

CS2010 Semester 1 2012/2013
Data Structures and Algorithms II

Tutorial 04 - Graph DS & Graph Traversal 1

For Week 06 (17 September - 21 September 2012)

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1 Introduction and Objective

This tutorial marks the second part of CS2010: Graph. This tutorial covers basic graph data structures and traversal algorithms as discussed in Lecture 05.

As we will have Quiz 1 that tests the first part of CS2010 is this coming Saturday, we have made the questions in this tutorial slightly shorter so that students can discuss Quiz 1 related materials with the tutor if needed.

Note: Use <http://www.comp.nus.edu.sg/~stevenha/visualization/representation.html> and <http://www.comp.nus.edu.sg/~stevenha/visualization/dfsbfbs.html> to *verify* the answers of some questions in this tutorial. However during written tests, you have to be able to do this by yourself.

2 Tutorial 04 Questions

Graph Properties

Q1. Does the following graph contain a non-simple cycle? If so indicate that cycle.

A cycle is defined as simple if it does not contain repeated vertices.

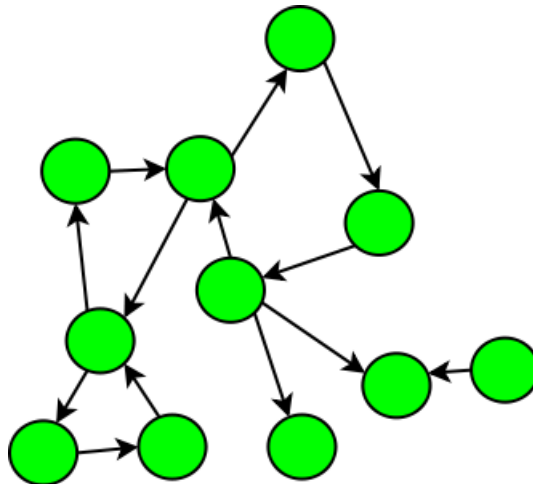


Figure 1:

Q2. How many edges are there in a complete bipartite graph of m nodes and n nodes respectively in each set?

A bipartite graph is a graph whose vertices can be divided into two disjoint sets U and V such that every edge connects a vertex in U to one in V ; but there is no edge between vertices in U and also no edge between vertices in V .

A complete bipartite graph is a bipartite graph where every node in one set U is connected to every other node in the other set V .

Q3. List the nodes in the queue at each step when performing a BFS of the graph below starting from source vertex 0. At the end, give the spanning tree induced by the BFS. (Assume that neighbors are visited in increasing order). Compare your answer with the animation produced by the algorithm visualization tool!

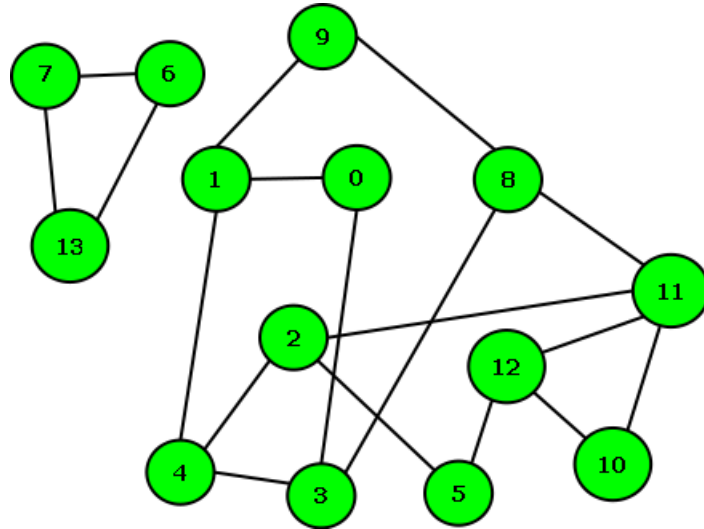


Figure 2:

Q4. Given a map of cities represented as a graph where cities are nodes and edges are routes between cities, give an algorithm to generate any valid path for a vehicle to go from a city a to another city b (you can assume that there is always some way to get from any city to every other city).

Q5. Give an algorithm to determine whether a graph is bipartite.

Problem Set 3

Q6. Discussion of PS3 Subtask 1 (a quick one)

Quiz 1

Free and Easy time to discuss past year Quiz 1 problems/solutions.