1. exercise R-5.6 (GT) [5 points]

2. Consider a greedy strategy for the following problem:

   We have a company with \( n \) workers. Worker \( w_i \) works a shift \((s_i, f_i)\), where \( s_i \) is that worker’s start time and \( f_i \) the finish time.

   We want to form a small committee \( C \subseteq \{w_1, \ldots, w_n\} \) with the following property: for every worker \( w_i \) there exists a worker \( w_c \in C \) such that the shift of \( w_i \) overlaps with the shift of \( w_c \). That is, the intervals \((s_i, f_i)\) and \((s_c, f_c)\) must intersect (they do not intersect if, say, \( f_i = s_c \)).

   So the problem is to find the smallest possible set \( C \) of workers whose shifts overlap with all workers.

   (a) Describe the greedy choice. (“Choose the first worker with property \( P \).”)

   (b) Show that if there is an optimal solution for which the greedy choice was not made, then an exchange can be made to conform with your greedy choice. (“Let schedule \( S \) use worker \( w_j \) who does not satisfy property \( P \), and let \( w_k \) be the worker that does. Here I show that the schedule \( S' \), which is obtained by exchanging worker \( w_j \) for \( w_k \), is just as good as \( S \) ...”)

   (c) Describe, in English, how to implement a greedy algorithm.

   (d) How long would your algorithm take?

   [10 points]

3. exercise 5.11 (DPV) [5 points]

4. exercise 5.13 (DPV) [3 points]

5. exercise 5.26 (DPV) (in some online pdfs copies of the text, this question is 5.25 - it is the problem starting “Here a problem that occurs in automatic program analysis”) [5 points]

Total: 28 points