Edited CT2 Question Set 3

Artificial Intelligence (SRM Institute of Science and Technology)

Reg.No. | | | | | | | | | | | | | | |

SRM Institute of Science and Technology
College of Engineering and Technology
School of Computing
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Mode of Exam
OFFLINE

SET C

Academic Year: 2023-24 (EVEN)

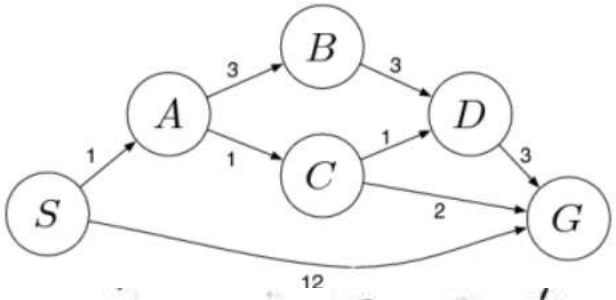
Test: CLAT-2 **Date: 2nd April 2024**
Course Code & Title: 21CSC206T – Artificial Intelligence **Duration:** 2 periods
Year & Sem: II /4th **Max. Marks:** 50

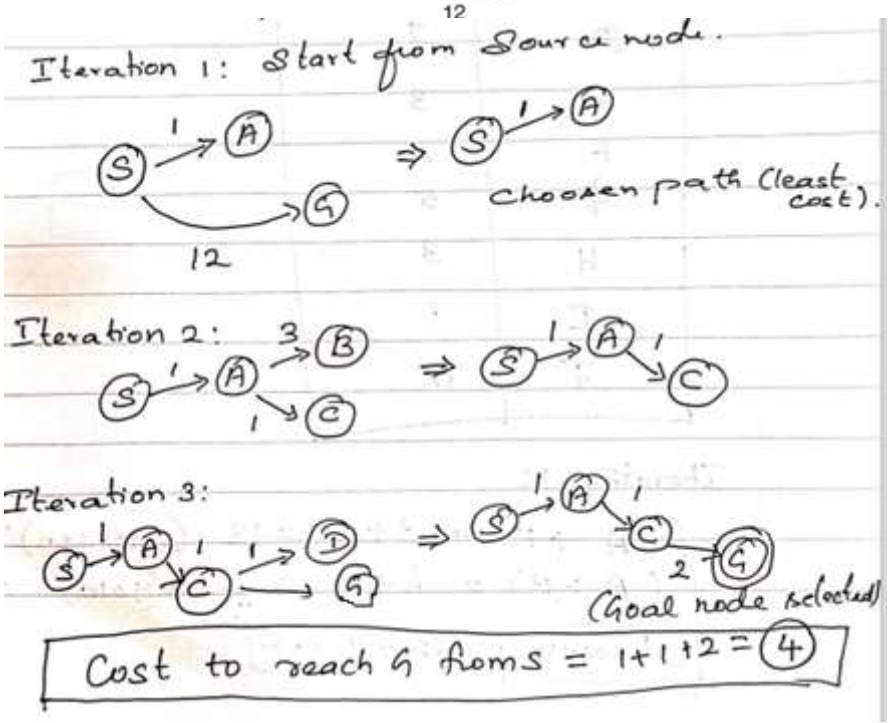
Course Articulation Matrix:

Course Outcome	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	-	-	-	-	-	2	-	-	-	-	-	-

