

ANSWER KEY IAT-1

1. (a) Describe in detail the four approaches to AI. (6)

Ans.

test.

3) compare and construct the definition of Artificial Intelligence from the following points of views Thinking Humanly Acting humanly. Thinking Rationally and Acting Rationally

→ Thinking Humanly

def: AI that tries to think like a human

Approach: studies and mimics how human think and solve problems

e.g: AI systems that try to understand human thought process like how we learn or reason

Pros and cons: can help us to understand human thinking useful for creating human-like interactions
Hard to copy the complex human brain, can be how to develop.

Acting Humanly

definition: AI that tries to behave like a human

Approach: Acts in ways that are similar to human actions and behaviours

e.g: Chatbots that talk like humans
Robots that can interact socially with people

Pros and cons: can seamlessly interact with humans, good for customer service and entertainment
many only mimic behaviour without true understanding.
can be limited to simple tasks.

Thinking Rationally

definition: AI that tries to think logically

approach: uses logic and rule to make decisions and solve problems

e.g: Expert systems that use rules to give advice or solve problems
AI that plans tasks based on logical steps

Pros and cons: effective in well-defined areas; ensure logical and consistent outcomes
can struggle with unclear problems, might be too rigid.

Acting Rationally

definition: AI that tries to act in the best way to achieve goals.

approach: optimized actions to get the best result based on goals and information

e.g → self-driving cars that navigate efficiently and safely
AI in finance that makes the best investment decisions

Pros and cons: practical and goal-focused, adapts well to changing needs
clear goals, might not always match human values ethics.

(b) What are the capabilities a computer must possess to meet the Turing test? (4)

Ans.

Capabilities a Computer must possess to meet the Turing Test

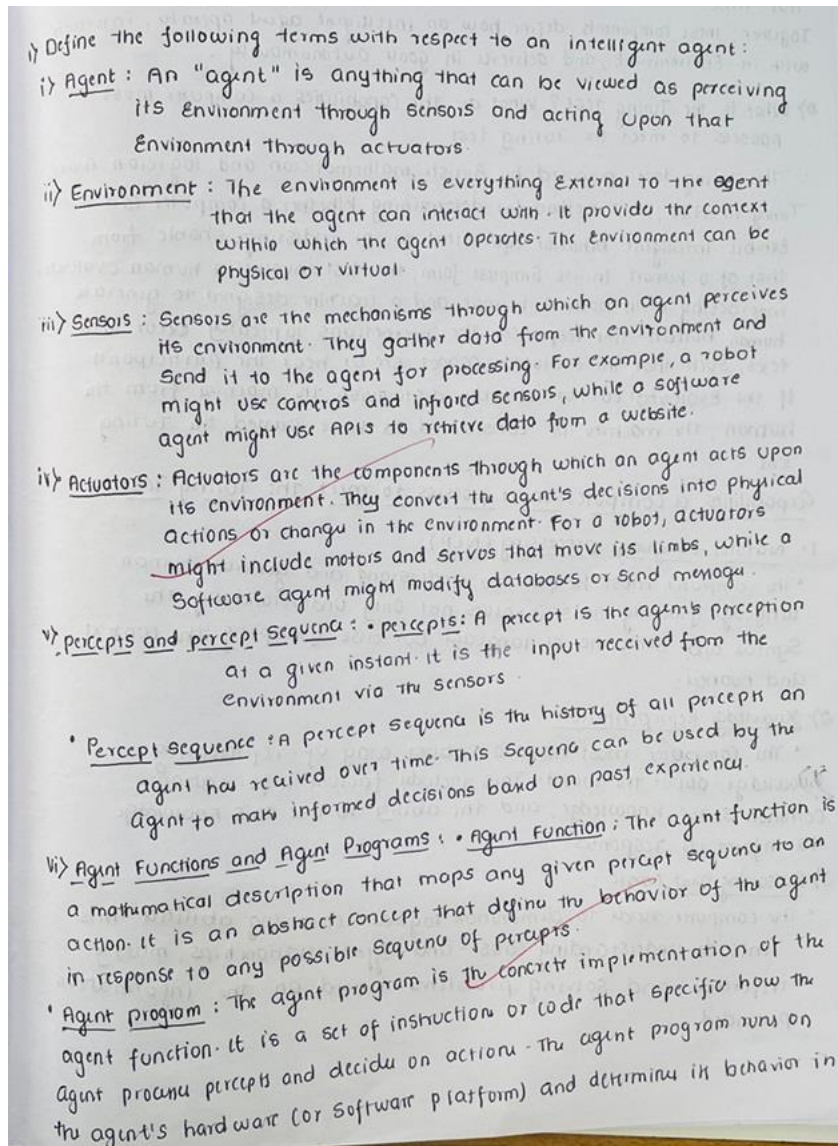
- 1) Natural Language Processing (NLP):
 - The computer must be able to understand and generate human language fluently. This involves not only understanding the syntax and semantics of language but also grasping the context and nuance.
- 2) Knowledge Representation:
 - The computer must have a robust way of representing knowledge about the world. This includes factual information, common sense knowledge, and the ability to use this knowledge to inform its responses.
- 3) Reasoning and Logic:
 - The computer needs to demonstrate logical reasoning abilities. This includes understanding cause-and-effect relationships, making inferences, and solving problems based on the information provided.

