

Problem Solving

Homework #4

Due: May-08 (Wed.) (before 03:00pm)

Instruction:

- a. You have 2 problems in this homework.
- b. Submit your report at the class on May-08.
- c. Any work that you turn in should be your own.
- d. Any late submission will not be accepted.

Problem #1. Invitation (10 pts)

You are going to host a party for your colleagues from work. The company has a hierarchical organization that can be represented as a tree. The CEO is the root node, and the parent node is an immediate supervisor of the child nodes. You also have preference-scores for the co-workers. The goal is to select a list of co-workers who will get the invitation to the party. Since nobody wants to have party with their immediate supervisor, you cannot invite them at the same time. In other words, you cannot select a child node if its parent node is already invited in the tree structure. Note that you can consider that you are not in the tree. Design an efficient algorithm to compute the list that maximizes the sum of preference scores. Give its time complexity.

Problem #2. Chip (10 pts)

We have $2N$ electronic chips, and there may be defective chips. When we connect a pair of chips, each chip tells whether the other chip is normal or not. The normal chips always give the correct status of the other, however, the result produced by the defective chips can be wrong. In other words, the defective chips randomly answer to the testing. The number of defective chips is smaller than the number of normal chips ($\# \text{ of defective chips} < N$). Design an efficient algorithm to find all defective chips. You need to provide the time complexity of the proposed algorithm.