

2025

M.Tech. 1st Semester Examination

COMPUTER SCIENCE WITH AI

Paper : MCIC403X0

[Artificial Intelligence]

Full Marks : 100

Time : Three Hours

The figures in the margin indicate full marks.

*Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any *five* questions : $2 \times 5 = 10$

1. What is the difference between a state and a node? [CO2]
2. What are the time complexity and space complexity of Iterative Deepening Search? [CO2]
3. What is consistent heuristics? [CO2]
4. What are the drawbacks of hill climbing? [CO2]
5. Define constraint satisfaction problems. [CO3]
6. Define forward chaining. [CO3]

P.T.O.

7. How do you represent "All dogs have tails" in First order logic? [CO3]
8. What kind of search is performed by A* algorithm? [CO2]

Group - B

Answer any *four* questions : 15×4=60

9. Discuss the complexity, completeness and optimality of the following search methods : 3×5=15
- (i) Breadth-first search
 - (ii) Bidirectional search
 - (iii) Best-first search [CO2]
 - (iv) A* search
 - (v) Minimax search

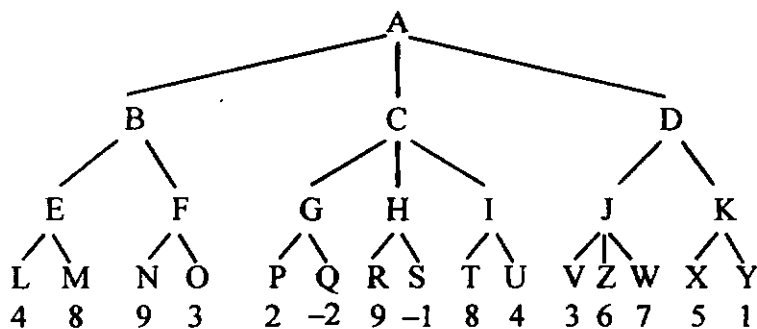
10. Consider the problem —

You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallons jug? Explicit assumptions : A jug can be filled from the pump, water can be poured out of a jug onto the ground, water can be poured from one jug to another and that there are no other measuring devices available.

- (i) Solve the problem.

- (ii) Draw the implicit graph of the problem and solve using D.F.S. 5+10 [CO1]
11. (i) How does informed search differ from blind search algorithm? [CO2]
- (ii) Prove that overestimation of heuristic values in A* search can result in non optimal solution path. [CO2]
- (iii) What is Manhattan distance heuristics? How does it work? Show with an example. 3+6+6 [CO2]
12. (i) How the drawbacks of hill climbing search can be removed? [CO2]
- (ii) What do you understand by linear conflict heuristics? [CO2]
- (iii) What is the idea behind genetic algorithm (GA)? Briefly discuss the working principle of GA. 5+3+7 [CO2]
13. Propose an evaluation function for tic-tac-toe. Draw the game tree with the evaluation function up to level 2. Find the minimax value. 4+9+2 [CO2]
14. (i) What do you mean by AI agent? [CO1]
- (ii) What is Turing Test? How is it done? [CO1]
- (iii) What are the components of knowledge representation? Explain each of them. 2+(2+3)+(2+6) [CO3]
- P.T.O.

15. What is $\alpha - \beta$ pruning? Apply $\alpha - \beta$ pruning to the following graph and identify the types of pruning.



15 [CO2]

16. Write short notes on (any *three*) :

5×3=15

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| (i) Tabu search | [CO2] |
| (ii) Simulated Annealing | [CO2] |
| (iii) DFS B & B | [CO2] |
| (iv) Greedy Best First search | [CO2] |

Internal Assessment - 30 marks
