Sub:	Artificial Intelligence					Sub Code:	BCS 515 B	Branch:	CSE
Date:	30/09/2025	Duration:	90 mins	Max Marks:	50	Sem / Sec:	5 A,B,C		

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Internal Assessment Test 1 – September 2025

Sub:	**Artificial Intelligence**				Sub Code:	BCS515B	Branch:	CSE		
Date:		90 mins	Max Marks:	50	Sem/Sec:	V/ A/B/C		OBE		
	Answer any FIVE FULL Questions						MARKS	CO	RBT	
1	Describe different types of Agent Programs?						10	CO1	L2	
2	Consider a Vacuum World with two locations A and B. The vacuum cleaner can move left or right and suck dirt. Initially, location A is dirty, and location B is clean. Represent this problem as a state space search by clearly specifying: (i) the initial state, (ii) goal state(s), (iii) possible actions, and (iv) the state transition diagram.						10	CO2	L3	
3	a)Explain the difference between uninformed (blind) and informed (heuristic) search strategies in AI problem-solving. b) What are the advantages and disadvantages of each approach?						(5+5)	CO1	L2	

CI CCI HoD

4	Provide the PEAS (Performance, Environment, Actuators, Sensors) specification for a robot designed for part-picking.	10	CO2	L2
5	a) Define an agent and explain how it interacts with its environment, illustrating with a diagram. b) List and explain the five essential components of a well-defined problem.	(4+6)	CO2	L2
6	Using Greedy Best-First Search, find a path from the start node **S** to the goal node **G** in the graph. Edge costs: S–A = 2, S–B = 4, A–B = 2, A–C = 3, B–C = 5, C–G = 4. Heuristic values: h(S)=7, h(A)=6, h(B)=4, h(C)=2, h(G)=0. Show the step-by-step working of the Greedy Best-First algorithm (expand the node with smallest h) and determine the final path and its total cost.	10	CO2	L3

CI CCI HoD

Answer 1 1. Simple Reflex Agent
2. Model Reflex
3. Goal Based
4. Utility Based
5. Learning Agents

(all agents 1 marks each , Diagram and example 1 marks each)

Answer 2:

(i) Initial state:

`(A, Dirty, Clean)`

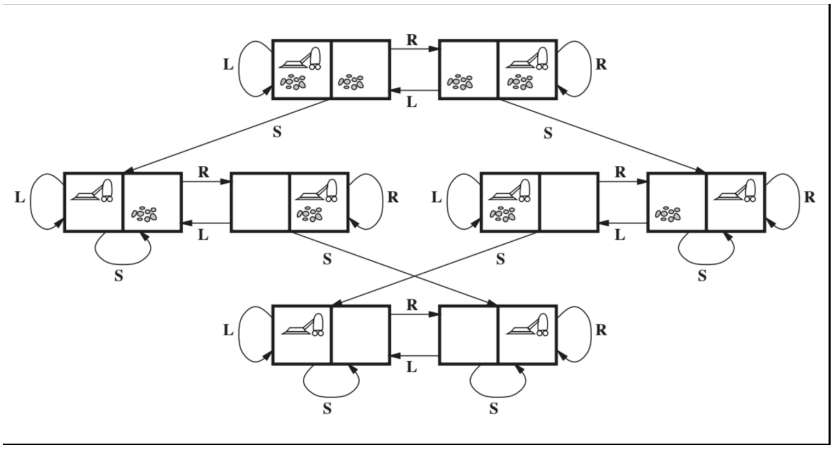
(ii) Goal state(s):

`(A, Clean, Clean)` **or** `(B, Clean, Clean)`

(iii) Actions:

- **Suck – cleans current square**
- **MoveRight – from A → B**
- **MoveLeft – from B → A**

(iv) State Transition Diagram



All parameters 1 marks , explanation 2 marks and figure is 2 marks

Answer 3-a: Uninformed (Blind) Search

- Does not use any domain-specific knowledge about the problem.
- It only knows the definition of the problem (initial state, actions, goal test).
- Explores the search space blindly until it finds a solution.
- Examples: Breadth-First Search (BFS), Depth-First Search (DFS), Uniform-Cost Search.

