USN

Internal Assessment Test 1 – Nov 2024

Solution and scheme

Sub:	Artificial Intelligence					Sub Code:	BCS515B	Branch:	CSE
Date:	11/11/2024	Duration:	90 mins	Max Marks:	50	Sem/Sec:	V/A,B&C		OBE

Answer any FIVE FULL Questions

		MARKS	CO	RBT
1	a. Discuss the four categories used to define artificial intelligence. Listing Four categories (4) Explanation (2)	6	CO1	2

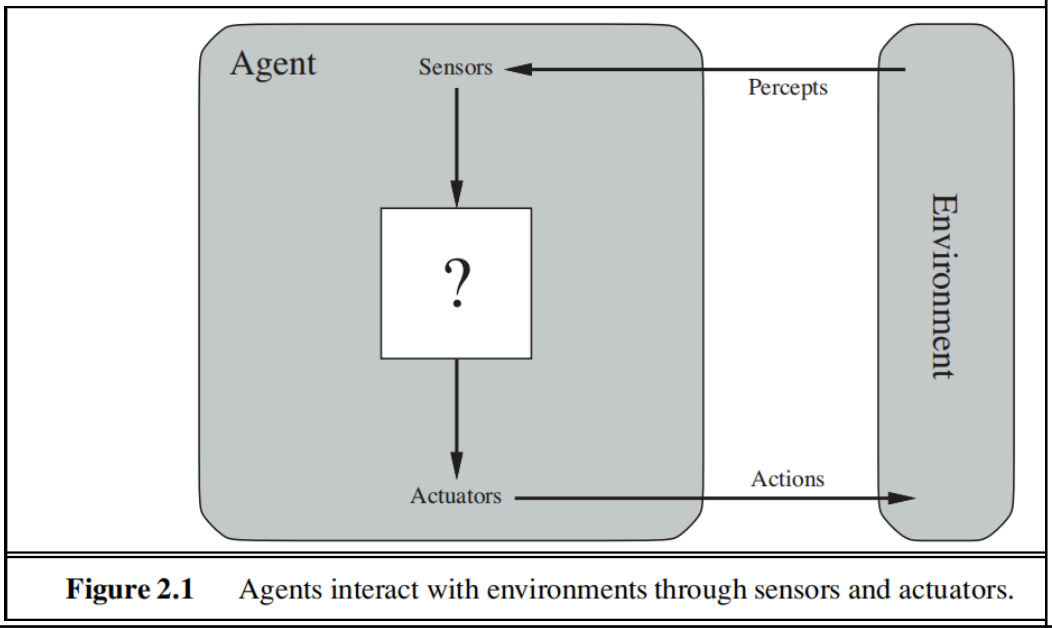
Thinking Humanly	Thinking Rationally
"The exciting new effort to make computers think . . . *machines with minds*, in the full and literal sense." (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . ." (Bellman, 1978)	"The study of mental faculties through use of computational models." (Charniak and McDermott, 1985) "The study of the computations that m it possible to perceive, reason, and act (Winston, 1992)
Acting Humanly	**Acting Rationally**
"The art of creating machines that perform functions that require intelligence when performed by people." (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991)	"Computational Intelligence is the st of the design of intelligent agents." (P *et al.*, 1998) "AI . . . is concerned with intelligent havior in artifacts." (Nilsson, 1998)

Figure 1.1 Some definitions of artificial intelligence, organized into four categories.

	b. Discuss the Turing test approach to test whether a computer has artificial intelligence Explanation (4)	4	CO1	2

A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer

The computer would need to possess the following capabilities:

	1. natural language processing to enable it to communicate successfully in English 2. knowledge representation to store what it knows or hears 3. automated reasoning to use the stored information to answer questions and to draw new conclusions 4. machine learning to adapt to new circumstances and to detect and extrapolate patterns 5. TOTAL TURING TEST- To pass the total Turing Test, the computer will need ❖ computer vision to perceive objects, and ❖ robotics to manipulate objects and move about			
2	a. What is an agent and discuss its interaction with the environment using an appropriate diagram. Explanation (3) Diagram (2)  **Figure 2.1** Agents interact with environments through sensors and actuators.	5	CO1	2
	b. Discuss the five components of a well-defined problem. Each components (1)	5	CO1	2

Problem-Solving Agent
Well-defined problems

A **problem** can be defined by five components:

- **initial state, actions, transition model, goal test, path cost.**

INITIAL STATE: The **initial state** that the agent starts in.

ACTIONS: A description of the possible **actions** available to the agent.

- Given a particular state s, ACTIONS(s) returns the set of actions that can be executed in s.
- Each of these actions is **applicable** in s.

