QuickCheck 06: Solutions

Due: 8:00 am on Thursday, Feb 20, 2020

QuickChecks must be scanned and submitted online via Gradescope. If you have a smartphone, you can follow these steps to scan using an app: https://www.gradescope.com/help#help-center-item-student-scanning. Otherwise, there are scanners located at various libraries on campus which can be found here: https://finance.uw.edu/c2/printing-copying/dawg-prints-copy-locations. Make sure that the gray border around the edge of this page is visible in your scanned document.

1. True or False?

(a) DFS can detect a cycle in a graph. ○ True ○ False

(b) BFS can detect a cycle in a graph. ○ True ○ False

(c) Pre-order is one type of DFS. ○ True ○ False

(d) Dijkstra's algorithm will always correctly find the shortest path in a graph with negative edge weights. ○ True ○ False
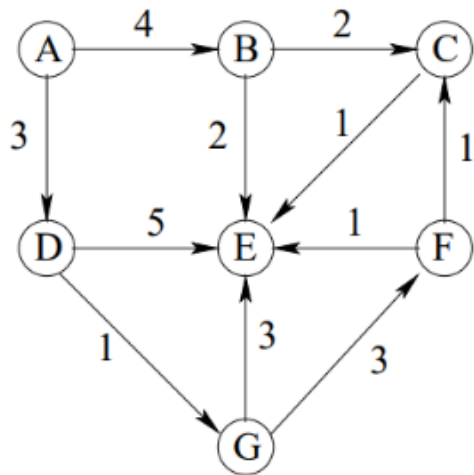
Solution:

(a) True

(b) True

(c) True

(d) False

2. Dijkstra's algorithm

(a) What is the runtime of Dijkstra's algorithm, in terms
of $|V|$ (the number of vertices in the graph) and $|E|$
(the number of edges in the graph)?

$\mathcal{O}\left(\rule{0cm}{0.8cm}\right.$ $\left.\rule{0cm}{0.8cm}\right)$

(b) Execute Dijkstra's algorithm on the graph below starting at vertex A. If there are any ties, the vertex with the
lower letter comes first. In the table below, list the vertices in the order in which they are deleted from the
priority queue and for each the shortest distance from A to the vertex.

Order Visited	Vertex	Distance from A
1	A	0
2		
3		
4		
5		
6		
7		

(c) What is the shortest path from A to E for the graph
in part (b)? List the vertices in order, separated by
commas (for example: A, B, C).

Solution:

(a) $\mathcal{O}\left(|E|\log|V| + |V|\log|V|\right)$, or $\mathcal{O}\left(|E|\log|V|\right)$ assuming $|E| > |V|$

(b)

Order Visited	Vertex	Distance from A
1	A	0
2	D	3
3	B	4
4	G	4
5	C	6
6	E	6
7	F	7

(c) A, B, E

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