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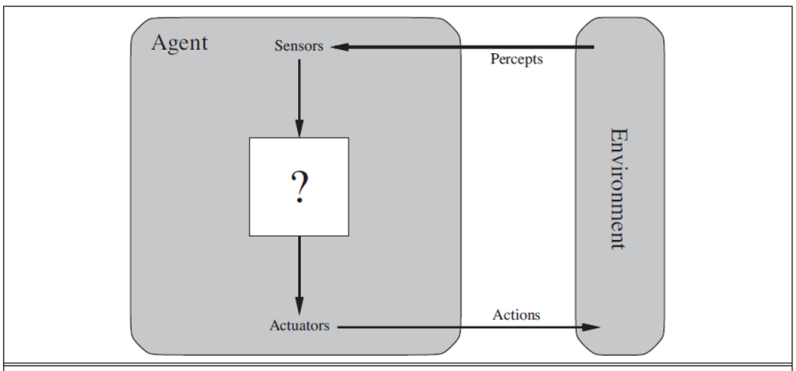
ANSWER KEY

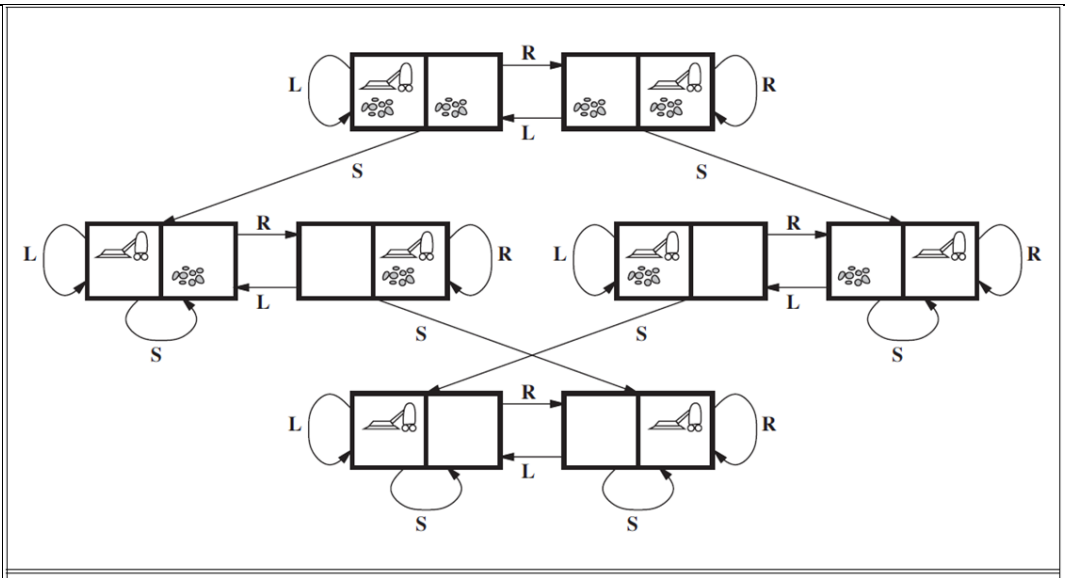
Internal Assessment Test 1 – Dec 2023

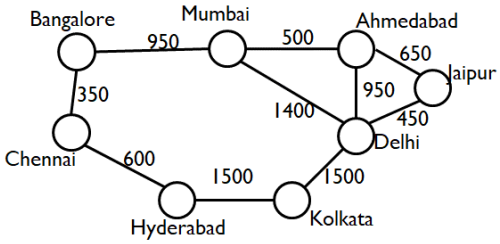
Sub:	Artificial Intelligence and Machine Learning					Sub Code:	21CS54	Branch:	CSE
Date:	21/12/2023	Duration:	90 mins	Max Marks:	50	Sem/Sec:	V/A,B&C		OBE

