CS 5130	**Advanced Data Structures and Algorithms**	Test 2
Name:	Fall 2009	Max Pts: 55

Important: This is an open book test. You can use any books, notes, or paper. *Do not log into the computer during the test*. Switch off any communications devices, including cell phones. Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [10 pt] Write an algorithm `swap_tree ( T )` that takes a binary tree T and swaps the left and right children of every node. Use any of the basic traversal methods.

2. [15 pt] Let $w_1 = \{5, 7, 10, 12, 15, 18, 20\}$ and $m = 35$. Find all possible subsets of w_1 that sum to m. Let $w_2 = \{20, 18, 15, 12, 10, 7, 5\}$ and $w_3 = \{15, 7, 20, 5, 18, 10, 12\}$. What is the effect of running sub of subsets algorithm (using backtracking) on the computing time with each of the three sequences?

3. [10 pt] Draw the dynamic state space tree generated by LC branch-and-bound algorithm for the following 0/1-knapsack instance:

$$\begin{aligned} n &= 5 \\ P &= (4, 4, 5, 8, 9) \\ W &= (4, 4, 5, 8, 9) \\ m &= 15 \end{aligned}$$

Use the fixed tuple size formulation.

4. [10 pt] Show that the clique optimization problem reduces to the clique decision problem.

5. [10 pt] For the vertex cover problem, state the corresponding absolute approximation problem.