

CSE 417: Algorithms and Computational Complexity

Assignment #6

March 1, 2004

due: Monday, March 8

1. Exercise 13.3. You are to write this algorithm using the sort of high level description used in the textbook's algorithms, not program the details in a language like Java.
2. Consider the optimization version of the vertex cover problem given in Problem 13.10 on pages 565-566. Consider the following greedy algorithm for this problem. Until the graph  $G$  is empty, repeat the following: choose the vertex  $v$  of maximum degree, add  $v$  to the vertex cover, and delete  $v$  and all its incident edges from  $G$ .

Prove that this greedy algorithm always finds the minimum vertex cover, or give a counterexample showing that it does not.

3. Exercise 13.9. You are to transform 3SAT into the set intersection problem according to Definition 13.6, and show that your transformation satisfies the three properties of that definition. That is, given a 3CNF formula  $f$ , produce  $A_1, A_2, \dots, A_m, B_1, B_2, \dots, B_n$  such that  $f$  is satisfiable if and only if there is a set  $T$  satisfying the properties of the exercise.

Hint:  $T$  might somehow reflect a truth assignment to the variables of  $f$ . But how do you ensure that  $T$  does not assign the value `true` to both a variable  $x$  and its negation  $\neg x$ ?

4. Exercise 13.12. You are to transform the undirected Hamiltonian cycle problem to the traveling salesperson problem according to Definition 13.6, and show that your transformation satisfies the three properties of that definition. Be careful that you don't do the reduction backwards.