CS251 - Data Structures and Algorithms
Fall 2024

PSO 8, Week 9

Question 1

(Review BFS and DFS)

Consider the following undirected graph drawn below. Assume that the graph is represented in an adjacency-list form and that each adjacency-list is given in lexicographic order.

(1) List the order that edges are added to the BFS tree if we run BFS starting at node A.

(2) List the order that edges are added to the DFS tree if we run DFS starting at node A.
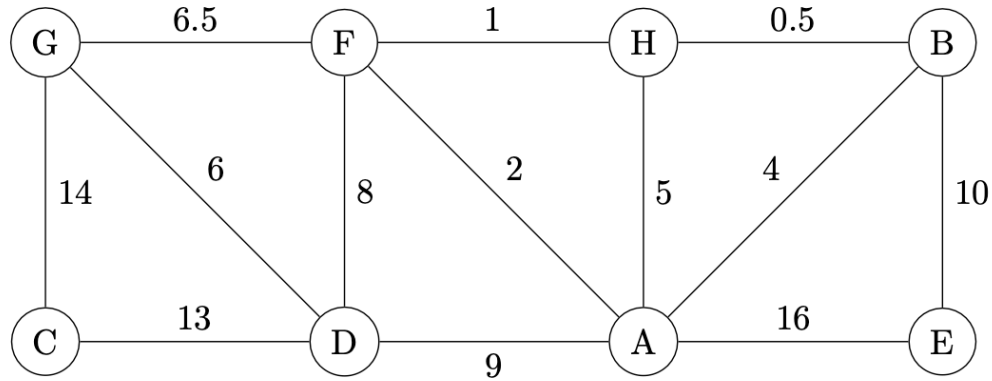
Question 2

(More on BFS and DFS)

(1) What is the minimum size of a binary tree where the BFS traversal is different from the pre-order traversal.

(2) Is is possible that a vertex u of a directed graph G can end up in a depth-first tree containing only u, even though u has both incoming and outgoing edges in G?

(3) **TRUE or FALSE**: A directed graph G contains a path from u to v, and if u is visited before v in a DFS of G, then v must be a descendant of u in the corresponding DFS tree.

Question 3

(Furthermore on BFS and DFS — Articulation point)

We define an *articulation point* as a vertex that when removed causes a connected graph to become disconnected. For this problem, we will try to find the articulation points in an undirected graph G.

(1) How can we efficiently check whether or not a graph is disconnected?

(2) How to determine if a node u is an articulation point or not?