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State	Finished
Completed on	Thursday, October 26, 2023, 11:10 AM
Time taken	9 mins 39 secs
Grade	7.00 out of 10.00 (70%)

Question 1

Correct

1.00 points out of 1.00

Which are properties of a minimum spanning tree?

- ☐ a. There is exactly one path from any node to any other node.
- ☐ b. There are no cycles.
- ☐ c. A MST of n nodes has $n-1$ edges.
- ☒ d. All are properties of a minimum spanning tree. ✓
- ☐ e. None are properties of a minimum spanning tree.

Your answer is correct.

The correct answer is:

All are properties of a minimum spanning tree.

Question 2

Correct

1.00 points out of 1.00

Why is the time complexity of Kruskal's algorithm $O(E \log V)$?

- ☐ a. Because each vertex is put into a priority queue, and pulled out (in time $O(\lg n)$) twice for each edge.
- ☒ b. Because the edges must be sorted in $O(E \log E)$ time and this sorting time dominates all other parts of the algorithm. ✓
- ☐ c. Because the amortized time for doing a disjoint set union operation is $O(\lg n)$ and this operation must be done n times.
- ☐ d. All of the above are reasons.
- ☐ e. None of the above is the reason.

Your answer is correct.

The correct answer is:

Because the edges must be sorted in $O(E \log E)$ time and this sorting time dominates all other parts of the algorithm.**Question 3**

Correct

1.00 points out of 1.00

During a run of Kruskal's algorithm on a connected n -node graph, how many make-set operations must be performed?

- ☐ a. 1
- ☐ b. $n-1$
- ☒ c. n ✓
- ☐ d. $2n$
- ☐ e. n^2
- ☐ f. None of the above.

Your answer is correct.

The correct answer is:

 n **Question 4**

Correct

1.00 points out of 1.00

During a run of Kruskal's algorithm on a connected n -node graph, how many union operations must be performed?

- ☐ a. 1
- ☒ b. $n-1$ ✓
- ☐ c. n
- ☐ d. $2n$
- ☐ e. n^2
- ☐ f. None of the above.

Your answer is correct.

The correct answer is:

 $n-1$ **Question 5**

Correct

1.00 points out of 1.00

During a run of Kruskal's algorithm on a connected n -node graph, how many find-set operations must be performed?

- ☐ a. 1
- ☐ b. $n-1$
- ☐ c. n
- ☒ d. $2E$, where E is the number of edges ✓
- ☐ e. n^2
- ☐ f. none

Your answer is correct.

The correct answer is:

 $2E$, where E is the number of edges

Question 6

Correct

1.00 points out of 1.00

Which of these statements are true: The minimum weight edge of a graph must be part of the MST. The maximum weight edge cannot be part of the MST.

- ☒ a. The first statement is true, the second false. ✓
- ☐ b. The first statement is false, the second true.
- ☐ c. Both statements are true.
- ☐ d. Both statements are false.

Your answer is correct.

The correct answer is:

The first statement is true, the second false.

Question 7

Correct

1.00 points out of 1.00

For a given graph G, is its minimum spanning tree unique?

- ☐ a. In general there may be more than 1 possible MST.
- ☐ b. If edge weights are unique, there is a unique MST.
- ☐ c. If the two minimum edge weights are the same, there may be more than 1 possible MST.
- ☒ d. All of the above are true. ✓
- ☐ e. None of the above are true.

Your answer is correct.

The correct answer is:

All of the above are true.

Question 8

Incorrect

0.00 points out of 1.00

Let G be an undirected connected graph with distinct edge weight. Let e_{\max} be the edge with maximum weight and e_{\min} the edge with minimum weight. Which of the following statements is false?

- ☐ a. Every minimum spanning tree of G must contain e_{\min}
- ☐ b. If e_{\max} is in a minimum spanning tree, then its removal must disconnect G
- ☐ c. No minimum spanning tree contains e_{\max}
- ☒ d. G has a unique minimum spanning tree ✗
- ☐ e. All of the above are false.

Your answer is incorrect.

The correct answer is:

No minimum spanning tree contains e_{\max}

Question 9

Incorrect

0.00 points out of 1.00

Let G be a connected undirected graph of 11 vertices and 30 edges. The weight of a minimum spanning tree of G is 500. When the weight of each edge of G is increased by five, what is the weight of a minimum spanning tree?

- ☐ a. 500
- ☐ b. 550
- ☐ c. 1500
- ☒ d. 2500 ✗
- ☐ e. None of the above

Your answer is incorrect.

The correct answer is:

550

Question 10

Not answered

Points out of 1.00

How can one determine if a graph is acyclic?

- ☐ a. Use a disjoint data structure, and do a union operation on each node until a find-set operation returns false.
- ☐ b. Insert edges into a min priority queue, and extract based on the node's distance from a source node.
- ☐ c. Use a DFS to determine if the graph has back edges.
- ☐ d. All of the above are ways to determine if a graph is acyclic.
- ☐ e. None of the above are ways to determine if a graph is acyclic.

Your answer is incorrect.

The correct answer is:

Use a DFS to determine if the graph has back edges.