ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

QUIZ 1   **WINTER SEMESTER, 2021-2022**
DURATION: 20 Minutes   **FULL MARKS: 15**

CSE 4711: Artificial Intelligence

Answer all **2 (two)** questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

Student ID: _____

The Missionaries and Cannibals problem goes 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. The goal is to take all the missionaries and cannibals to the other side of the river. In one move, one or two people can use the boat (given it is on their side) to go the other side of the river. However, on any side, the cannibals must not outnumber the missionaries (if they do, the cannibals will eat the missionaries).

We want to formulate this scenario as a search problem. Given the missionaries, cannibals, and a boat are on one side of the river, our goal is to apply a search algorithm to find out the plan to take them to the other side.

1. Model the state space graph for this problem. Your model should describe the states, actions available, successor function, start state, and goal test.   **10**
   (CO2, PO4)

Solution: **State:** Six-tuple of integers listing the number of missionaries, cannibals, and boats on each side of the river. E.g., $[M_{left}, C_{left}, B_{left}, M_{right}, C_{right}, B_{right}]$
Actions: Given the boat exists on one side of the river, 1/2 person can be moved to the other side.
Successor Function: Choose the action that move 1 or 2 people and 1 boat from one side to another. The cost can be the number of moves.
Start State: $[3, 3, 1, 0, 0, 0]$
Goal Test: The state should be $[0, 0, 0, 1, 3, 3]$

Rubric:

- 2 points for each portion

---

2. Considering both the tree search and graph search variants of Breadth-First Search (BFS) and Depth-First Search (DFS), which algorithm will you prefer to find the solution? Justify your answer.   **2 + 3**
   (CO3, PO2)

Solution: We should use BFS graph search here. From all but the first and last states, there is only one other choice. As most of the actions would return us to a previously visited state, graph search can help avoid repeating states. Since the state space is very small, we can use BFS to find the optimal solution quickly. Alternatively, DFS can also be used to find the optimal solution, considering single valid choice per state.

Rubric:

- $1 + 1$ points for correct choice (Variant + Algorithm).

- $2 + 1$ points for reasoning (Variant + Algorithm).