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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSD 3102 – ARTIFICIAL INTELLIGENCE TECHNIQUES

YEAR: III CSE, CSE(IoT) & CSE(CS) **SEMESTER: V**

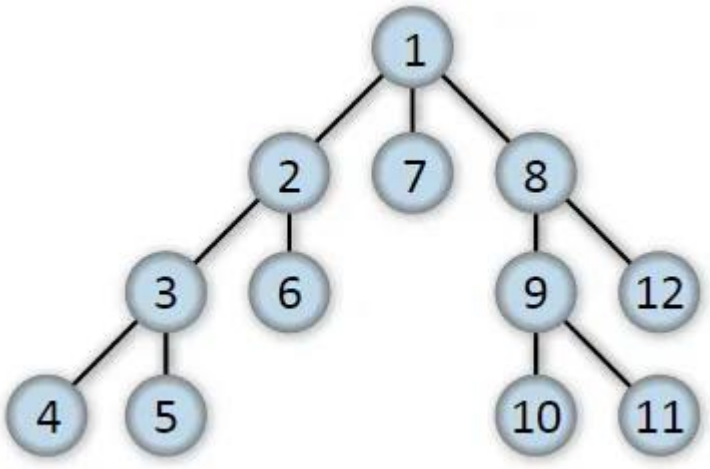
Total Marks: 20

ASSIGNMENT

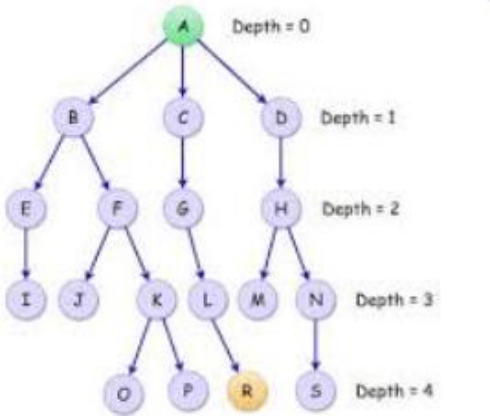
Question 1: Three missionaries and three cannibals must cross a river using a boat that can hold at most two people at a time. The goal is to get everyone across the river without leaving a group of missionaries on either side in a situation where they are outnumbered by cannibals (because the cannibals would eat them). All missionaries and cannibals must arrive safely on the other side of the river.The boat cannot cross the river by itself with no people on board.

Formulate a strategy to safely get all the missionaries and cannibals across the river while adhering to the given constraints. Identify the sequence of crossings and describe the reasoning behind your solution." **(4 marks)**

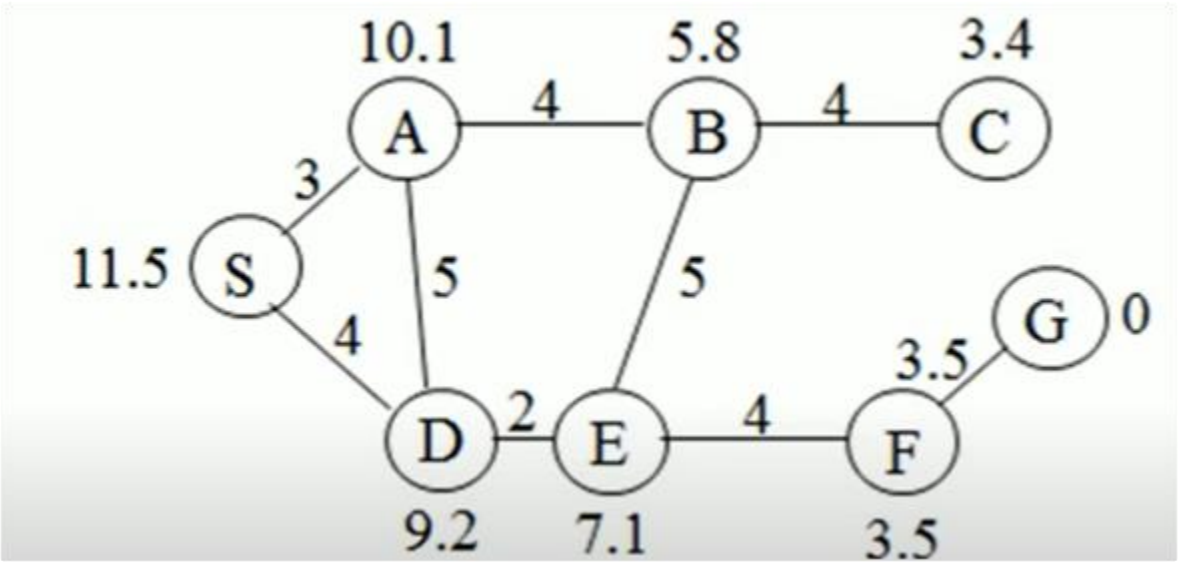
Question 2: Analyze how the depth first search algorithm would traverse the below tree starting from the root node 1. **(3 marks)**



Question 3: Apply Iterative Deepening Search for the below tree to reach goal node R from A. **(4 Marks)**



Question 4: Find the shortest path to reach the goal state G from Start state S using A* search algorithm. **(4 Marks)**



Question 5: Consider a simple grid-based path finding problem. Apply to find the shortest path from a start node to a goal node in a small maze. **(5 Marks)**

Problem Setup:

- **Grid Size**: 4x4
- **Start Node**: Top-left corner (0,0) . It is represented as “S”
- **Goal Node**: Bottom-right corner (3,3). It is represented as “G”
- **Obstacles**: Some cells are blocked and cannot be traversed. It is represented as “1”
- **Open Cell:** The cell without obstacle is open cell and it is represented as “0”
- **Memory Constraint**: The algorithm can only store up to 3 nodes in memory at any time.
- Use the Manhattan distance as the heuristic function

S	0	0	0
0	1	0	0
0	1	1	0
0	0	0	G

Illustrate how SMA* can be used in a constrained environment to find paths efficiently managing limited memory.