TRANSITION MODEL: A description of what each action does is known as the **transition mod**

- A function RESULT(s,a) that returns the state that results from doing action a in state s.
- The term **successor** to refer to any state reachable from a given state by a single
- The **state space** of the problem is the set of all states reachable from the *initial state* by any sequ of actions.
- The *state space* forms a **graph** in which the nodes are states and the links between nodes are act
- A **path** in the state space is a sequence of states connected by a sequence of actions.

Problem-Solving Agent
Well-defined problems

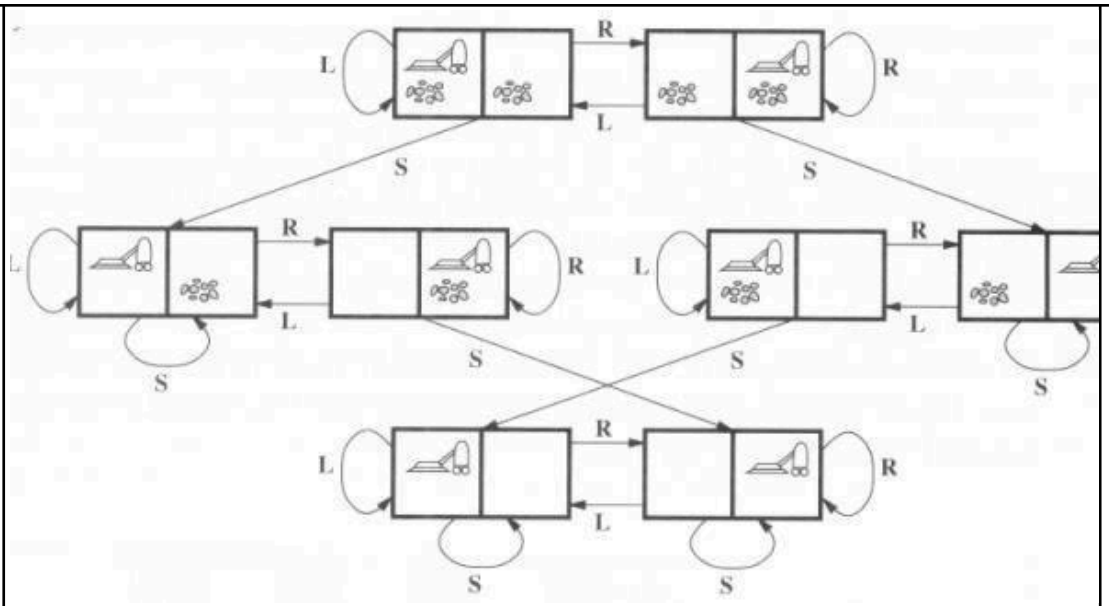
GOAL TEST: The **goal test** determines whether a given state is a goal state.

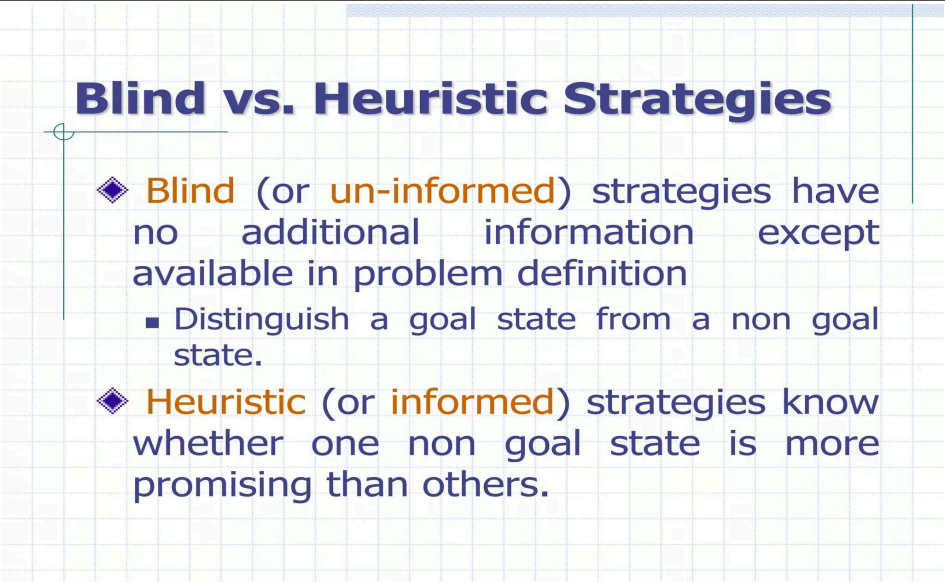
PATH COST: A **path cost** function that assigns a numeric cost to each path.