- 4) Learning and Adaptation:
 - The ability to learn from interactions and adapt responses accordingly is crucial. This might involve learning new facts, adjusting to the evaluator's style of questioning, and improving over time.
- 5) Understanding and Generating Contextual Responses:
 - The machine must understand the context of the conversation and respond appropriately. This involves maintaining coherence over a series of exchanges and recognizing when to change topics or provide elaborations.
- 6) Handling Ambiguity and Incomplete Information:
 - The computer should be able to handle ambiguous or incomplete information and still provide sensible responses, much like a human would.
- 7) Emotional Intelligence:
 - Although not a strict requirement, the ability to recognize and respond to emotional cues can enhance the believability of the machine's responses, making it seem more human-like.

Passing the Turing Test does not necessarily imply that a machine possesses true understanding or consciousness. It merely suggests that the machine's responses are sufficiently sophisticated to be indistinguishable from those of a human in the context of the

2. (a) Define the following terms with respect to an intelligent agent:
 (i) Agent, (1) (ii) Environment, (1) (iii) percepts, percept sequence, (1) (vi) Agent functions, agent programs. (1)

Ans.

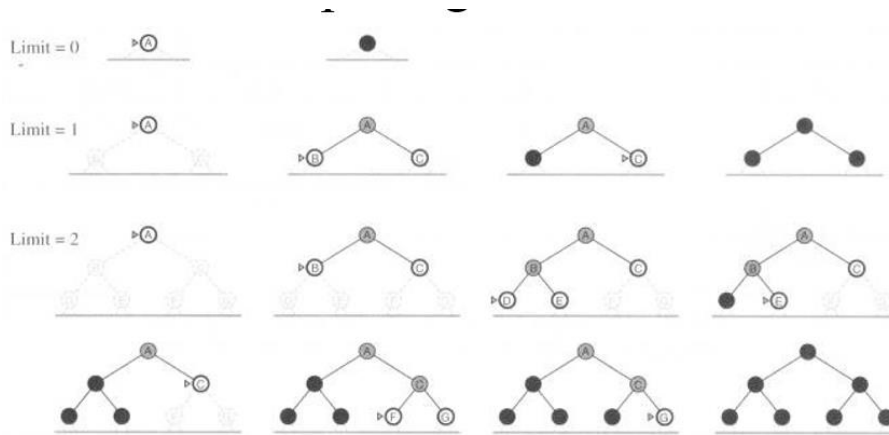


- (b) Define and compare DFS (2), BFS (2), and IDS (2).

Ans.

Breadth-first search-

- The root node is expanded first (FIFO)
- All the nodes generated by the root node are then expanded
- And then their successors and so on
- Expand shallowest unexpanded node
- *Frontier* (or fringe): nodes in queue to be explored
- *Frontier* is a first-in-first-out (FIFO) queue, i.e., new successors go at end of the queue.
- *Goal-Test* when inserted.



3. (a) Write a brief note on any three types of agent programs. (2 marks for each type)

Ans.

5) Compare and contrast the four types of agent programs. Explain in detail the properties of the task environment.

=> These are 4 types of Agent programs -

(i) Simple Reflex agents:-

Definition: Simple reflex agents act solely based on the current percept, ignoring the rest of the percept history.