Q. No	Question	Marks	BL	CO	PO	PI Code	Marks Scored
	Part – A (10 x 1 = 10 Marks) Instructions: Answer ALL						
1	_ Ans: n-1___ is the maximum number of edges in a binary tree with N nodes.	1	1	2	1	1.6.1	
2	If there are multiple paths to a node in UCS with the same cost, UCS explores them in _____ order. Ans: FIFO	1	1	2	1	1.6.1	
3	Uninformed search methods are also known as _____ search methods. Ans: Blind Search	1	1	2	1	1.6.1	
4	An agent is composed of _____ Ans: Architecture and Program	1	1	2	1	1.6.1	
5	Match the following: Simple reflex agents – Smart Sprinkler System model-based agents – Utilizes internal state information	1	1	3	2	2.7.1	
6	Identify the odd one out: • Constraint propagation • Constraint relaxation • Forward Checking • Minimum remaining values heuristic answer	1	1	3	2	2.7.1	
7	Which of the following statements is true? • Goal-based agents exhibit purposeful decision-making • Goal-based agents ignore alternative paths entirely • Goal-based agents have no concept of subgoals • Goal-based agents always reach the optimal solution	1	1	3	2	2.7.1	
8	Which of the following statements is true about the "Cryptarithmetic"? • Cryptarithmetic puzzles are unsolvable without trial and error • All cryptarithmetic puzzles can be solved mentally • Cryptarithmetic puzzles have identical solutions for variations • Brute force is often impractical for solutions	1	1	4	1	1.6.1	
9	Which of the following statements is false about the "Depth Limited Search"? • Depth Limited Search explores all possible paths • Stops search at specified depth level • Facilitates faster search by restricting exploration depth • Avoids infinite loops by limiting search depth	1	1	4	1	1.6.1	
10	Which of the following statements is true about the Constraint satisfactory	1	1	4	1	1.6.1	

	• It guarantees a solution within polynomial time • It aims to find feasible solutions efficiently						
	Part – C (1 x 16 = 16 Marks) Instructions: Answer any ONE						
11	(a) Consider the graph given below. Apply the Uniform Cost Search to find the path cost to reach G from S.	8	2	2	2	2.7.1	





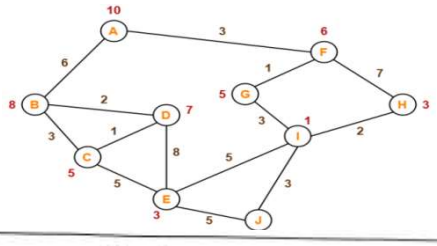
(OR)

(b) Compare and contrast Depth First Search (DFS) and Breadth First Search (BFS) algorithms with examples.

Parameters	BFS	DFS
Stands for	BFS stands for Breadth First Search.	DFS stands for Depth First Search.
Data Structure	BFS(Breadth First Search) uses Queue data structure for finding the shortest path.	DFS(Depth First Search) uses Stack data structure.
Definition	BFS is a traversal approach in which we first walk through all nodes on the same level before moving on to the next level.	DFS is also a traversal approach in which the traverse begins at the root node and proceeds through the nodes as far as possible until we reach the node with no unvisited nearby nodes.
Conceptual Difference	BFS builds the tree level by level.	DFS builds the tree sub-tree by sub-tree.
Approach used	It works on the concept of FIFO (First In First Out)	It works on the concept of LIFO (Last In

		suitable for searching vertices closer to the given source.	solutions away from the source.					
	Applications	BFS is used in various applications such as bipartite graphs, shortest paths, etc.	DFS is used in various applications such as acyclic graphs and finding strongly connected components etc.					
12	(a) Discuss the importance of flexibility in intelligent agents. How does flexibility contribute to the adaptability and robustness of agents in varying environments? Intelligent Agents(2 Marks) Flexibility and Intelligent Agents (6 Marks) Responsive: It should respond in timely fashion to the perceived environment. Pro-active: It should exhibit opportunistic, goal-directed behaviour and take the initiative, wherever necessary. Social: It should be able to interact when they are deemed appropriate with the other artificial agents, or humans in order to compete problem solving. Other properties an intelligent agent should have are as follows: Mobility: It is recommended that an intelligent agent should be mobile to accumulate knowledge and carry out desired work/ decision-making. Veracity: Intelligent agent should be truthful. It is not expected to hide information or lie. Benevolence: It should avoid conflict and should do what is told. Rationality: It should act to maximise the expected performance. Learning: Performance is increased with learning. It should have learning ability that is essential for true autonomy. **(OR)** (b) Describe the concept of Alpha-Beta pruning. How does it improve the efficiency of the Mini-Max algorithm? **Alpha-Beta pruning (2 marks)** ● The Max player will only update the value of alpha. ● The Min player will only update the value of beta. ● While backtracking the tree, the node values will be passed to upper nodes instead of values of alpha and beta. ● We will only pass the alpha, beta values to the child nodes. ● function minimax(node, depth, alpha, beta, maximizingPlayer) is **one example(4 Marks)** **To improve the efficiency of the Mini-Max algorithm((2 Marks)** The minimax search algorithm that the number of game states it has to examine are exponential in depth of the tree. Since we cannot eliminate the exponent, but we can cut it to half. Hence there is a technique by which without checking each node of the game tree we can compute the correct minimax decision, and this technique is called **pruning**. This involves two threshold parameter Alpha and beta for future expansion, so it is called **alpha-beta pruning**. It is also called as **Alpha-Beta Algorithm**.	8	2	3	2	2.7.1	
13	(a) Explain the role of knowledge representation in designing intelligent agents. Provide examples to illustrate its importance. **About knowledge Representation (4 marks)** **Example(4 Marks)** **(OR)** (b) Describe the components of a knowledge-based agent. How does knowledge representation facilitate the decision-making process in such agents? Components of a knowledge-based agent: Environment Knowledge Base Percepts Actions •An intelligent agent needs **knowledge about the real world** for taking	8	2	4	2	2.7.1	

