Name: _____ Student ID: _____

Indian Institute of Technology Jammu
Mid-Term Examination
UG + PG
February 26, 2024

Course Title: Artificial and Computational Intelligence **Maximum Time: 90 Mins**
Course Code: CSL020U4E **Maximum Marks: 30**

Instructions:

- Conditions of Examination: Closed book; No dictionary; Non-programmable calculator is allowed.
- This question paper contains total of 2 Questions.

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1. **[8 + 10]**

You are given an Algorithm 1 to perform search in an infinite depth graph.

Algorithm 1 Graph Search Algorithm (GS) with Branching Factor b and Infinite Depth

```
1: procedure GS(initial_state, goal_test, get_neighbors, b)
2:     L ← List(initial_state)                          ▷ (state, depth)
3:     while L is not empty do
4:         current_state ← Extract a node randomly from L and remove it from L
5:         if goal_test(current_state) then
6:             return current_state                      ▷ Goal found
7:         end if
8:         L ← L ∪ get_neighbors(current_state)
9:     end while
10:    return None          ▷ Goal not reached within the given depth limit
11: end procedure
```

In Algorithm 1, goal_test() and get_neighbors() functions returns the boolean true if current_state is the goal node and generates list of immediate neighbors of the current_state respectively.

(a) Compute the time and space complexity of Algorithm 1. Also, comment on the optimality and feasibility of the solution if goal state exist at depth d.

(b) Execute the Algorithm 1 on a finite Graph given in figure 1. Compute the path length from start node to the goal node obtained by Algorithm 1

2. **[8 + 2 + 2]**

(a) You have to design an approach for computer to play the maze puzzle (Figure 2) in minimum number of steps. Represent the problem as a graph search problem by defining the notion of vertices, edges and constraints if any. Also, comment on the size of state space.

(b) Also, comment on the size of state space in the above maze puzzle.

(c) Also, suggest the improvements in Algorithm 1 to solve this maze puzzle if any.

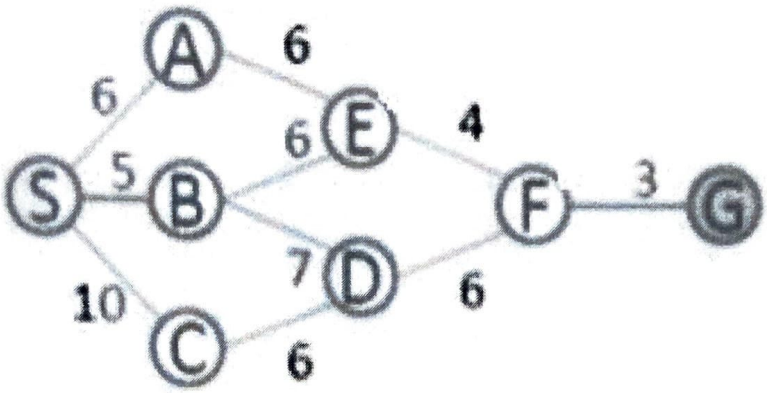

Figure 1: Graph for Search Algorithms

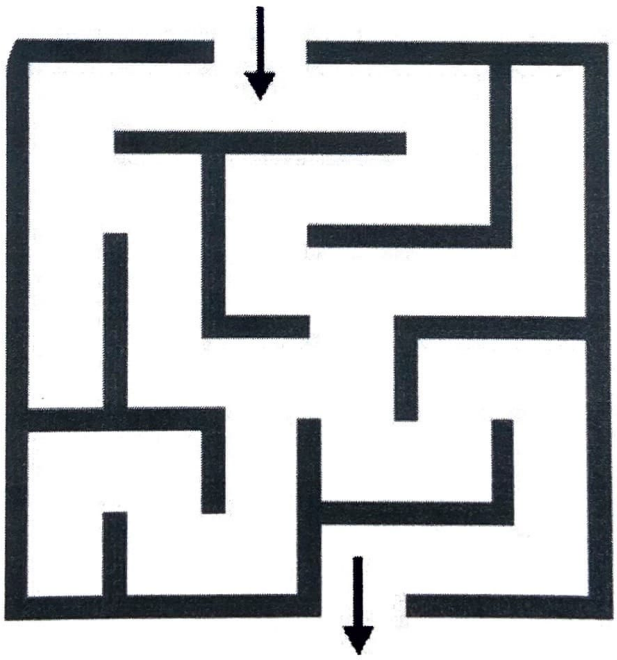

Figure 2: Maze Puzzle