Operations Research
Project

Master Computer Science 1st year
## Université CÃ´te d'Azur

1 Project

The goal of this project is to develop a program which is able to solve the maximum flow min cost problem.
The graph is extracted from a file containing its list of nodes, arcs, upper bound capcities and costs. The file is a text file and its format is the following one:

- The first line contains 4 numbers : *numNodes numArcs sourceNode sinkNode*, where *numNodes* is the number of nodes of the graph, *numArcs* is its number of arcs, *sourceNode* is s, the source node of the flow and *sinkNode* is t, the sink of the flow
- Then, each line contains the description of an arc under the form: *emanatingNode, terminatingNode, maxCapacity, cost*. This defines the arc (*emanatingNode, terminatingNode*) whose upper bound capacity is *maxCapacity* and whose cost is *cost*.

Important: only integers will be used
Note that the text file file has a s many line as there are arcs +1.

For instance, consider the following graph:
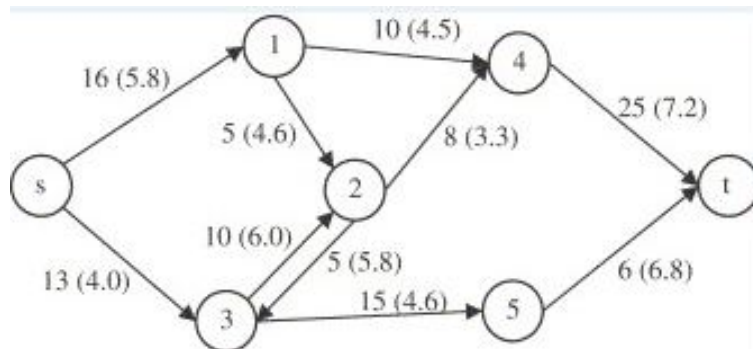
The text file representing it is (s is node 0 et t is node 6):

7	10	0	6
0	1	16	58
0	3	13	40
1	2	5	46
1	4	10	45
2	3	5	58
2	4	8	33
3	2	10	60
3	5	15	46
4	6	25	72
5	6	6	68

If the arc (t,s) is not in the graph you will have to add it before making your computation.
The tasks of the project are:

1. Implement a maximum flow algorithm for a graph given by a text file. The result is the max flow value and the list of flow value traversing each arc.

2. Implement an algorithm computing a minimum cut for a graph given by a text file. The result is the list of arcs that form a minimum cut

3. Implement a maximum flow minimum cost algorithm for a graph given by a text file. The result is the max flow value, the minimum cost value, and the list of flow value traversing each arc.

4. Detail in a report the algorithms you have used. Be precise.

5. Send all the source file and the instruction to compile them by email to jcregin@gmail.com before June 12, 2023