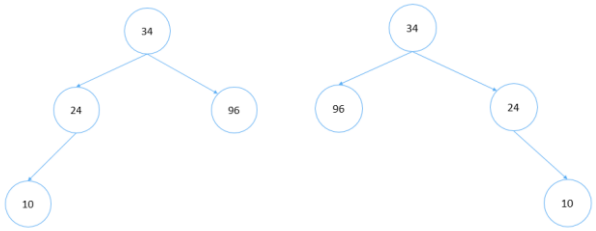
INFSCI 2591: Algorithm Design
Project 5
Due: December 13, 2016

Problem 1

Part A: Design and implement an algorithm that takes a binary tree as input and creates its mirror image version. For example, if Figure 1(a) is the input binary tree then your algorithm should produce a mirror image of it as shown in Figure 1(b).



(a) (b)

Figure 1. (a) Input; (b) Output.

Part B: Design and implement another algorithm that takes two binary trees as input and checks to see if they are mirror image of each other. For example, by taking the two binary trees in Figure 1 as input, the output of the algorithm should be "Mirror image". If the two input binary trees are not mirror image of each other, the output should be "Not mirror image".

Submit the following:

a. Pseudocode: 20 points [A:10; B: 10]
b. Source code with results on test cases: 40 points [A: 20; B: 20]
c. Time complexity (theoretical and experimental): 40 points[A: 20: B: 20]

Problem 2

Design and implement a program to play three-dimensional Tic-tac-toe between you and the program. Three-dimensional Tic-tac-toe is played on a 4 x 4 x 4 board and like two-dimensional Tic-tac-toe, players mark X and O on the board's squares alternately. The player who first aligns four marks (X or O) in any direction, parallel to one side of the board or along a diagonal, is the winner. The three-dimensional Tic-tac-toe has 76 wining positions. The program should allow you and your program mark a square in turn and print the output/board of each step of the game between you (always X) and your program (always O) until there is a winner and the game is over.

Submit the following:

a. Pseudocode: 10 points
b. Source code: 30
c. Correct results (you should be the start player in 4 games and your program should be the start player in 4 other games): 60 points

Total points: 200