

### C.1 - CSC A48 – Quiz # 3

Please **read each question very carefully**, and consider your answer before marking it down on the answer sheet. **You should avoid erasing, making multiple answers, or scratching over answers** as it will cause the marking software to make mistakes on your quiz.

1.- Which of the following statements about **graphs** is **not true**:

- a) Undirected graphs can have more nodes than edges
- b) Any un-directed graph can be also represented with a suitable directed graph
- c) Any directed graph can be also represented with a suitable un-directed graph
- d) Some problems can only be represented by directed graphs
- e) Social networks are suitably represented with un-directed graphs

2.- Which of the following statements is not correct:

- a) Directed edges represent one way relationships between nodes
- b) The **degree** of a node carries information about its relative importance in the graph
- c) The **degree** of a node can be at worst  $O(N)$
- d) **Copying** an adjacency list has complexity  $O(|V|*|E|)$
- e) A path through a graph is also a graph (though it may be of a different type)

3.- Consider the following algorithm for working with a graph, and determine its worst-case complexity.  $N$  is the number of nodes,  $M$  is the number of edges.

```
AdjList <-- AdjMatrix
  * For every entry  $A[j][i]$ 
    If  $(A[j][i] \neq 1)$  insert  $i$  at the tail into the linked list at index  $j$  of the AdjList
```

- a)  $O(N*M)$                       b)  $O(M \log N)$                       c)  $O(N^2)$                       d)  $O(N^3)$                       e)  $O(M)$

4.- The following statement is **true** regarding the algorithm above (in question 3)

- a) The average-case complexity is the same as the worst case complexity
- b) The average-case complexity is  $O(N)$
- c) The average-case complexity can not be estimated in general
- d) The best case complexity is  $O(M)$
- e) The average case complexity is  $O(N^2)$

5.- You're writing an application for a top-quality restaurant in Toronto. They want to put in place a quality control and health assurance system that keeps track of the origin of every food item used in the restaurant. The restaurant with input each of their suppliers, then each supplier will be asked to input their suppliers, and so on all the way to the farmer or food grower who actually produced the food. Which graph representation would be well suited this application?

- a) An **adjacency list** where nodes represent suppliers, and directed edges connect them
  - b) An **adjacency matrix** where nodes represent suppliers, and directed edges connect them
  - c) An **adjacency list** where nodes represent suppliers, and un-directed edges connect them
  - d) An **adjacency matrix** where nodes represent food items, and directed edges connect them to suppliers
  - e) Either of a) or b)
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6.- You are reading an on-line blog that explains how to solve a path finding problem on a graph. The algorithm looks like standard DFS but when you tried to implement it (exactly as described), it crashed. Which of the reasons below **can not be** the cause of this problem.

- a) The algorithm is missing a base case    b) The recursive call doesn't reduce the size of the problem
  - c) One of the parameters is a large compound data type    d) The graph has too many edges
  - e) The graph has too many nodes
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7.- What is the **order of the maximum length** of a path returned by DFS on a graph with  $N$  nodes and  $M$  edges?

- a)  $O(N)$     b)  $O(N \log N)$     c)  $O(M)$     d)  $O(N^2)$     e)  $O(M*N)$

8.- One of the statements below is **false** regarding Tail Recursion

- a) It eliminates the need to keep a stack of active calls    b) It is more efficient than plain recursion
- c) It can be as fast as a loop-based solution    d) It reduces algorithm complexity
- e) It reduces the amount of computation

9.- A recursive solution **doesn't have** one of the properties below. Select which one.

- a) It is always more difficult to understand    b) It can lead to cleaner, simpler code
- c) It is intuitive for the right problems    d) It can be slower if not implemented carefully
- e) It requires careful thought to design

10.- Which of the problems below is **not** well suited for a recursive solution

- a) BST traversal    b) Labelling and counting cells in an image
- c) Drawing a tree    d) Amino-acid sequence alignment
- e) Making a list of your friends' friends...