Discrete Optimisation
Exercise Session 11: Solving flow problems

3rd January 2017

After this session, you should be able to solve all exercises of Chapter 9 in the exercises book.

Exercise 1 (maximum flow)**.** Solve the following maximum flow with the shortest augmenting path algorithm.

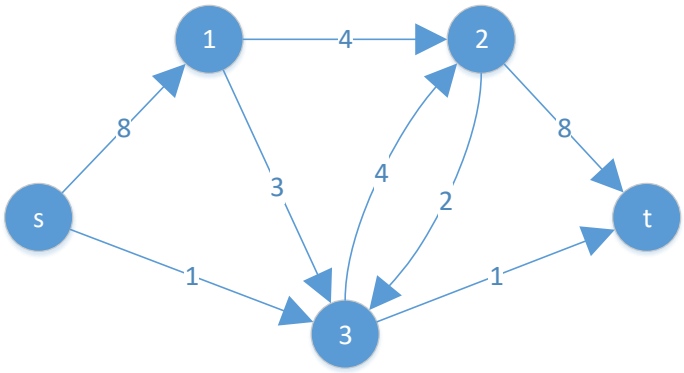

Figure 1: Network for exercise 1.

Exercise 2 (feasible flow)**.** Solve the following feasibility flow with bound constraints as a maximum flow with edge demands.

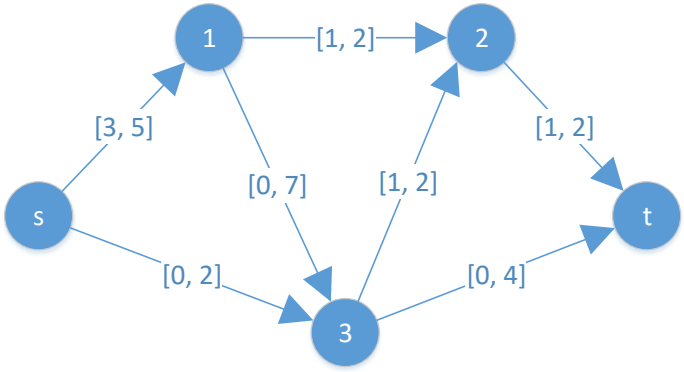

Figure 2: Network for exercise **??**.

Exercise 3 (minimum cut)**.** In the following graph, apply a maximum flow algorithm of your choice to find a minimum (s, t)-cut.

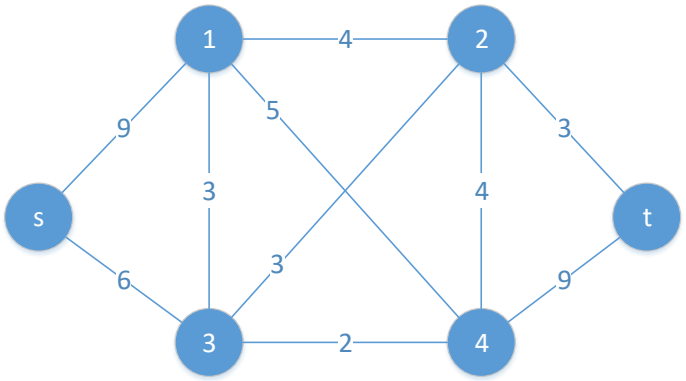

Figure 3: Network for exercise 3.

Exercise 4 (lot sizing by dynamic programming)**.** A steel mill manufactures beams; the director wants to plan the production for the next four weeks. The demand for beams is exactly known for each week. The cost for using the furnace can be divided into two parts: a fixed cost to get the furnace turned on and a variable cost proportional to the number of beams produced. Storing beams from a time period to another is costly, and is proportional to the number of beams to store.

1. Propose a MILP formulation.
2. Propose an algorithm to solve it by dynamic programming and apply it on this instance.

Week	t	1	2	3	4
Demand [10 spools]	d_t	8	5	13	4
Variable cost [1000€ per 10 spools]	p_t	1	1	1	2
Fixed cost [1000€]	f_t	20	10	45	15
Storage cost [1000€ per 10 spools]	h_t	1	1	1	1

Table 1: Spool factory planning requirements.