning?	Remember	—	CO 6
12	Define Baye’s theorem.	Remember	—	CO 6
13	What does posterior probability mean?	Remember	—	CO 6

14	What is a Bayesian network?	Remember	—	CO 6
15	Define ”node” in the context of Bayesian networks.	Remember	—	CO 6
16	Define marginal probability.	Remember	—	CO 6
17	What is a temporal model?	Remember	—	CO 6
18	Define ”time series” in the context of temporal models.	Remember	—	CO 6
19	Define hidden state in an HMM.	Remember	—	CO 6
20	What does ”observation sequence” mean in the context of Hidden Markov Models?	Remember	—	CO 6

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HOD CSE(AI & ML)