

Network Design [Network Optimization Module]

Exam 4/06/2019

Surname _____
Name _____

Exercise #1

The graph **graph04062019R1.gml** in the attached file contains a set of potential customers that a telecom company can connect with a network rooted in node 1. Each location (node) u has associated a revenue [**revenue** attribute in the graph] and each edge uv has a connection cost [**cost** attribute in the graph].

Q1. Assuming that the company must connect **all** customers, find the most profitable implementation between the following networks configuration:

Net1: a network in which each node (excluding the root) can accept up to 3 connections.

Net2: a network in which the root node can accept up to 4 connections.

Q2. If the company may connect only a subset of customers, find the most profitable network with the constraint that the number of hops from the root node cannot exceed 4.

Q3 [Bonus]. The network in Q2 can be extended by installing in each terminal nodes a router that can connect up to three nodes in the neighbourhood at half the connection costs. Find the most profitable network extension that connects all customers (the cost of the router is 150 Euro).

Exercise #2

The graph **atsp04062019R1.gml** represents a logistic distribution network. A company must deliver one unit of a certain product to customers located in the nodes. The company can implement the following delivering plans:

Q1. Rent a vehicle with capacity $C=50$ at a cost of 3400 Euro/day

Q2. Rent one vehicle with capacity $C=18$ at a cost of 1100 Euro/day and rent a warehouse in node 16 able to store products at a cost of 2100 Euro/day

Q3. Rent two vehicles with capacity $C=18$ at a cost of 1650 Euro/day per vehicle

Find the most convenient delivering plan.

For each alternative report the optimal solution, the value of the linear relaxation and the number of enumerated nodes.