



EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Mid Term I Examination, Summer 2023 Semester

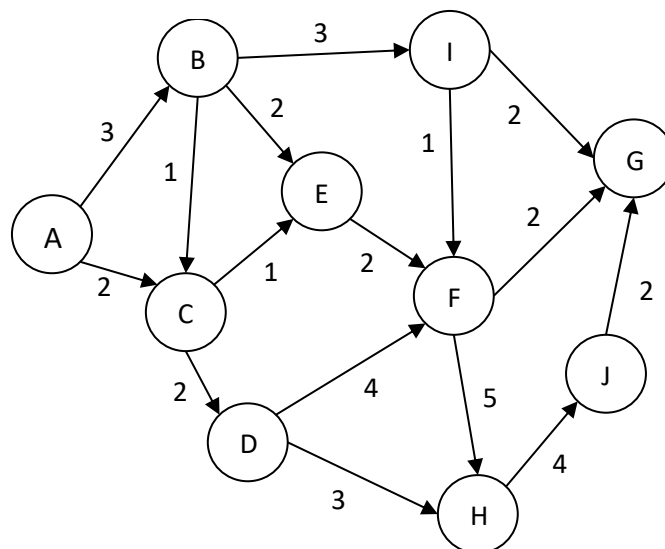
Course: CSE 366(4), ETE475 (4), ICE475 (4), ICE 476(4), Artificial Intelligence, Section-4
Instructor: Dr Md Rifat Ahmmad Rashid, Assistant Professor, Department of CSE
Full Marks: 30
Time: 1 Hour and 20 Minutes

Notes: There are FIVE questions, answer ALL of them. Course Outcome (CO), Cognitive Level (C), and Mark of each question are mentioned at the right margin.

1. a) Explain the intuition behind the Uniform cost search (UCS) and A* search algorithm.

[C2, C3
Marks:
2+6]

b) Apply the A* and uniform cost search technique to find the route from A to G in the given graph below. Use search tree to demonstrate both techniques.



Node	h(n)
A	32
B	24
C	21
D	18
E	15
F	11
I	9
J	7
H	10
G	0

2. The missionaries and cannibals problem is usually stated as follows. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.

[C3
Marks: 4]

Formulate the problem precisely (states, initial state, actions, goal state and path cost), making only those distinctions necessary to ensure a valid solution.

3. Your goal is to navigate a robot out of a maze. The robot starts in the center of the maze facing north. You can turn the robot to face north, east, south, or west. You can direct the robot to move forward a certain distance, although it will stop before hitting a wall. [C2 Marks: 3+3]
- a. Formulate this problem (states, initial state, actions, goal state and path cost). Estimate the size of the state space.
- b. From each point in the maze, we can move in any of the four directions until we reach a turning point, and this is the only action we need to do. Formulate the problem (states, initial state, actions, goal state and path cost) using these actions. Do we need to keep track of the robot's orientation now?
4. Answer the following questions: [C2 Marks: 3+3]
- a) Discuss the conditions for optimality in A* search.
- b) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent.
5. You are faced with the following 8-tiles search problem and want to solve it using a heuristic function. However, the heuristics you have developed so far are less effective than desired. Propose a heuristic function and use the heuristic to solve the given 8-tiles problem. Answer the following question: [C2 Marks: 2+4]
- a) Create a heuristic function that will help solve the given 8-puzzle problem while being consistent and admissible.
- b) Solve the given 8-puzzle problem using the A* algorithm, where you need to use the proposed heuristic function and assume a path cost of 1. Show your solution using a search tree.

Starting state

1	2	3
	4	6
7	5	8

Goal state

1	2	3
4	5	6
7	8	