Answer any FIVE FULL Questions

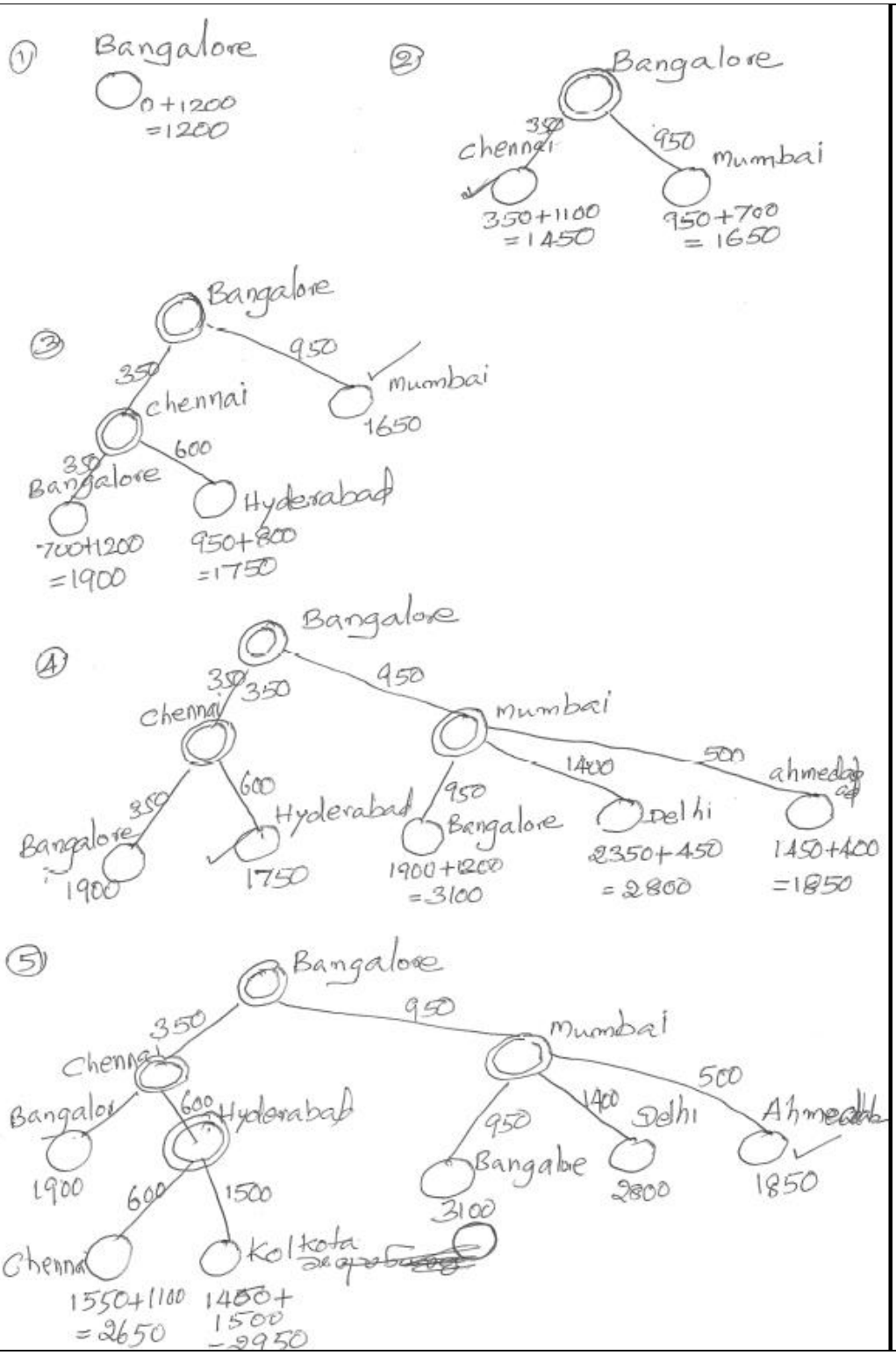
		MARKS	CO	RBT
1	a. Discuss the four categories used to define artificial intelligence.	6	CO1	2
	Ans: 1.Acting humanly: The Turing Test approach The computer would need to possess a combination of the following capabilities to act humanly Natural language processing Knowledge representation Automated reasoning Machine learning Computer vision Robotics 2. Thinking humanly: The cognitive modeling approach 3. Thinking rationally: The "laws of thought" approach Codify irrefutable reasoning processes. Develop a precise notation for statements about all kinds of objects in the world and the relations among them. 4. Acting rationally: The rational agent approach An agent is just something that acts A rational agent is one that acts so as to achieve the best outcome			
	b. Discuss the Turing test approach to test whether a computer has artificial intelligence	4	CO1	2
	Ans: The Turing Test approach 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.			
2	a. What is an agent and discuss its interaction with environment using an appropriate diagram.	5	CO1	2