Informed (Heuristic) Search

- Uses additional domain knowledge (a heuristic function) to guide the search.
- A heuristic estimates how close a state is to the goal.
- Tries to explore paths that seem more promising, reducing unnecessary search.
- Examples: Greedy Best-First Search, A* Search.

Explanation 3 marks and example 1 marks each

Answer 3-b

Uninformed Search

Advantages:

1. Simple to understand and implement.
2. Works without domain knowledge.
3. Guarantees solution if one exists (for complete methods).
4. Some methods guarantee optimality (e.g., BFS, Uniform-Cost).
5. Provides a baseline to compare with heuristic methods.

Disadvantages:

1. Very inefficient for large search spaces.
2. Explores many unnecessary states.
3. High memory usage (e.g., BFS).
4. Time complexity can grow exponentially.
5. Not practical for real-world complex problems.

Informed Search

Advantages:

1. Much faster and more efficient than uninformed search.
2. Reduces number of explored nodes.
3. Can give optimal solutions with admissible heuristics (e.g., A*).
4. More practical for real-world AI problems.
5. Flexible – heuristics can be refined to improve performance.

Disadvantages:

1. Requires a good heuristic (not always easy to design).
2. Poor heuristics can mislead the search.
3. Heuristic calculation may be expensive.

4. Depends on domain knowledge availability.

5. May still fail in very large or poorly structured search spaces.

Explanation of advantages of both approaches 3 marks and disadvantages 2 marks

Answer 4

PEAS for Part-Picking Robot

1. Performance Measure (P):

- Accuracy in picking correct parts.
- Speed of picking and placing.
- Minimizing damage or errors.
- Efficient use of energy.
- Safety in operation (no collisions with humans or machines).

2. Environment (E):

- Factory floor / warehouse.
- Conveyor belts, bins, shelves, or pallets with parts.
- Dynamic environment (moving parts, other robots, human workers).
- Lighting and noise conditions.
- Possible obstacles in workspace.

3. Actuators (A):

- Robotic arm with gripper (vacuum or mechanical).
- Wheels / mobile base (if robot is mobile).
- Conveyor belt interface (if integrated).
- Display panel / alarm for human interaction.

4. Sensors (S):

- Camera / vision system for part recognition and location.
- Proximity sensors for obstacle detection.
- Force/torque sensors for handling delicate parts.

- Position sensors (encoders, gyroscope) for movement.
- RFID/barcode scanner (if parts are labeled).

All parameters 2 marks each and explanation 2 marks

Answer 5-a

Agent: An agent is anything that can perceive its environment through sensors and act upon that environment through actuators to achieve a goal.

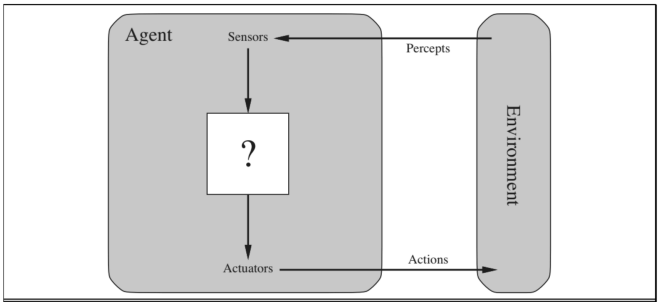


Figure 2.1 Agents interact with environments through sensors and actuators.

Explanation of concept 2 marks and figure 2 marks

Answer 5-b

Initial State
Actions
Transition Model
Goal Test
Path Cost

Each parameter is 2 marks each.

Answer 6-:

Path found by Greedy Best-First: S → B → C → G

Total cost: 13 (4+ 5+4)

Figure is 2 marks and correct path and cost 4 marks each