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State	Finished
Completed on	Thursday, November 9, 2023, 11:09 AM
Time taken	9 mins 45 secs
Grade	7.00 out of 10.00 (70%)

Question 1

Correct

1.00 points out of 1.00

When programming Prim's algorithm, it is imperative to find the lightest edge quickly. What is one way of doing this?

- ☐ a. All of the above.
- ☐ b. Place the edges into a max priority queue.
- ☐ c. Place the vertices into a priority queue and do an increaseKey() operation as new vertices are discovered.
- ☐ d. None of the above.
- ☒ e. Place the vertices into a min priority queue where the key is the shortest adjacent edge. ✓

Your answer is correct.

The correct answer is:

Place the vertices into a min priority queue where the key is the shortest adjacent edge.

Question 2

Correct

1.00 points out of 1.00

What is meant when it is said that the shortest paths problem has an optimal substructure?

- ☐ a. None of the above.
- ☒ b. A shortest path between two vertices contains other shortest paths within it. ✓
- ☐ c. The shortest path will always have a cycle, to make it easy to get back to where you came from.
- ☐ d. All of the above.
- ☐ e. The shortest path found by an algorithm such as Dijkstra's will always be unique.

Your answer is correct.

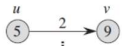
The correct answer is:

A shortest path between two vertices contains other shortest paths within it.

Question 3

Incorrect

0.00 points out of 1.00



Given the vertices above, where 5 represents the current distance from the source to vertex u and 9 is the current known distance from the source to vertex v , what is the result of executing the command: $\text{relax}(u, v, w)$.

- ☐ a. None of the above.
- ☒ b. $u.d$ is changed to 7 ✗
- ☐ c. $u.d$ is unchanged.
- ☐ d. All of the above.
- ☐ e. $v.d$ is unchanged.

Your answer is incorrect.

The correct answer is:

$u.d$ is unchanged.

Question 4

Correct

1.00 points out of 1.00

Dijkstra's algorithm allows negative weight edges.

- ☐ True
- ☒ False ✓

The correct answer is 'false'.

Question 5

Correct

1.00 points out of 1.00

What is a greedy algorithm?

- ☐ a. An algorithm that uses more than 2x the size of the data in storage resources.
- ☐ b. None of the above.
- ☐ c. Any algorithm that always leads to the correct solution.
- ☒ d. An algorithm that makes the best immediate choices that it can, which then lead to an optimal solution. ✓
- ☐ e. All of the above.

Your answer is correct.

The correct answer is:

An algorithm that makes the best immediate choices that it can, which then lead to an optimal solution.

Question 6

Correct
1.00 points out of 1.00

What is the time complexity of Dijkstra's algorithm when a priority queue with a $O(\lg n)$ `increaseKey()` function is used?

- ☐ a. $O(n)$
- ☒ b. $O(E \lg V)$ ✓
- ☐ c. $O(V^2)$
- ☐ d. $O(n \lg n)$
- ☐ e. None of the above.

Your answer is correct.

The correct answer is:
 $O(E \lg V)$

Question 7

Incorrect
0.00 points out of 1.00

Given a weighted graph where weights of all edges are unique (no two edges have same weights), there is **always** a unique shortest path from a source to destination in such a graph?

- ☒ True ✗
- ☐ False

The correct answer is 'false'.

Question 8

Incorrect
0.00 points out of 1.00

In a weighted graph, assume that the shortest path from a source s to a destination t is correctly calculated using Dijkstra's algorithm. If we increase the weight of every edge by 1, the shortest path **always** remains the same.

- ☒ True ✗
- ☐ False

The correct answer is 'false'.

Question 9

Correct
1.00 points out of 1.00

What type of algorithm is Floyd-Warshall?

- ☐ a. Greedy
- ☐ b. Divide and Conquer
- ☐ c. Randomized Monte Carlo
- ☒ d. Dynamic Programming ✓
- ☐ e. None of the above

Your answer is correct.

The correct answer is:
Dynamic Programming

Question 10

Correct
1.00 points out of 1.00

Why are negative weight edges a problem with shortest paths algorithms?

- ☒ a. They can be part of a negative-weight cycle, which makes the concept of distance meaningless. ✓
- ☐ b. All of the above.
- ☐ c. In the context of a topological sort, they imply that one can go backwards in time, which isn't true in real life.
- ☐ d. None of the above.
- ☐ e. A graph with negative weight edges can only be have distances calculated with the Bellman-Ford algorithm.

Your answer is correct.

The correct answer is:
They can be part of a negative-weight cycle, which makes the concept of distance meaningless.