CS 101 Fall 2024 - Quiz 7
November, 18, 2024 - 10 Minutes **Name:** **Student ID:**

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1. (1 points) Honor Code

I promise that I will complete this quiz independently and will not use any electronic products or paper-based materials during the quiz, nor will I communicate with other students during this quiz.

I will not violate the Honor Code during this quiz. ◯ True ◯ False

2. (7 points) True or False

Determine whether the following statements are true or false.

(a) (1') After applying union-by-rank and path compression, the amortized time complexity of find on a disjoint set is still $\omega(1)$, but we can treat it as $\Theta(1)$ in practice. √ True ◯ False

(b) (1') Adjacency matrix is usually better(from the perspective of time complexity) than adjacency list when inserting a new vertex to a graph. ◯ True √ False

(c) (1') We can use BFS to determine whether a graph is bipartite. √ True ◯ False

(d) (1') A directed graph with n vertices and n-1 edges can be strongly connected. Notice that here $\mathbf{n > 1}$. ◯ True √ False

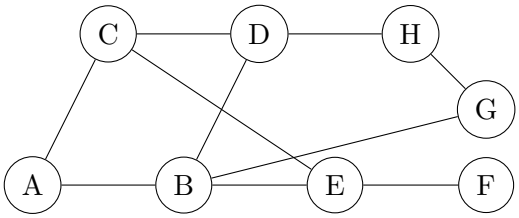
(e) (1') The time complexity of graph traversal on a connected undirected graph stored with its adjacency list is $\Theta(|E|)$ where $|E|$ is the number of edges. √ True ◯ False

(f) (1') In a simple undirected graph with $3n$ vertices and 3 connected components, the maximum number of edges in the graph is $\frac{3n(n-1)}{2}$. ◯ True √ False

(g) (1') For a simple undirected unweighted graph G, the diagonal elements of A^2 is the degree of each node, where A is the adjacency matrix of G. √ True ◯ False

3. (8 points) Simulation of DFS

Perform DFS and BFS on the graph given below, and write down the nodes in the order they are visited. If there are multiple unvisited neighbors of a node, push them into stack or queue in their lexicographical order.



(a) (4') DFS starting from node A

Solution:
using recursive DFS: A → B → D → C → E → F → H → G
using iterative DFS: A → B → C → D → E → F → H → G
regarding pop from the stack as visited: A → C → E → F → B → G → H → D

(b) (4') BFS starting from node E

Solution: E → B → C → F → A → D → G → H

4. (1 points) Forms

(a) Which can best describe your CS101 study through the past term?

◯ Easy ◯ Mild ◯ Moderate ◯ Severe

(b) How much time do you usually spend in CS101 for one week, lecture or discussion class not included?

◯ 1-3 hr ◯ 3-5 hr ◯ 5-7 hr ◯ 7-10 hr ◯ 10-15 hr ◯ More than 15 hr

(c) During the course, what confusing points do you have, or which aspects of the concepts are poorly understood?

Solution:

(d) How do you think we can improve these in the upcoming lessons?