## COMP108 Algorithmic Foundations Tutorial 8 w/c 24th March 2014

Tutorial participation contributes to 5% of overall marks. For this tutorial, make sure you have scanned your ID card.

1. Consider the following binary tree T rooted as f.



Give the order of traversal of preorder, inorder, and postorder traversal of the tree.

## Preorder:

## Inorder:

## Postorder:

2. BFS/DFS. Download three java files GraphApp.java, Graph.java and Vertex.java and two input files graph1.txt and graph2.txt from the tutorial page http://www.csc.liv.ac.uk/~pwong/teaching/comp108/201314/tutorial.html (Use right mouse click to save the files.)

The two files refer to the graphs in Figure 1.

You can refer to the lecture notes for the pseudo codes.

http://www.csc.liv.ac.uk/~pwong/teaching/comp108/201314/notes.html (Graph Theory)

- (a) Compile and run the program; then enter options 1 and 3 to generate some new graph and see the adjacency matrix.
- (b) Try option 2 to input a new graph. Copy the content of one of the .txt file as the adjacency matrix. Note that graph1.txt contains 6 vertices and graph2.txt 7 vertices.
- (c) Try options 4 and 5 and note that these functions are NOT working yet.
- (d) Fill in the program Graph.java the methods **bfs()** for breadth first search, **dfs()** for depth first search.

Remember to read the comments in the methods. Also refer to the pseudo code on slides #36 and #54 of the lecture notes on Graph Theory.



Figure 1: The two graphs.

- (e) Checking the answer:
  - For graph1.txt, bfs gives **a d e f b c** and dfs gives **a d b c e f**.
  - For graph2.txt, bfs gives **a b c e d f g** and dfs gives **a b d f e c g**.
- 3. [Puzzle] Form groups of two persons with your fellow classmates to play the following game.

There are 26 coins on the table. Two players take turns removing 1, 2, 3 or 4 coins. The winner is the player who removes the last coin. Design a winning strategy for the player making the first move.

If there are 25 coins on the table, does the player making the first move have a winning strategy?

What is the relationship between the initial number of coins and which player having a winning strategy?