	 **Figure 2.1** Agents interact with environments through sensors and actuators. An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators. Percept is an agent's perceptual inputs at any given instant. An agent's behavior is described by the agent function that maps any given percept sequence to an action.			
	b. Discuss the five components of a well-defined problem.	5	CO1	2
	A problem can be defined formally by five components: 1. The initial state that the agent starts in. Example in(Ooty) 2. A description of the possible actions available to the agent. Given a particular state ACTIONS(s), returns the set of actions that can be executed in s. For example, from the state In(Ooty), the applicable actions are {Go(Mysore), Go(Coimbatore)}. 3. A description of what each action does; the transition model A function RESULT(s, a) that returns the state that results from doing action a in state s. Example: RESULT(In(Ooty),Go(Mysore)) = In(Mysore) 4. The goal test, which determines whether a given state is a goal state. 5. A path cost function that assigns a numeric cost to each path.			
3	What are the possible states of vacuum world problem that has two rooms. Draw the state space for the problem.	10	CO1	1

	 **Figure 3.3** The state space for the vacuum world. Links denote actions: L = *Left*, R = *Right*, S = *Suck*.			
4	a. Discuss any two applications of AI.	5	CO1	3
	Some Examples are Touring problems. VLSI layout problem Robot navigation Automatic assembly sequencing			
	b. Explain the following terms in the context of searching for solutions i) Search Tree ii) Frontier (also known as open list) iii) Loopy path	5	CO1	2
	• 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. • The set of all leaf nodes available for expansion at any given point is called the frontier. (Also called the open list) • Loopy path – A path reaching a previous node in the state space tree. o Results in repeated states o Search tree becomes infinite			
5	a. Discuss the difference between uninformed searches and heuristic searches? b. Explain greedy best first search with any example.	[4+6]	CO1	2
	a) The uninformed search strategies are the strategies have no additional information about states beyond that provided in the problem definition. BFS and DFS are examples of uninformed search strategies Strategies that know whether one non-goal state is "more promising" than another are called informed search or heuristic search strategies Informed Search Strategies uses problem-specific knowledge beyond the definition of the problem itself—can find solutions more efficiently than can an uninformed strategy. A general approach for informed search is called best-			

	first search. b) Greedy best-first search tries to expand the node that is closest to the goal, on the grounds that this is likely to lead to a solution quickly. It evaluates nodes by using just the heuristic function; that is, f(n) = h(n). As an example, in the tourist problem we use the straight line distance heuristic, which we will call hSLD.			
6	Apply A* algorithm on the tourist problem shown in Figure below to reach Jaipur from Bangalore with minimal cost. Clearly show the sequence in which the nodes are expanded to obtain the solution. Cost (distance) of travelling from one city to another is shown as edge weight. Use the straight-line distances shown in the table for heuristic function values.  Select straight line distance shown in the table below as heuristic function value **Figure 1**	10	CO1	3
	The growth of the state space tree is given. The expanded nodes are shown with double circle. The node to be expanded(the un-expanded node that has the lowest evaluation function value) is shown with a tick sign.			

