Started on	Monday, 8 April 2024, 11:24 AM
State	Finished
Completed on	Monday, 8 April 2024, 11:46 AM
Time taken	21 mins 51 secs
Grade	**10.00** out of 10.00 (**100**%)

Question 1

Correct

Mark 1.00 out of 1.00

Consider a weighted, directed acyclic graph G= (V,E,w) in which edges that leave the source vertex s may have negative weights and all other edge weights are non-negative. Does Dijkstra's algorithm correctly compute the shortest-path weight δ(s,t) from s to every vertex t in this graph?

Select one:

- True ✔
- False

For the correctness of Dijkstra, it is sufficient to show that d [v] = δ(s,v) for every v∈ V when v is added to s. Given the shortest s; v path and given that vertex u precedes v on that path, we need to verify that u is in S. If u = s, then certainly u is in S. For all other vertices, we have defined v to be the vertex not in S that is closest to s. Since d[v] =d[u] +w(u,v) and w (u,v) > 0 for all edges except possibly those leaving the source, u must be in S since it is closer to s than v.

The correct answer is 'True'.

Question 2

Correct

Mark 1.00 out of 1.00

Which of the following statements are correct regarding shortest paths in graphs?

- a. Edges with negative weights reachable from the source are not acceptable in shortest path trees
- b. A shortest path can not contain cycles ✔
- c. All subpaths of a shortest path are shortest paths as well ✔
- d. Cycles with negative weights reachable from the source are acceptable in shortest path trees

Your answer is correct.

The correct answers are:
A shortest path can not contain cycles,

All subpaths of a shortest path are shortest paths as well

Question 3

Correct

Mark 1.00 out of 1.00

In the Bellman-Ford algorithm, how many iterations are required to find the shortest path in a graph with V vertices and E edges?

Select one:

- a. V - 1 ✔
- b. E - 1
- c. V
- d. E

Your answer is correct.

The correct answer is: V - 1

Question 4

Correct

Mark 1.00 out of 1.00

Consider a weighted directed graph G = (V,E,w) and let X be a shortest s-t path for s,t ∈ V. If we double the weight of every edge in the graph, setting w'(e) = 2 w(e) for each e ∈ E, then X will still be a shortest s - t path in (V,E,w').

Select one:

- True ✔
- False

Any linear transformation of all weights maintains all relative path lengths, and thus shortest paths will continue to be shortest paths, and more generally all paths will have the same relative ordering. One simple way of thinking about this is unit conversions between kilometers and miles.

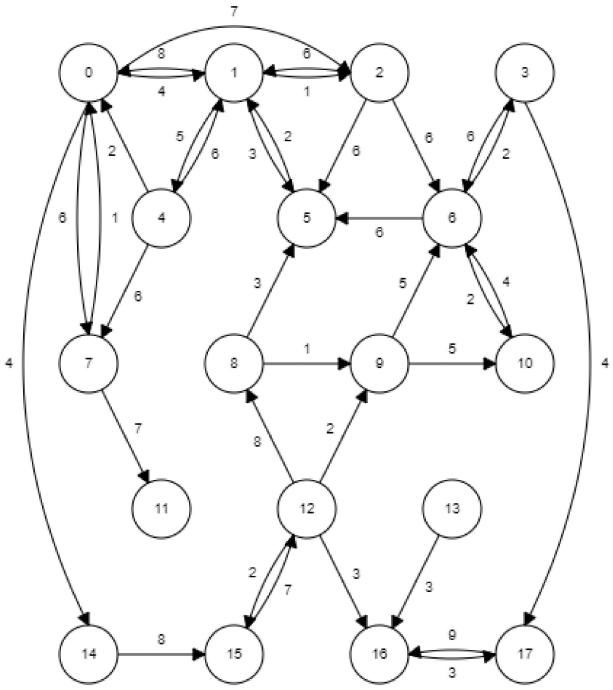
The correct answer is 'True'.

Question 5

Correct

Mark 1.00 out of 1.00

Suppose we executed Dijkstra algorithm on the following graph starting from 8.



That execution returned the following path from 8 to 12.

8 5 1 4 0 14 15 12

Which of the following is/are true?

Select one or more:

- [x] a. 1 4 0 14 15 is a shortest path from 1 to 15 ✔
- [ ] b. This graph has negative cycles
- [ ] c. Cost of the shortest path from 8 to 4 is 12
- [x] d. There is no path from 8 to 13 ✔

Your answer is correct.

Paths inside a shortest path are shortest paths between respective vertices.

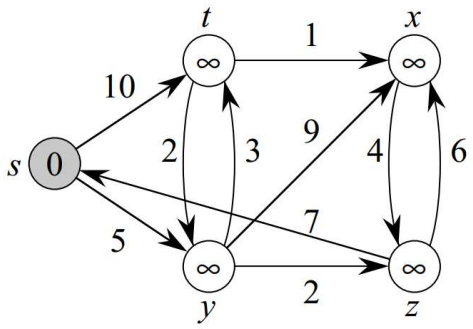
The correct answers are:
1 4 0 14 15 is a shortest path from 1 to 15,

There is no path from 8 to 13

Question 6

Correct

Mark 1.00 out of 1.00



Suppose we execute the first iteration of Bellman ford algorithm for the above graph. Take s as the source vertex. Recall that the order we process the edges inside an iteration can result in different results in intermediate iterations.

What can be a possible value at node **x** after 1st iteration? (i.e. iterating over all the edges 1 time)

Select one or more:

- a. Infinity ✔
- b. 10
- c. 13 ✔
- d. 0

Your answer is correct.

The correct answers are:
13,

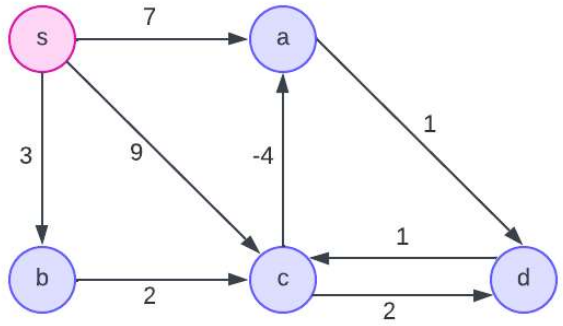
Infinity

Question 7

Correct

Mark 1.00 out of 1.00

What is the weight of the shortest path from source s to d in the following graph?



Answer: 2 ✔

The correct answer is: 2

Question 8

Correct

Mark 1.00 out of 1.00

Which algorithm is used to solve the single-source shortest path problem in a graph with negative edge weights?

Select one:

- a. Bellman-Ford algorithm ✔
- b. Prim's algorithm
- c. Dijkstra's algorithm
- d. Kruskal's algorithm

Your answer is correct.

The correct answer is: Bellman-Ford algorithm

Question 9

Correct

Mark 1.00 out of 1.00

What is the worst case space complexity of Bellman Ford algorithm?

Select one:

- a. O(|V|) ✔
- b. O(|E| |V|)
- c. O($|V|^2$)
- d. O(|E|)

The correct answer is: O(|V|)

Question 10

Correct

Mark 1.00 out of 1.00

Which of the following data structures is typically used in the implementation of Dijkstra's algorithm?

Select one:

- a. Hash table
- b. Queue
- c. Stack
- d. Priority queue ✔

Your answer is correct.

The correct answer is: Priority queue