Mechanism: They use condition-action rules, where a specific condition triggers a specific action.

Pros: fact and straightforward
Effective in well-defined, predictable environment

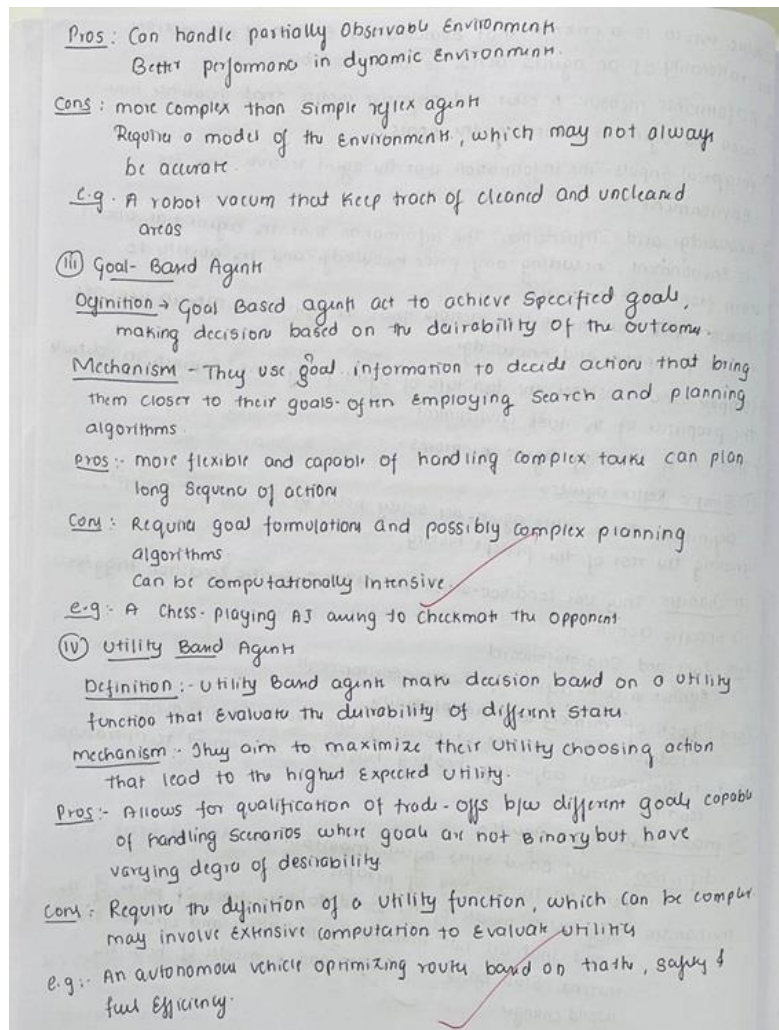
Cons: Lack of memory and adaptability.
Inadequate for complex or partially observable environment

e.g. A thermostat adjusting heating based on the current temperature reading

(ii) Model Based Reflex Agents:-

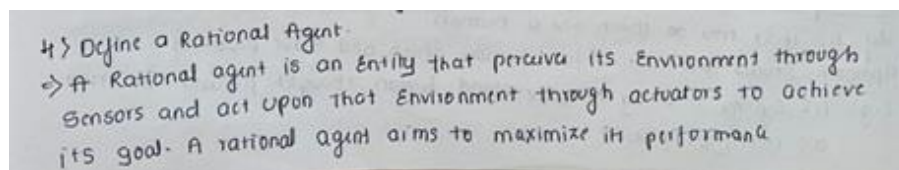
Definition: model based reflex agents maintain an internal state that depends on the history of percepts.

