JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-2 EXAMINATION-2025

M.Tech-2nd Semester (ECE)

COURSE CODE (CREDITS): 21M11EC212 (3) MAX. MARKS: 25

COURSE NAME: Artificial Intelligence and Expert Systems

COURSE INSTRUCTORS: Dr. Naveen Jaglan MAX. TIME: 1 Hour 30 Min

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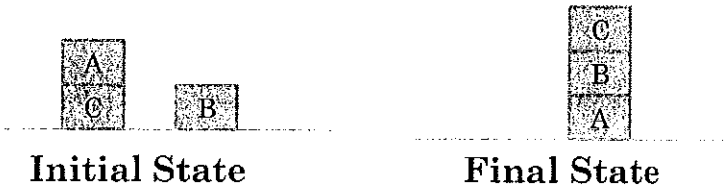
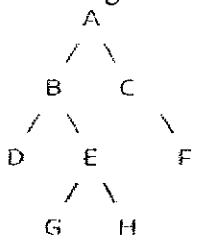
***Note:*** *(a) All questions are compulsory.*

*(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.*

| Q.No | Questions | CO | Marks |
|---|---|---|---|
| Q1 | Find the solution to the following blocks world problem using steepest hill method. State the heuristics used. What are the limitations of hill climbing algorithms?<br>  <br>**Initial State** **Final State** | 1 | 4 |
| Q2 | Write a Python program to perform Breadth-First Search (BFS) traversal on the given graph starting from node 'A':<br>  <br>(a) Implement BFS using a queue (FIFO).<br>(b) Return the order in which the nodes are visited.<br>Assume the graph is stored as an adjacency list in a dictionary. | 2 | 4 |
| Q3 | Use the Alpha-Beta pruning algorithm to prune the game tree shown below assuming child nodes are visited from left to right. Show all final alpha and beta values computed at root, each internal node explored, and at the top of pruned branches. | 2 | 3 |

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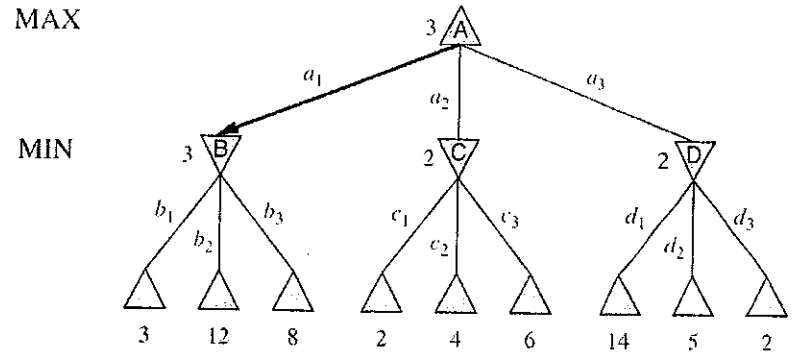
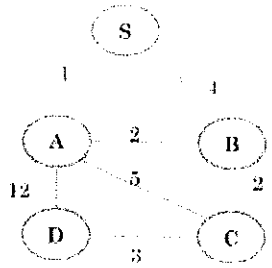
|---|---|---|---|
| |  | | |
| Q4 | Prove each of the following statements, or give a counter example:<br>(a) Breadth-first search is a special case of uniform-cost search.<br>(b) Depth-first search is a special case of best-first tree search.<br>(c) Uniform-cost search is a special case of A∗ search. | 3 | 3 |
| Q5 | For the search space shown below, find the optimal path from S to D using the heuristic values defined in table.<br>  <br>| Node | Heuristic Value |<br>\|---\|---\|<br>\| S \| 7 \|<br>\| A \| 6 \|<br>\| B \| 2 \|<br>\| C \| 1 \|<br>\| D \| 0 \| | 3 | 5 |
| Q6 | Suppose an AI agent must choose between two paths in a navigation system. The utility function U(x) = 10 - cost(x) is given, where cost(x) represents energy consumption. If Path A has a cost of 3 units and Path B has a cost of 7 units, which path will the agent choose? Why? | 2 | 2 |
| Q7 | How does AO* differ from A* in terms of its problem-solving approach? Why is AO* particularly useful for problems modeled as AND-OR graphs? Explain how AO* determines the most promising solution path in an AND-OR graph. What role does backtracking play in updating the solution graph? | 4 | 4 |