Quiz 1

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Quiz 1

8/8 points (graded)

1. Can a complete graph be a tree?

- ◯ No, never.
- ◯ Yes, if the order of the graph is an odd number.
- ◉ Yes, if the order of the graph is 1 or 2. ✔

Explanation

A tree is a connected graph with no cycle. Any complete graph is connected, as it includes all edges, but most complete graphs contain a cycle. More precisely, any complete graph that contains at least 3 vertices contains a cycle, as any triplet of vertices in the graph results in a cycle.

2. Consider a graph G that contains the edge $\{u, v\}$. What can you say about the sequence $\{u, v\}, \{v, u\}$?

- ◯ It is not a cycle, because a cycle is a sequence of vertices, not of edges.
- ◉ It is not a cycle, because a cycle is a path, and in a path each edge can only appear once at most. ✔
- ◯ It is a cycle.

3. What is the size of a graph with the corresponding adjacency matrix $\begin{bmatrix} 0101 \\ 1010 \\ 0100 \\ 1000 \end{bmatrix}$?

- ◉ 3. ✔
- ◯ 6.
- ◯ 16.

Explanation

The size of a graph is the number of edges it contains. From the adjacency matrix, we can see that the set of edges is $\{\{v_1, v_2\}, \{v_1, v_4\}, \{v_2, v_3\}\}$, provided we name v_1, v_2, v_3, v_4 the vertices of the graph.

4. Let's consider a list with 10 elements. How many elements have to be accessed to reach the 6th element?

- ◉ Five ✔
- ◯ One
- ◯ Ten

Explanation

We already know the address of the first element, so we only have to read the addresses of the second, third, fourth, fifth, and sixth elements (which equals a total of five addresses).

5. We use lists to store the neighbors of vertices of a complete graph of order 25. How many elements do such lists contain?

- ○ 5
- ◉ 24
- ○ 625

✔

Explanation
In a complete graph, all vertices are connected with each other, so each vertex has 24 neighbors. So, the lists representing neighbors have a size of 24.

6. Imagine that we want to represent a graph containing many vertices in memory. We know that this graph has very few edges. What data structures are adapted?

- ☐ An array
- ☑ A list
- ☑ A dictionary

✔

Explanation
Since there are few edges, it is better to only represent existing edges (and not nonexisting ones). This means that an array would require too much memory.

Consider the following problem: We are given a list of routers and proximities between some of these routers. Each router can be associated with one frequency, with the limit that two routers that are in proximity should not be associated with the same frequency. The aim is to find the minimum number of distinct frequencies that have to be chosen in order to solve the problem.

7. What would be the good way to go about solving this problem?

- ◉ Find a way to formalize the problem, find a solution to solve the formalized problem, then code the solution.
- ○ Find a solution to solve the problem, code it, then search for possible other solutions in the literature.
- ○ Code a first solution, write its specification, then find an adequate formalism to express the problem.

✔

8. Of the following classical graph theoretical problems, which presents a good way to formalize the given problem?

- ○ The problem of finding the diameter of a graph: find the largest minimum length of a path between two vertices of a graph.
- ○ The problem of finding the maximum clique of a graph: find the largest set of vertices such that any two vertices in the set are connected by an edge.
- ◉ The problem of coloring a graph: find the minimum number of distinct colors such that each vertex of a graph is associated with a color and two vertices connected by an edge have different colors.

✔

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ℹ Answers are displayed within the problem