

Subject Code: EX/CSE/T/412A

**B. E. COMPUTER SCIENCE AND ENGINEERING 4TH YEAR 1ST SEMESTER
EXAMINATION, 2021**

ARTIFICIAL INTELLIGENCE

Time : 3 Hours

Total Marks 70

Read the Following Instructions Carefully:

- ☐ Put your Name, Class Roll No, Primary Mobile phone no, Email at the first page
- ☐ Put Class Roll No at the top-right corner of every page
- ☐ Put your signature at the bottom of every page

Different parts of the same Question should be answered together.

Answer either (a) or (b) of Q1 [CO1]

Answer any two from Q2, Q3 and Q4 [CO2]

Answer any one from Q5 and Q6 [CO3]

Answer any one from Q7 and Q8 [CO4]

Q9 is compulsory [CO5]

1. ***Answer either (a) or (b)*** 5
 - (a) Do you think that Turing Test is a good way to judge a Rational Agent? ----Justify.
 - (b) How can you solve a problem through searching? Discuss.

2.
 - (a) Why is Iterative Deepening called an “optimal” search strategy? 4
 - (b) Compare BFS, DFS and IDS with respect to computation time requirement. 4
 - (c) When do you prefer IB to ID? 2
 - (d) Uniform Cost Search considers weighted graph. Suppose all the weight values are increased by a positive constant k . Will the solution path change? What will happen with the cost to reach the solution? -----Explain 5

3. **Justify (T/F) with supportive examples:**
 - (a) General Graph Search Algorithm is applicable for various search strategies. 5
 - (b) If the time complexity of a search algorithm is higher, it will not provide optimal solution. 5
 - (c) Heuristic search processes are better than blind search techniques. 5

4. (a) What happens if we use a heuristic function $h(\cdot)$ in A^* that does not have the guarantee that $h(n) = h^*(n)$, for all states n (where, h^* is the actual cost)? – Discuss. 5

(b) *We need to measure 9 liters of water from jugs of 12, 8 and 5 liters.*

Solve this problem using formal search procedure (mention start state, goal state, operators etc.)

Draw the search tree and find the shortest path to the goal state.

What is the cost of optimal solution?

10

5. (a) Why random restart hill climbing is better than simple hill climbing process? 3
 (b) In which situation simulated annealing will behave like a random search? 4
 (c) Describe a situation where use of Linear Normalization selection is better than Roulette Wheel selection process in Genetic Algorithm. 3

6. (a) Consider the following game tree in which static scores are all from first player's point of view. Which branches will be pruned if α - β pruning algorithm is used? 6

(Show all intermediate values)

(Ignore the static scores written at the leaf nodes; Rather, consider the scores in the following manner (from left to right):

Leftmost node (node 1): Your last two digit roll number mod 10

2nd leftmost mode (node 2): Your last two digit roll number mod 9

3rd leftmost mode (node 3): Your last two digit roll number mod 8

... ..

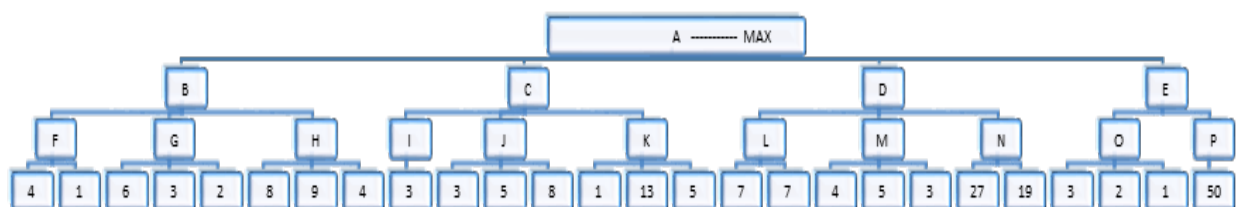
9th leftmost mode (node 9): Your last two digit roll number mod 2

Again, the 10th leftmost mode (node 10): Your last two digit roll number mod 10

11th leftmost mode (node 11): Your last two digit roll number mod 9

and so on....

i.e., the same process for all the remaining nodes. (where, mod represents remainder)



(b) Suppose you thought of improving the performance of game tree search by embedding iterative deepening method on it. Will you gain anything on this modification? Explain your answer. 4

7. (a) Find the *mg*u of the following:

$Q\{g(x,y), h(x,y)\}, Q\{g(z,u), h(w,u)\}, Q\{g(t,t), h(v,f(v))\}$ 3

(b) Convert the following *wff* into clause form.

$\sim(\forall x)\{P(x) \rightarrow [(\forall y)[P(y) \rightarrow P(f(x,y))]] \wedge \sim(\forall y)[Q(x,y) \rightarrow P(y)]\}$. 6

(c) Consider the premises $\forall x.(p(x) \Rightarrow q(x))$ and $\forall x.(q(x) \Rightarrow r(x))$. Now use Resolution to conclude $\forall x.(p(x) \Rightarrow r(x))$. 3

(d) Justify: Resolution Refutation always terminates either by finding a contradiction or by failing to find a contradiction? Provide reasons in support of your answer. 3

8. (a) Write down the differences between crisp set and fuzzy set. 4

(b) Model 'old' man using suitable membership function. Then graphically represent 'not very old'. 4

(c) How do you normalize a sub-normal fuzzy set? 3

(d) What type of information (about a 'node') you can obtain by looking at the SL-justification part? Discuss. 4

9. What is a Perceptron? Discuss how a perceptron can model AND function. What is the limitation of single layer perceptron? 3+4+3

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