P P SAVANI UNIVERSITY

Seventh Semester of B. Tech. Examination

December 2021

SECE4042 Artificial Intelligence

15.12.2021, Wednesday **Time: 09:00 a.m. To 11:30 a.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 Answer the Following: (Any FIVE) **[05]**

(i) State ONE merit of BFS as compared to DFS.

(ii) What is local maximum?

(iii) When is A* an admissible algorithm?

(iv) Define: plateau

(v) Give an example wherein Depth First Search is better than Iterative Deepening Depth First Search.

(vi) Define: Instance

(vii) What is Forward chaining?

Q - 2 (a) Explain AI Problem Characteristics in detail. **[05]**

Q - 2 (b) What do you mean by state space representation of a problem? Illustrate how you can represent the Water Jug problem as a state space search: **[05]**

OR

Q - 2 (a) Explain breadth first search algorithm. **[05]**

Q - 2 (b) Consider the following initial and goal configuration for 8-puzzle problem. Draw the search tree. Apply A* algorithm to reach from initial state to goal state and show the solution. Consider Manhattan distance as a heuristic function (i.e. sum of the distance that the tiles are out of place.). **[05]**

Initial State

1	2	3
7	8	4
6		5

Goal State

1	2	3
8		4
7	6	5

Q - 3 (a) What is Artificial Intelligence? Explain any one real life application in detail. **[05]**

Q - 3 (b) Analyze the 8-puzzle problem with respect to the problem characteristics. What is a dominant admissible heuristic for the 8 puzzle problem? **[05]**

OR

Q - 3 (a) Differentiate between forward reasoning and backward reasoning technique. **[05]**

Q - 3 (b) Explain Simple Hill Climbing and its problems with neat diagram. **[05]**

Q - 4 Attempt any one. **[05]**

(i) Consider the following facts.

1. Ravi likes all kinds of food.
2. Apples and chicken are food.
3. Anything anyone eats and is not killed is food.
4. Ajay eats peanuts and is still alive
5. Rita eats everything that Ajay eats.

Prove by resolution that- "Ravi likes peanuts."

(ii) Consider following facts.

1. The members of the Elm St. Bridge Club are Joe, Sally, Bill and Ellen.
2. Joe is married to Sally.
3. Bill is Ellen's brother.
4. The spouse of every married person in the club is also in the club.
5. The last meeting of the club was at Joe's house.

Use resolution to prove- The last meeting of the club was at Sally's house.

SECTION – II

Q - 1 Answer the Following: (Any FIVE) **[05]**

(i) Define Fuzzy set.

(ii) What is zero sum game?

(iii) What is plausibility in Dempster Shafer theory?

(iv) Define: Local Maxima

(v) Define Joint probability.

(vi) Enlist different types of learning in Artificial Neural Network.

(vii) Define Pragmatic analysis step in Natural Language processing.

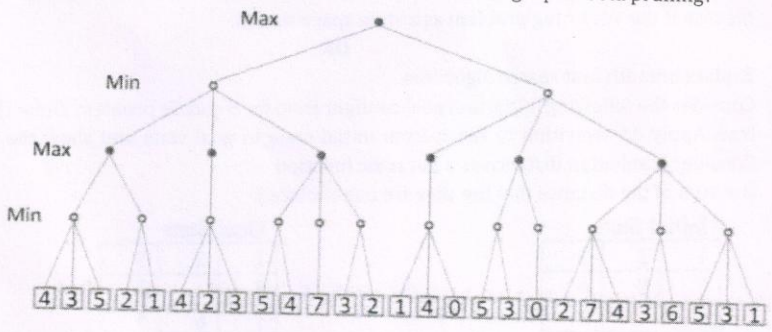
Q - 2 (a) Write short note on Hidden Markov Model. **[05]**

Q - 2 (b) Explain Bayesian Network with suitable example. **[05]**

OR

Q - 2 (a) Explain various phases of natural language processing in brief. **[05]**

Q - 2 (b) Consider the game tree of Fig. 1 in which the static scores are from first player's point of view. Suppose the first player is maximizing player. Applying mini-max search, show the backed-up values in the tree. What move will the MAX choose? If the nodes are expanded from left to right, what nodes would not be visited using alpha-beta pruning? **[05]**



Q - 3 (a) Explain different types of learning in Artificial Neural networks. **[05]**

Q - 3 (b) Explain Iterative deepening Depth first search with example. **[05]**

OR

Q - 3 (a) Write a short note on "Applications of Artificial Neural Networks". **[05]**

Q - 3 (b) Write short note on Activation function in ANN. **[05]**

Q - 4 Attempt any one. **[05]**

(i) Describe any one application of Natural Language Processing in detail.

(ii) Explain advantages and disadvantages of ANN.

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SECTION – I

Q - 1 Answer the Following: (Any FIVE) **[05]**

(i) State two differences between BFS and DFS.

