

Homework 5 (Rubric)

Instructor: Dieter van Melkebeek

TA: Kevin Kowalski

Problem 3 [10 points]

- [3 points] for stating an optimal pairing of routes
- [1 point] for giving an algorithm that produces the stated pairing in $O(n \log n)$ time
- [2 points] for attempting a reasonable exchange argument
- [3 points] for a correct exchange argument
- [1 point] for run-time analysis

Many submissions gave a correct algorithm for the problem and successfully proved that an exchange as described in the solutions does not increase the total overtime. However, a significant number of these submissions failed to complete the exchange argument by showing that a finite sequence of these exchanges would result in the greedy solution.

A number of submissions attempted to use a variant of the following argument to show optimality: let G be the greedy solution, and let G' be a schedule obtained from G by swapping the evening routes corresponding to two morning routes. This swap can not decrease the total overtime, so G must be optimal. This argument does not work because while G may be at least as good as any solution obtainable from G with a single swap, it's possible that a solution that requires more swaps might still be better than G .