

Washington State University
School of Electrical Engineering and Computer Science
Spring 2022

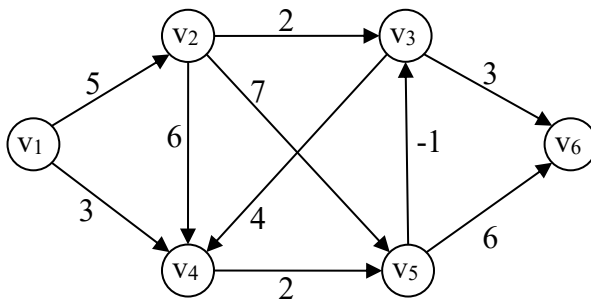
CptS 223 Advanced Data Structures in C++

Homework 11 - Solution

Due: April 20, 2022 (11:59pm pacific time)

General Instructions: Put your answers to the following problems into a PDF document and upload the document as your submission for Homework 11 for the course CptS 223 Pullman on the Canvas system by the above deadline.

Questions 1-4 refer to the following graph G.



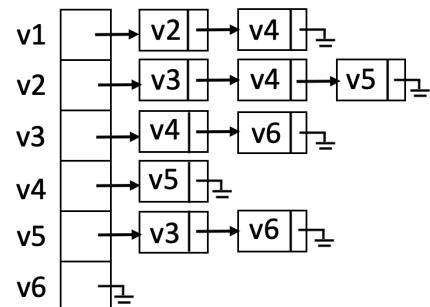
1. Show the adjacency matrix and adjacency list representations of graph G, following the example on slide 10 of the graphs-part1 lecture.

Solution: The adjacency matrix may have just 1's instead of the non-zero weights. The adjacency list elements can appear in any order and may also contain the weights. The adjacency list array should contain pointers, not the first vertex in the list.

Adjacency Matrix

	v1	v2	v3	v4	v5	v6
v1	0	5	0	3	0	0
v2	0	0	2	6	2	0
v3	0	0	0	4	0	3
v4	0	0	0	0	2	0
v5	0	0	-1	0	0	6
v6	0	0	0	0	0	0

Adjacency List



2. Show the shortest path and path cost from v_1 to every other vertex in graph G.

Solution:

v_1 to v_2 : $v_1 \rightarrow v_2$ (cost = 5)

v_1 to v_3 : $v_1 \rightarrow v_4 \rightarrow v_5 \rightarrow v_3$ (cost = 4)

v_1 to v_4 : $v_1 \rightarrow v_4$ (cost = 3)

v_1 to v_5 : $v_1 \rightarrow v_4 \rightarrow v_5$ (cost = 5)

v_1 to v_6 : $v_1 \rightarrow v_4 \rightarrow v_5 \rightarrow v_3 \rightarrow v_6$ (cost = 7)

3. Show a topological sort of graph G after removing edge $v_3 \rightarrow v_4$ and assuming the edges are unweighted.

Solution: $v_1, v_2, v_4, v_5, v_3, v_6$

4. Show the maximum flow network in G from source v_1 to sink v_6 , but after removing edge $v_5 \rightarrow v_3$. Also show the final residual graph (the one with no augmenting paths) for your maximum flow. Be sure to show both the forward and back capacities in the residual graph.

Solution:

