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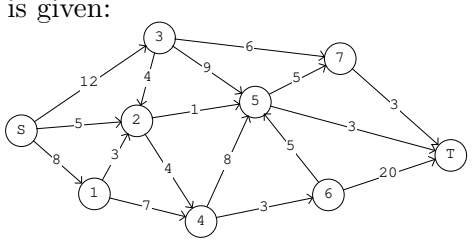
Linear Optimization - WS 2017/2018

Exercise 3

Exercise 1
The following directed graph is given:



The edges present the pipes with a fixed flow direction and the knots present the distributors. The pipes are marked with their capacity. Formulate the problem of maximizing the flow from S to T as a linear optimization problem.
Note: No distributor can store water or pass more than it gets.

(4 Points)

Exercise 2
Transform the following problems into the form $\min\{c^T x | Ax \leq b\}$ or show that it is not possible.

a)

$$\begin{aligned} \min \quad & x_1 + 2x_2 + 3x_3, \\ \text{s.t.} \quad & 2 \leq x_1 + x_2 \leq 3, \\ & 4 \leq x_1 + x_3 \leq 5, \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

b)

$$\begin{aligned} \min \quad & x_1 + x_2 + x_3, \\ & x_1 + 2x_2 + 3x_3 = 10, \\ & x_1 \geq 1, x_2 \geq 2, x_3 \geq 1. \end{aligned}$$

c)

$$\begin{aligned} \min \quad & |x_1| + |x_2| + |x_3|, \\ \text{s.t.} \quad & x_1 + x_2 \leq 1, \\ & 2x_1 + x_3 = 3. \end{aligned}$$

(2 + 2 + 2 = 6 Points)

Exercise 3
Solve the problem

$$\begin{aligned} \text{minimize} \quad & -2x_1 - 3x_2, \\ \text{s.t.} \quad & -4x_1 + 3x_2 \leq 12, \\ & 2x_1 + 3x_2 \leq 30, \\ & x_1 \leq 6, \\ & x_1 \geq 0, x_2 \geq 0, \end{aligned}$$

graphically.

(4 Points)

*Hand in solutions on **Tuesday**, November 7th, **at the beginning** of the lecture!*