You will submit your solution to this assignment to the Curator System (as `HW04`). Your solution must be either a plain text file (e.g., NotePad) or a typed MS Word document; submissions in other formats will not be graded.

Credit will only be given if you show relevant work.

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1. [50 points] Apply Dijkstra's SSAD algorithm to find the shortest distance from vertex 0 to every other vertex in the graph shown in Figure 1 below. For uniformity, when choosing which node to visit next, take them in increasing numeric order. You must show supporting work in the form of a table; see the course website for an acceptable format. You do not need to list the paths in your answer, just the minimum distances.

Note: the example in the course notes shows an undirected graph, but the algorithm applies to directed graphs as well, and in the obvious manner.

Green values indicate an update; red values indicate the node has been added to the solution set in that step:

0	1	2	3	4	5	6	7	8	9	10	Current solution set
0	7	-	-	5	-	-	2	-	-	-	0
	7	-	-	5	3	-	2	6	-	-	0, 7
	7	4	9	5	3	10		6	6	-	0, 7, 5
	7	4	6	5		10		6	6	-	0, 7, 5, 2
	6		6	5		10		6	6	-	0, 7, 5, 2, 4
	6		6			10		6	6	-	0, 7, 5, 2, 4, 1
			6			8		6	6	12	0, 7, 5, 2, 4, 1, 3
						8		6	6	12	0, 7, 5, 2, 4, 1, 3, 8
						7			6	10	0, 7, 5, 2, 4, 1, 3, 8, 9
						7				10	0, 7, 5, 2, 4, 1, 3, 8, 9, 6
										10	0, 7, 5, 2, 4, 1, 3, 8, 9, 6, 10
0	6	4	6	5	3	7	2	6	6	10	<-- shortest path lengths

2. [50 points] Using a depth-first traversal, find a topological ordering of the nodes in the graph shown in Figure 2 below. For uniformity, when choosing which node to visit next, take them in increasing numeric order. You must show supporting work; see the course website for an acceptable format.

Starting at vertex 0, on the first pass of DFS I mark 0, proceed to 1 and mark it, proceed to 2 and mark it, proceed to 3 and mark it, and proceed to 10 and mark it. 10 has no unmarked successors, so I prefix it to my solution (10). Then I backtrack to 3, which has no unmarked successors, so I prefix it to my solution (3 10). Continuing, I backtrack through 2 and 1, prefixing them to my solution (1 2 3 10), until I reach 0 again. From 0 I proceed to and mark 4, which has no unmarked successors, so I prefix 4 to my solution (4 1 2 3 10). I then backtrack to 0, which now has no unmarked successors, so I prefix 0 to my solution, and I conclude the first pass of DFS with the partial solution: 0 4 1 2 3 10.

I start my second pass at vertex 5, marking it; then I proceed to 9 and mark it, then to 6 and mark it. 6 has no unmarked successors, so I prefix it to my solution (6 0 4 1 2 3 10), then backtrack to 9, which has no unmarked successors and prefix that to my solution (9 6 0 4 1 2 3 10), and finally backtrack to 5, which has no unmarked successors, and prefix 5 to my solution, concluding the second pass with the partial solution: (5 9 6 0 4 1 2 3 10).

The final two passes start at 7 and 8, respectively; neither of those has an unmarked successor, so I prefix them to the solution, obtaining the complete solution: (8 7 5 9 6 0 4 1 2 3 10).

Figure 1

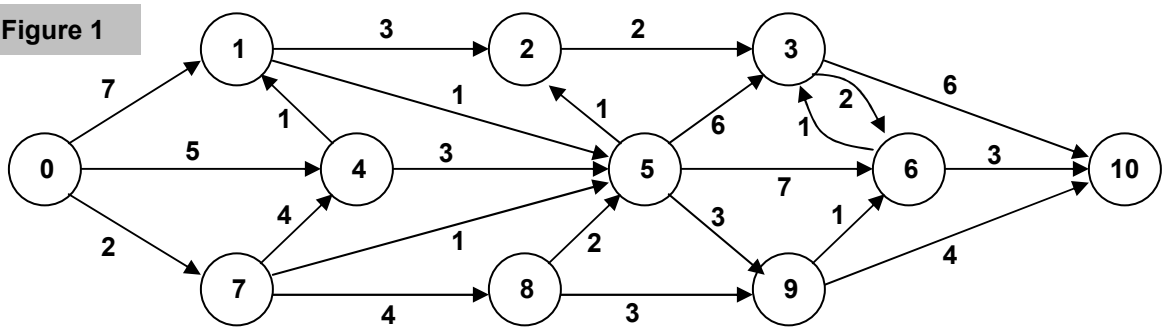

Figure 2