- The problem-solving agent chooses a cost function that reflects its own performance measure.
- The **cost of a path** can be described as the sum of the costs of the individual actions along the pa
- The **step cost** of taking action a in state s to reach state s′ is denoted by c(s, a, s′).

- A **SOLUTION** to a problem is an action sequence that leads from the ***initial state*** to a ***goal state***
- Solution quality is measured by the path cost function, and an **OPTIMAL SOLUTION** has the lowest path cost among all solutions.

3	What are the possible states of a vacuum world problem that has two rooms. Draw the state space for the problem. State space Diagram (10)	10	CO1	1

				
4	a. Discuss any two applications of AI. Any two applications with explanation (2+2)	4	CO1	3
	b. Explain the following terms in the context of searching for solutions i) Search tree (1) A solution is an action sequence, so search algorithms work by considering various possible action sequences. The possible action sequences starting at the initial state form a search tree with the initial state at the root The branches are actions and the nodes correspond to states in the state space of the problem. ii) Frontier (also known as open list) with example (2) We reach a state when we identify a path from the start state to it. But, we say that we expanded it if we had followed all its outward edges and reached all its children. So, we can also think of a search as a sequence of expansions, and we first have to reach a state before expanding it. Frontier is the reached but unexpanded states because we can expand only them iii) Loopy path with example (2) loopy path: path from Arad to Sibiu and back to Arad again! We say that In(Arad) is a repeated state in the search tree, generated in this case by a loopy path	6	CO1	2
5	a. Discuss the difference between uninformed searches and heuristic searches? difference (2 ×2 =4)	[4+6]	CO1	2



b. Explain greedy best first search with an example.

explanation and example (2+4)

Greedy best-first search expands the node that is closest to the goal, on the grounds that this is

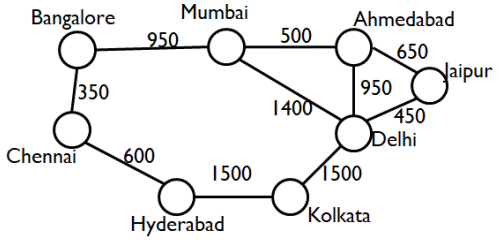
likely to lead to a solution quickly.

• Greedy search expands the node that appears to be closest to goal

• Greedy best-first search evaluates nodes by using just the heuristic function.

• This means that it uses heuristic function h(n) as the evaluation function f(n) (that is f(n) = h(n)).

6	Apply A* algorithm on the tourist problem shown in Figure 1 below to reach Jaipur from Bangalore with minimal cost. Clearly show the sequence in which nodes are expanded to obtain the solution. Cost (distance) of traveling from one city to another is shown as edge cost in the graph. Use the straight-line distances shown in the table for heuristic function values.	10	CO1	30lÍ



Select straight line distance shown in the table below as heuristic function value

Location	Straight line distance to Jaipur	Location	Straight line distance to Jaipur
Bangalore	1200	Delhi	300
Chennai	1100	Ahmedabad	400
Mumbai	700	Kolkata	1000
Hyderabad	800		

Figure 1

Solution of a* search with shortest path (9+1)

Shortest path =2100

CI CCI HoD

CO-PO and CO-PSO Mapping																				
Course Outcomes		**Blooms Level**	**Modules covered**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	Explain the architecture and components of intelligent agents, including their interaction with the AI environment.	L2	M1	3	3	2	3	3	1	-	-	1	-	-	1	-	-	-	2
CO2	Apply problem-solving agents and various search strategies to solve a given problem.	L3	M2	3	3	2	3	3	1	-	-	1	-	-	1	-	-	-	2
CO3	Illustrate logical reasoning and knowledge representation using propositional and first-order logic.	L3	M3	3	3	2	3	3	1	-	-	1	-	-	1	-	-	-	2
CO4	Demonstrate proficiency in representing knowledge and solving problems using first-order logic.	L3	M4	3	3	2	3	3	1	-	-	1	-	-	1	-	-	-	2
CO5	Describe classical planning in the context of artificial intelligence, including its goals, constraints, and applications in problem-solving.	L3	M5	3	3	2	3	3	1	-	-	1	-	-	1	-	-	-	2

COGNITIVE LEVEL	REVISED BLOOMS TAXONOMY KEYWORDS
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)				CORRELATION LEVELS	
PO1	Engineering knowledge	PO7	Environment and sustainability	0	No Correlation
PO2	Problem analysis	PO8	Ethics	1	Slight/Low
PO3	Design/development of solutions	PO9	Individual and team work	2	Moderate/ Medium
PO4	Conduct investigations of complex problems	PO10	Communication	3	Substantial/ High
PO5	Modern tool usage	PO11	Project management and finance		
PO6	The Engineer and society	PO12	Life-long learning		