Assignment 1 - Greedy

A large company that produces huge amounts of data does not have the necessary resources to store monthly backups and decides to hire external backup providers. The company has O different offices and we know, for each office o, which is the amount of data b_o, in PetaBytes (10^6 GB), that it needs to store.

After studying several possibilities, a number of backup providers D are chosen. Using a backup provider d has a fixed cost f_d and an additional cost s_d for each PB it stores. Each backup provider d can store at most k_d PBs of data.

Each office can use just one backup providers, and each backup providers can store data store data from no more than 3 different offices. In addition, the total number of backup providers want to be kept limited to no more than 3.

The goal is to find out which backup centers will be used and how many PBs of each office every will store backup provider, so that the total cost is minimized.

The data is as follows:

```
O = 1..7;

B = 1..5;

b = [200 200 200 200 200 200 200] // Demand per office (in PB)

k = [1500 500 700 1000 1000]   // Capacity per backup provider (in PB)

f = [300 350 250 800 600]      // Fixed cost

s = [1.00 0.15 0.65 0.45 0.50] // Cost per PB
```

We want to develop a heuristic algorithm to obtain approximate solutions to the optimization problem. In this assignment we concentrate on Greedy.

(a) Specify the algorithm, including: *i*) the candidates; and *ii*) the greedy function $q(\cdot)$. Specify $q(\cdot)$ using mathematical notation and a short descriptive text.

(b) Let us assume that the algorithm specified in (a) is being executed.

Detail the decisions made in every iteration of the algorithm until a solution is obtained. For each iteration, compute the value of the proposed greedy function $q(\cdot)$ for all the candidates.

The following table shows an example for a possible strategy. Of course different strategies are possible, therefore modify the table properly to fit your needs.

	Office						
Iter #*i*	1	2	3	4	5	6	7
q(*o*)							
d							

Detail the obtained solution in the next table.

Backup Provider	Office						
	1	2	3	4	5	6	7
1							
2							
3							
4							
5							

What is the total cost?

Do you think this is solution is optimal? Why?