	Knowledge = {sentences} expressed in a knowledge representation language •The **Knowledge-base** is a set of representations of facts of the world. •A knowledge-based agent should be able to do the following: - represent states, actions, etc. - incorporate new percepts - update the internal representation of the world - deduce the internal representation of the world - deduce appropriate actions.						
	Part – C (1 x 10 = 10 Marks) Instructions: Answer any ONE						
14	Given the graph below, demonstrate how the A* algorithm searches for the shortest path from node A to node J. In your explanation, highlight how A* combines the advantages of Breadth First Search (BFS) and Best First Search (BFS) through its use of heuristics. Also, discuss the importance of the chosen heuristic being both admissible and consistent.	16	3	2	2	2.8.1	



Part - C.

$f(n) = g(n) + h(n)$

14) Source node = A

Destination node = J.

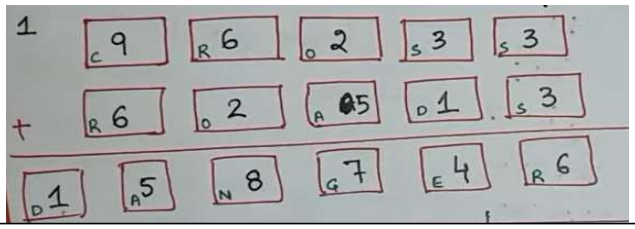
State	h(n)
A	10
B	8
C	5
D	7
E	3
F	6
G	5
H	3
I	1
J	0

Iteration 1:

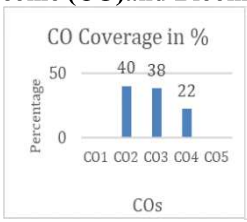
$f(A \to F) = 3 + 10 = 13$ (Choosen) ✓

$f(A \to B) = 6 + 8 = 14$ → (Hold) ✗

Choosen path = A → F

	Iteration 2: $f(A \to f \to G) = 4+5 = 9$ (Choosen) ✓ $f(A \to f \to H) = 10+3 = 13$ (Hold) ✗ Choosen path = $A \to f \to G$ Iteration 3: $f(A \to f \to G - I) = 7+1 = 8$ (choosen) Choosen path = $A \to f \to G \to I$ Iteration 4: $f(A \to f \to G \to I \to J) = 10$ (Its destination and hence its choosen) $f(A \to f \to G \to I \to E) = 15$ ✗ Choosen path = $A \to f \to G \to I \to J$ Cost to reach from A to node J = 10						
15	Solve the following crypt arithmetic problem and write the step-by-step process. C R O S S + R O A D S D A N G E R  	16	3	3	2	2.8.1	
Total (50)							

Course Outcome (CO)and Bloom's Level (BL) Coverage in Questions



Approved by the Course Coordinator **Audit Professor**