Subject Code: EX/CSE/PC/B/T/326

B. E. COMPUTER SCIENCE AND ENGINEERING 3rd YEAR 2nd SEMESTER EXAMINATION, 2022

ARTIFICIAL INTELLIGENCE

Time : 3 Hours **Total Marks 100**

Q1 is compulsory [CO1]
Answer any two from Q2, Q3 and Q4 [CO2]
Answer any one from Q5 and Q6 [CO3]
Q7 is compulsory [CO4]
Q8 is compulsory [CO5]

Answer different parts of the same Question together.

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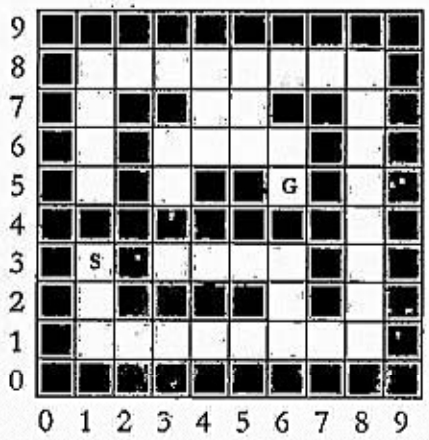
1. (a) Comment on: The aim of Artificial Intelligence is to make machine intelligent. 6

   (b) What are the different types of Artificial Intelligence systems? Discuss briefly. 8

   (c) Discuss on Turing Test in connection to intelligence of a machine. Is there any limitation of this test? - Discuss. 6

2. (a) You have read various search algorithms. How do you evaluate their performances? Briefly discuss on it. 5

   (b) Consider the problem of Maze search with the following figure. 15



In this problem, an agent is trying to traverse a maze from the starting point S to the goal point G. In each step, the agent can move in one of the four compass directions; each move costs 1 unit. The agent always considers alternative moves in the following order:

1. Move North
2. Move East
3. Move South
4. Move West

Apply A* search algorithm to solve this problem. Number the squares in the order the agents visits the squares, starting with 0 at the starting point. You do not need to re-expand nodes already visited; this means that you can "jump" from the current node to the next node in the queue.

Calculate the path cost on the basis of one cost unit per move. The heuristics to use is the function of the difference between the horizontal position of the current node and the goal node, plus the difference in the vertical position of the current node [xn,yn] and the goal node [xg,yg] and it is: $h([x,y]) = (|xg - xn|) + (|yg - yn|)$

For this problem,

- Mark the sequence in which the nodes are visited in the maze.
- Draw the corresponding search tree.
- Fill in the table with the information about the search trace. (initial one is S, and you may need to insert the rows into the table)

Current Node	Path Cost	Heuristic	f-cost	Queue
S				

3. (a) Suppose a given graph is weighted one. In each time while examining a node from OPEN list, the least cost one is selected and expanded. What is this search algorithm known as? Discuss briefly on its advantages and disadvantages. 5

(b) Justify the follwing statements alongwith suitable reasoning.

(i) General Graph Search Algorithm is applicable for a wide variety of search processes. 5

(ii) Bidirectional search procedures are applicable for all kinds of problems. 5

(iii) A* search is a combination of past and future. 5

4. (a) Consider the following game tree in which static scores are all from first player's point of view.

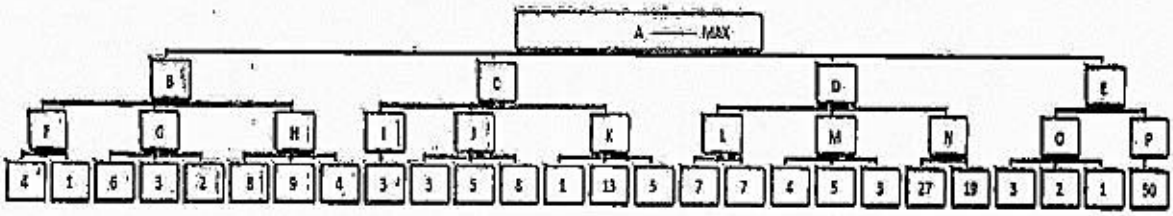
(i) Which path will be chosen if Minimax algorithm is used?

(ii) Which branches will be pruned if α-β pruning algorithm is used? 3+7

(The static evaluation scores from left to right are:

4 1 6 3 2 8 9 4 3 3 5 8 1 13 5 7 7 4 5 3 27 19 3 2 1 50)

Show all intermediate values



(b) Compare the performances of Minimax and Alpha beta pruning algorithm. Write down the aspects for comparison (include at least time, space, and correctness aspects). 5

(c) Discuss on how AND-OR tree can be utilized for two person game playing tasks. 5

5.(a) Why do we require 'unification'? 3

(b) Find the *mgu* of the following:

{ Q(h(x,y), w), Q(h(g(v), a), f(v)), Q(h(g(v)), f(b)) } 5

(c) Convert the following *wff* into clause form. 6

$\forall x\,(f(x) \Rightarrow \exists y\,(m(x,y))) \wedge \forall x \forall z\,((a(x,z) \vee b(x,z)) \wedge c(z,3))$

(d) What is Skolemization? Eliminate Existential quantifier from the following WFF: 3+3

$$\forall x\ [\exists y\ Animal(y) \wedge \neg Loves(x,y)] \vee [\exists z\ Loves(z,x)]$$

6. (a) Is it true that resolution refutation always terminates either by finding a contradiction or by failing to find a contradiction? Provide reasons in support of your answer. 4

(b) What is Refutation tree? Discuss on any two control strategies (along with their pros and cons) for performing resolution refutation. 2+6

(c) What is Fuzzy set? Draw the differences between Crisp set and Fuzzy set. 3+5

7. (a) What is classification? How can you use Genetic algorithm for classification? 2+4

(b) Discuss on the pros and cons of mutation operator used in GA . 4

8. Answer either (a) or (b).

(a) Consider the 3-puzzle problem shown in Fig. below:

Possible operators (in order) are: **up, down, left, right**. Assume that **repeated states are not detected.**

Draw search tree using BFS. Would DFS find the goal? How many nodes would be generated if IDS is used starting with depth increment of one? 10

2	3
1	

Initial state

1	2
3	

Final state

(b) Consider the following facts:

Every child loves Santa.
Everyone who loves Santa loves any reindeer.
Rudolph is a reindeer, Rudolph has a red nose.
Anything which has a red nose is weird or is a clown.
No reindeer is a clown.
John does not love anything that is weird.

---Prove that "John is not a child" using resolution. 10

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