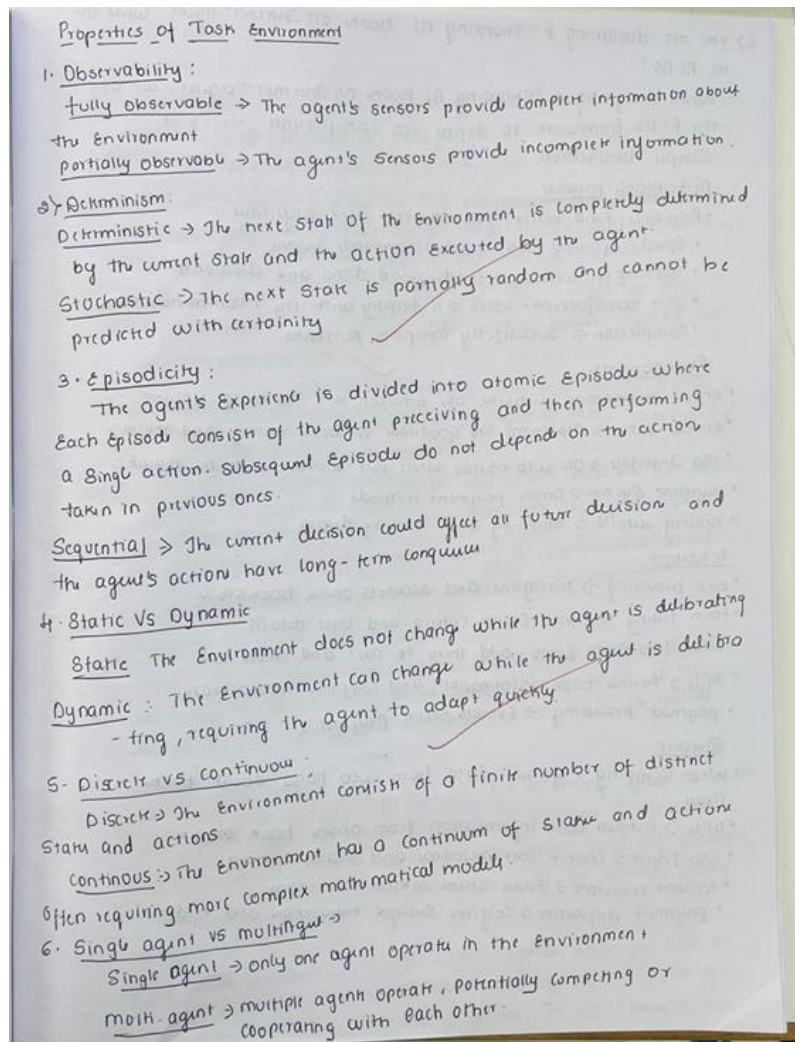
Mechanism: They use a model of the world to keep track of parts of the world that are not immediately perceptible and update the internal state based on percepts and a model of how the world changes.



(b) Define a rational agent (1). Explain in detail the properties of the task environment (3).

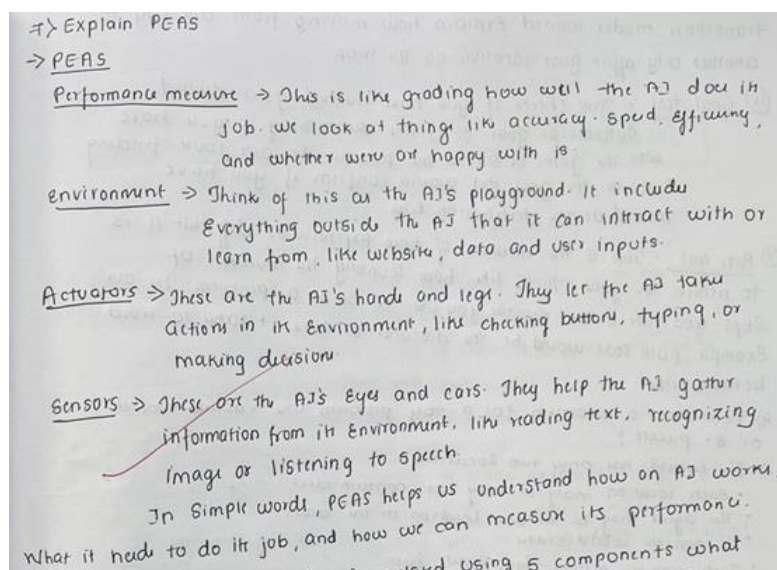
Ans.