(ii) Why A* is better than Best First Search?

(iii) Write any one heuristic function related to 8-puzzle problem?

(iv) Convert following statements in to First order logic format:
Statement: Every man respects his parent.

(v) Enlist different types of AI.

(vi) Define: State Space Tree

(vii) What is Backward chaining?

Q - 2 (a) What is Turing Test? Explain in detail. **[05]**

Q - 2 (b) Describe state space of water jug problem using suitable example. **[05]**

OR

Q - 2 (a) Explain Best first search algorithm with small example. **[05]**

Q - 2 (b) Consider the following initial and goal configuration for 8-puzzle problem. Draw the search tree. Apply A* algorithm to reach from initial state to goal state and show the solution. Consider Manhattan distance as a heuristic function (i.e. sum of the distance that the tiles are out of place.). **[05]**

Initial State

1	2	3
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Goal State

1	2	3
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7	6	5

Q - 3 (a) What is Artificial Intelligence? Explain any one real life application in detail. **[05]**

Q - 3 (b) Why we need Heuristic function? What is an admissible heuristic for the 8 puzzle problem? **[05]**

OR

Q - 3 (a) Apply inference rules of propositional logic to infer conclusion from given set of statements: **[05]**
Statement-1: If A works hard then B or C will enjoy themselves.
Statement-2: If B enjoys himself then A will not work hard.
Statement-3: If C enjoys himself then D will not enjoy himself.
Conclusion: If A works hard then D will not enjoy himself.

Q - 3 (b) What is knowledge? Explain different types of knowledge in brief. **[05]**

Q - 4 Attempt any one. **[05]**

(i) Differentiate between forward chaining and backward chaining technique.

(ii) Explain problem in hill climbing and their solution.

SECTION – II

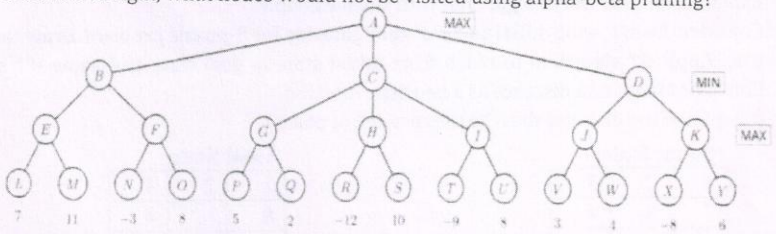
Q - 1	Answer the Following: (Any FIVE)	**[05]**
(i)	What is Bayes' Theorem?	
(ii)	Define: Certainty Factor	
(iii)	Define: Plausibility	
(iv)	What is Goal state?	
(v)	Name the phases-steps of NLP.	
(vi)	Define: Local Minima	
(vii)	What is perceptron?	
Q - 2 (a)	What features of natural language make it difficult to process using computing systems? Enlist and briefly explain the steps in Natural Language Processing.	**[05]**
Q - 2 (b)	State the Bayes' theorem. Illustrate how a Bayesian Network can be used to represent causality relationship among attributes.	**[05]**

OR

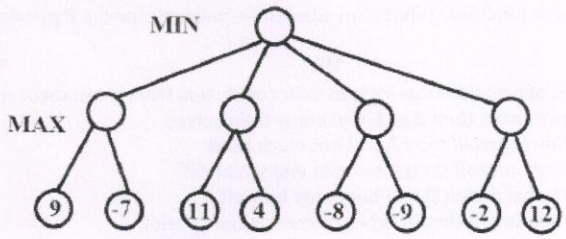
Q - 2 (a)	Explain syntax and semantic analysis of natural language processing in detail.	**[05]**
Q - 2 (b)	Explain certainty factor and ruled based system in detail.	**[05]**
Q - 3 (a)	What is linearly separable problem? Design a perceptron for any of such problem. State one example of a problem which is not a linearly separable.	**[05]**
Q - 3 (b)	What do you mean by Fuzzy logic? Explain with example.	**[05]**

OR

Q - 3 (a)	Write a short note on "Applications of Artificial Neural Networks".	**[05]**
Q - 3 (b)	Explain Iterative deepening Depth first search with example.	**[05]**
Q - 4	Attempt any one.	**[05]**
(i)	Consider the game tree of Fig. 1 in which the static scores are from first player's point of view. Suppose the first player is maximizing player. Applying mini-max search, show the backed-up values in the tree. What move will the MAX choose? If the nodes are expanded from left to right, what nodes would not be visited using alpha-beta pruning?	



(ii)	We have two players: MIN who plays first and can make 4 moves, MAX who plays second and can make 2 moves. Suppose that after 1 turn, the values of the leaves are as in the figure :	



Compute (with the algorithm minimax) the value of the root of the tree, than say which is the most convenient move for MIN. Then tell with the reason, which parts of the tree are not generated if we perform an alpha-beta pruning.

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