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		


①
Bangalore
0+1200
=1200
②
Bangalore
350
Chennai
950
Mumbai
350+1100
=1450
950+700
=1650
③
Bangalore
350
chennai
950
mumbai
1650
350
Bangalore
600
Hyderabad
700+1200
=1900
950+800
=1750
④
Bangalore
350
350
Chennai
950
Mumbai
350
Bangalore
600
Hyderabad
950
Bangalore
1400
Delhi
500
ahmedabad
1900
1750
1900+1200
=3100
2350+450
=2800
1450+400
=1850
⑤
Bangalore
350
Chennai
950
Mumbai
Bangalor
600
Hyderabad
500
1400
Delhi
Ahmedabad
1900
950
Bangalbe
2800
1850
3100
600
1500
Chenna
Kolkota
1550+1100
=2650
1450+
1500
=2950

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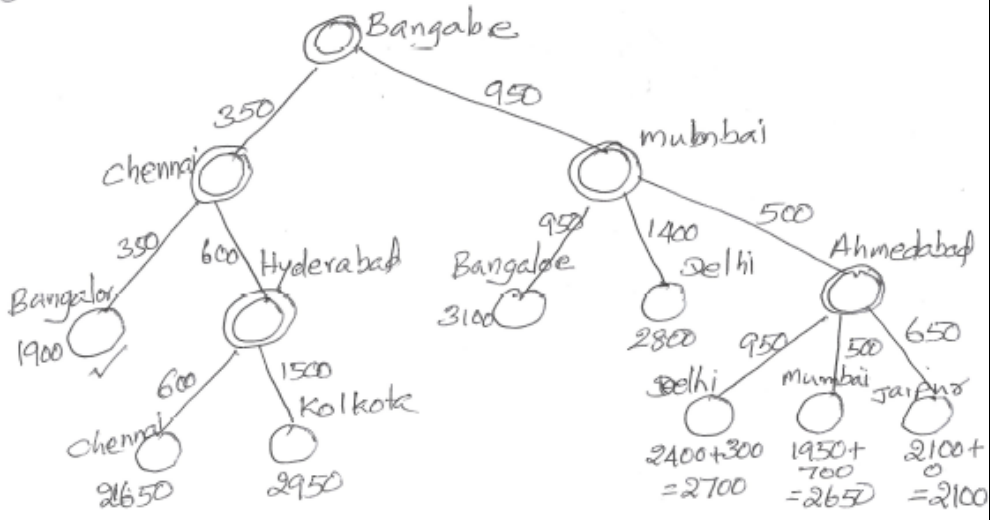

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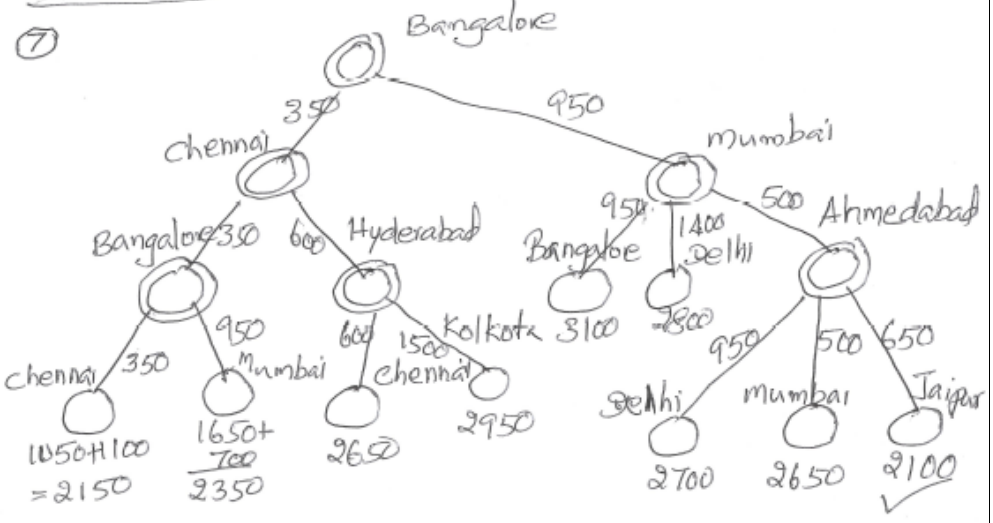

Since the next node to be expanded is the goal node, Algorithm stops. The path returned is Bangalore → Mumbai → Ahmedabad → Jaipur with a cost of 2100.