

Advanced Analysis of Algorithms
Fall 2018
Assignment 2
(Greedy Algorithms)
Submission Date: Oct 1, 2018 before 5:00 p.m.

Note: Clearly describe your idea in 3-4 lines and then give the pseudo code

Problem 1

Your friends are starting a security company that needs to obtain licenses for n different pieces of cryptographic software. Due to regulations, they can only obtain these licenses at the rate of at most one per month. Each license is currently selling for a price of \$100. However, they are all becoming more expensive according to exponential growth curves: in particular, the cost of license j increases by a factor of $r_j > 1$ each month, where r_j is a given parameter. This means that if license j is purchased t months from now, it will cost $100 \cdot r_j^t$. Assume that all the price growth rates are distinct. Given that the company can only buy at most one license a month, in which order should it buy the licenses so that the total amount of money it spends is as small as possible. Use greedy strategy to solve this problem. Analyze the time complexity of your algorithm and give its correctness proof

Problem 2

You are given a long line segment of length L , and assume that you can move d miles per day. We'll assume that the potential stopping points are located at distances x_1, x_2, \dots, x_n from the start of the line. We'll say that a set of stopping points is *valid* if the distance between each adjacent pair is at most d , the first is at distance at most d from the start of the line, and the last is at distance at most d from the end of the line segment. Given a set of valid stopping points, device an algorithm that traverse these stopping points in minimum number of days. Use greedy strategy to solve this problem. Analyze the time complexity of your algorithm and give its correctness proof

Problem 3

Suppose that we have a set of activities to schedule among a large number of lecture halls, where any activity can take place in any lecture hall. We wish to schedule all the activities using as few lecture halls as possible. Give an efficient greedy algorithm to determine which activity should use which lecture hall. Prove the correctness of your algorithm and analyze its time complexity.

Problem 4

You are given a set of n jobs. Associated with each job, i , is a processing time t_i and a deadline d_i by which it must be completed. A feasible schedule is a permutation of the jobs such that if the jobs are processed in that order then each job finishes by its deadline. Use greedy approach to find the feasible solution of the problem if there exists any. What would be the greedy strategy? Will it always find the feasible solution (if it exists)? Justify your answer. Also give the time complexity of your proposed greedy algorithm.

Note: Plagiarism of any sort is not acceptable and will be severely punished.