Exercise Set 6

Problem 1

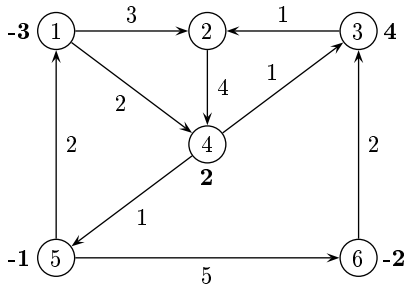
The renovation of a flat is composed of several tasks listed below.

Task	Description	Precedences	Duration [days]
A	Removal of doors		1/2
B	Sanding and painting of doors	A	3
C	Installing doors	B, J	1/2
D	Removal of wallpaper		1
E	Installing electric wires	D	1
F	Installing plugs	E, H, I	1/2
G	Screeding of the walls	E, A	2
H	Painting of the ceiling	G	2
I	Processing of new wallpapers	G	3
J	Painting of the frames	H, I	1
K	Removal of the carpet	H, I, J	1/2
L	Sanding of the parquet	K	1
M	Coating of the parquet	L, F	4
N	Painting of the balcony		2
O	Garden lounge on the balcony	N	1

a) Determine the PERT network associated to this project.
b) Determine the critical tasks and the minimal duration of the renovation.

Problem 2

We consider the transshipment problem given by the following network where the numbers beside the edges are the unit usage costs, and the numbers at the vertices represent the supply (negative) and the demand (positive).



a) Determine the auxiliary network $R'(V,E',b,c')$ of phase I of the transshipment simplex algorithm and use vertex 1 as the main source.
b) Solve the auxiliary problem and given a feasible solution for the initial problem.
c) From the feasible solution computed in b), find the optimal solution of the initial problem by applying the transshipment simplex algorithm to network $R(V,E,b,c)$.

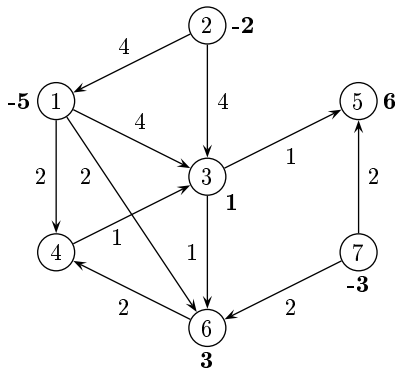
Problem 3

Let $G = (V,E)$ be a directed graph and c a weighting of the arcs of G.

a) Formulate the shortest path problem from vertex $s \in V$ to vertex $t \in V$ as a transshipment problem.
b) Same question for the shortest path problem from $s \in V$ to any other vertex in G.

Problem 4

We consider the transshipment problem given by the following network where the numbers beside the edges are the unit usage costs, and the numbers at the vertices represent the supply (negative) and the demand (positive).



a) Determine the auxiliary network $R'(V,E',b,c')$ of phase I of the transshipment simplex algorithm by using vertex 1 as the main source.
b) Determine a feasible tree-solution for network $R(V,E,b,c)$ by using the phase I of the transshipment simplex algorithm.
c) Determine an optimal solution of network $R(V,E,b,c)$ by applying the phase II of the transshipment simplex algorithm to the feasible solution from b).