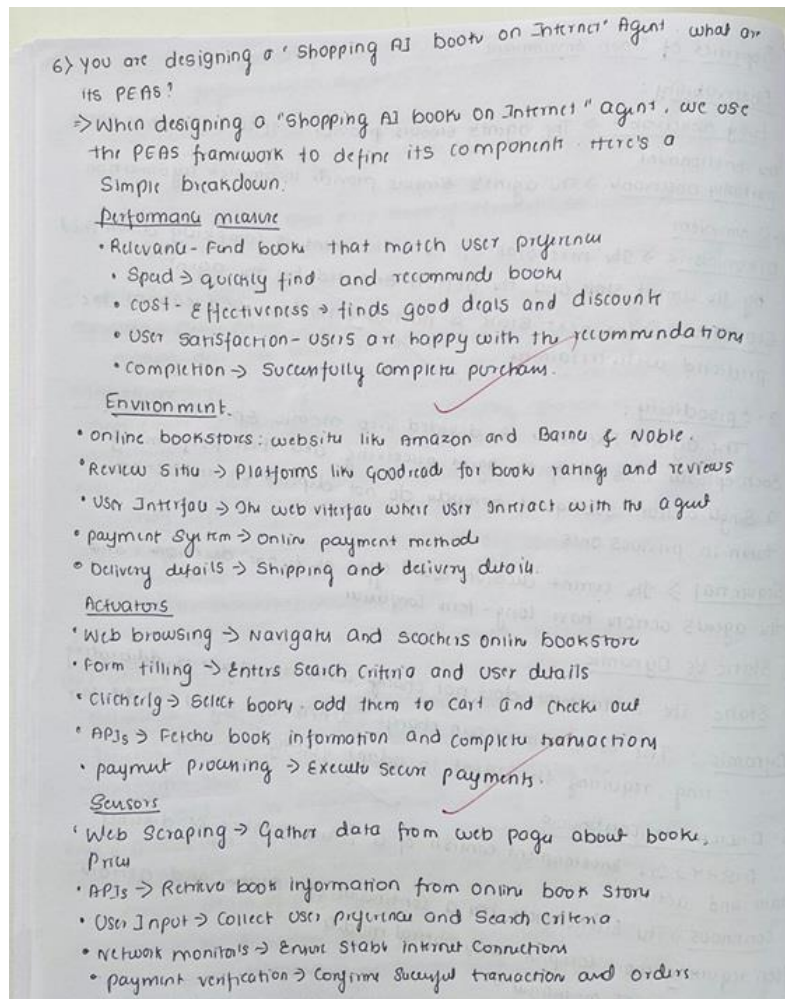




4. (a) Describe PEAS (2). You are designing a “shopping AI books on Internet” Agent (4). What are its PEAS (4)?

Ans.





5. (a) There are three missionaries and three cannibals who want to cross a river using a boat that can carry at most two people. The problem imposes certain constraints to ensure the safety of the missionaries and prevent the cannibals from outnumbering the missionaries on either side of the river at any time (10).

Ans.

Let's denote the sides as L (left) and R (right). Initially, the state is (3M, 3C, L).

1. Move 2C from L to R. New state: (3M, 1C, R).
2. Move 2C back from R to L. New state: (3M, 3C, L).
3. Move 2M from L to R. New state: (1M, 3C, R).
4. Move 1M and 1C from R to L. New state: (2M, 2C, L).
5. Move 2C from L to R. New state: (2M, 0C, R).
6. Move 2C back from R to L. New state: (2M, 2C, L).
7. Move 2M from L to R. New state: (0M, 2C, R).
8. Move 1M and 1C from R to L. New state: (1M, 3C, L).
9. Move 1M from L to R. New state: (0M, 3C, R).
10. Move 1C back from R to L. New state: (0M, 2C, L).
11. Move 2C from L to R. New state: (0M, 0C, R).

6. (a) The 8-puzzle sliding block start and goal states are given here. Using the depth-first search algorithm shows how to reach the goal state from the start state. What is the total cost (10)?

1	2	3
4		6
7	5	8

Start State

	1	2
4	6	3
7	5	8

Goal State

Ans.

Computer Science

1) The 8-puzzle block start and goal state are given here. How can DFS algorithm show how the goal state from start state? what is the total cost?

1	2	3
4		6
7	5	8

Start state

	1	2
4	6	3
7	5	8

Goal state

→

	1	2
4	6	3
7	5	3

Goal state

1	2	
4	6	3
7	5	8

4	1	2
6	3	
7	5	8

↓

1	2	3
4	6	3
7	5	8

↓

1	2	3
4		6
7	5	8

↓

1	2	3
4		6
7	5	8

Start state

The total cost is 4.