Indian Institute of Information Technology Ranchi

Department of CSE

B. Tech. Mid Semester Examination – Spring Semester 2022-23

Semester: 6th **Branch: CSE**

Course Code: CS 3002 **Course Name: Artificial Intelligence**

QUESTION PAPER **Max Marks: 60**

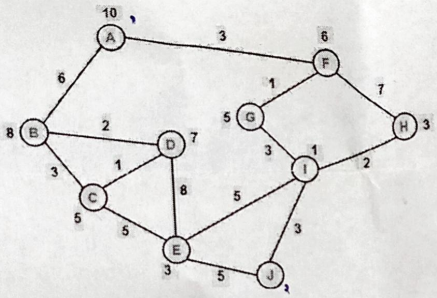
Duration: 2 hrs.

Instructions:

(1) Answer all the questions. Number in [] indicates marks.
(2) Scientific calculator is allowed in the examination.
(3) Any missing data can be assumed suitably.

1 **(a)** Define AI. State Turing test and show its application in AI. [5]

(b) Let in the following graph, nodes represent states. A and J are the start and goal states, respectively. The value of the heuristic function for each node is shown alongside with the node. The edges represent the distance between two nodes. Give the order of nodes visited by A*. [10]



(c) Consider the following 8-puzzle, 'S' is a start state, and goal state as given below, [5]

1	2	3
4	5	6
	7	8

(S)

1	2	3
4	5	6
7	8	

(Goal)

Apply BFS to find the goal state from state 'S'. Give the total number of unique states including 'S'.

2 (a) Consider the following graph. [5+5]

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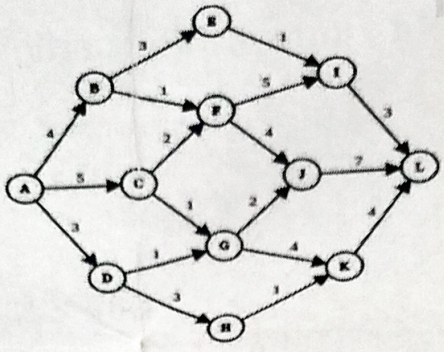

Duplicate Nodes will not be expanded.

(1) A is the initial state and we always pick the lexicographically smallest state in case of a tie. If the goal state is L, find the order of exploration of states in BFS?

(2) A is the initial state and we always pick the lexicographically smallest state in case of a tie. If the goal state is L, find the order of exploration of states in UCS?

(b) Give a problem formulation for following. [10]

Let there are three jugs, measuring 12 gallons, 8 gallons, and 3 gallons of water, and a water faucet. The task is to measure out exactly one gallon of water. One is permitted to fill the jugs full or empty them out from one to another or onto the ground.

(c) Differentiate between Stochastic and Steepest Hill Climbing algorithm for solving 4-Queen problem. Discuss any two problems that will occur when Local search algorithm is applied to solve any problem. [5]

3 **(a)** Suppose we are playing a game where there is one goal state and each step has a cost in the range [1,100]. Now, we wish to find the optimal path starting from the initial state. Which of the following search algorithms (Breadth First Search, Iterative Deepening, Uniform Cost Search) are guaranteed to be optimal? Write your answer with proper justification. [5]

(b) Explain the Genetic Algorithm and show its functioning to maximize $F(x)=x^3$ in the interval [0,10] up to two iterations. [5]

(c) Discuss the properties of Alpha-Beta along with their limitations and apply it on the following game tree. [5]