CS340 Analysis of Algorithms
Fall 2023

Homework:	**3**	**Professor:**	**Dianna Xu**
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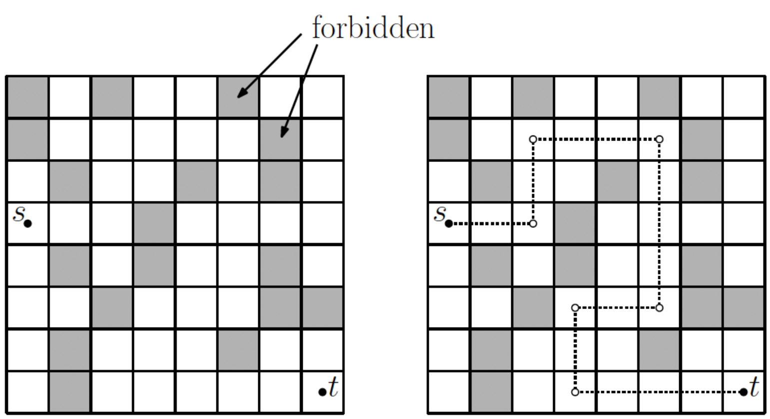
1. Problem 3.10 Full write-up. You may assume that G is unweighted.

2. Problem 4.3 Correctness only.

3. You are building the navigation system for a computer game. In this game, a player is located on an $N \times N$ grid and wishes to move from some cell s to another cell t. (Let's assume that cells are identified by their $[i,\ j]$ row-column indices.) On the grid, certain $[i,\ j]$ pairs are forbidden, meaning that the player is not allowed to pass through or land on these cells (see Fig. (a)). The player moves by *teleporting* horizontally or vertically from the current cell to any valid cell, provided that there is no obstacle cell between.



(a) (b)

Your are to devise an algorithm that computes the minimum number of moves to get from s to t. (For example, in Fig. (b) we show that it is possible to get from s to t using only 7 moves.) By the nature of teleportation, the distance traveled on each move does not matter, only the number of moves. The input to your program is the value N and a list of the $[i,\ j]$ pairs of the forbidden cells (and s and t). The output is the number of moves to reach t. (It is not necessary to output the path.) You may assume that there is always a path from s to t.

Let $n = N^2$ denote the total number of cells on the grid. Justify the correctness of your algorithm and derive its running time as a function of n. In other words, full write-up. Be sure to explain how you handle teleportation in your description.

Please hand in your assignment electronically on Moodle.