HOMEWORK 6

Due Friday, October 30, 2009 at the beginning of class

For general homework policies and our suggestions, please see the policy document.
Do not forget to look at Jeff's grading rubric before you write down your solutions.
No collaboration is allowed on problem 1(a).

1. $(20 + 20 = 40$ points)

   (a) (**Your must work on this problem on your own: NO collaboration is allowed**)
       You are given n jobs such that for job i we are given a pair (t_i, d_i), where t_i is the
       duration of the job (i.e. the number of "days" it needs for completion) and d_i is its
       deadline (i.e. the day by which it needs to be done). Given a schedule (i.e. for each
       job i we get a start time s_i and a finish time f_i), the *overflow* of job i is defined to be
       $o_i = \max(0, f_i - d_i)$. Give an algorithm that runs in time $O(n \log n)$ that outputs "yes"
       if there exists a schedule with $\max\{o_i | 1 \le i \le n\} = 0$ and "no" otherwise.

   (b) Part (b) of Exercise 2 in Chapter 4.

2. (40 points) Exercise 3 in Chapter 4.

   Note: In this problem you are *given* the algorithm. The problem is asking you to analyze
   the algorithm using an analysis similar to the one we saw in class for Interval Scheduling. It
   might help to mathematically formulate the problem first. So some fraction of the grade will
   be allotted to the mathematical formulation of the problem. Also, in many real life problems,
   not all parameters are equally important, so keep that in mind when tackling this question.

3. (20 points) Exercise 5 in Chapter 4.

   Hint: Think of a greedy way to place the cell towers. It might help to forget about the schedul-
   ing algorithms we have seen in class and just think of a greedy algorithm from "scratch." Then
   try to analyze the algorithm using similar arguments to one we have seen in class.