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: _____

A famous conjecture from Donald E. Knuth states that starting with the number 4, a sequence of factorial, square root, and floor operations can be performed to reach any desired positive integer. For example, we can reach 5 from 4 using:

$$\left\lfloor \sqrt{\sqrt{\sqrt{\sqrt{\sqrt{(4!)!}}}}} \right\rfloor = 5$$

We want to formulate this scenario as a search problem. Given any number, our goal is to apply a search algorithm to find out whether we can start from 4 to reach that number.

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

   > **Solution:** **State:** Positive numbers. Since there are infinite positive numbers, there can be infinite number of states.
   > **Actions:** 3 actions: factorial, square root, and floor, if the current state is an integer. 2 actions: square root and floor, if the current state is not an integer.
   > **Successor Function:** Apply one of the available operations on the current state. There will be an edge connecting the states. The cost can be the number of operations.
   > **Start State:** The number 4.
   > **Goal Test:** State is the desired positive integer.
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   > **Rubric:**
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   > - 2 points for each portion

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

   > **Solution:** We should use BFS graph search. Since the state space is infinite, the search tree can be huge. To ensure the optimal solution is found quickly, we should use BFS graph search. Using graph search can result in small number of nodes being expanded.
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   > **Rubric:**
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   > - 1 + 1 points for correct choice (Variant + Algorithm).
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   > - 2 + 1 points for reasoning (Variant + Algorithm).