

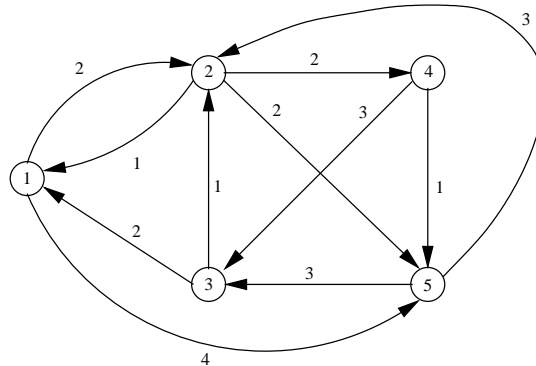
Linear and Network Optimization

Exercise 12

Please return your solutions by Tuesday, July 1st, 10:30 a.m., in the mailbox No. 5.

Problem 1 (5 points)

Apply the algorithm of Floyd-Warshall to the following digraph G_1 :



Problem 2 (5 points)

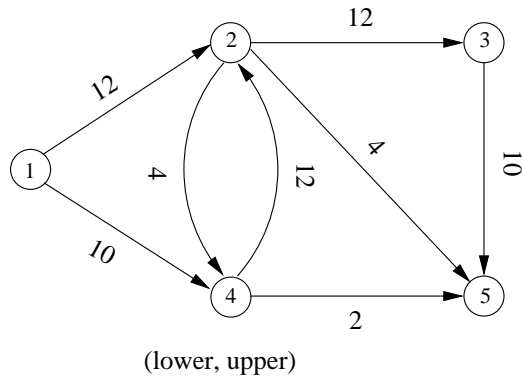
Project planning:

Suppose that a project for the selection and installation of an automated warehouse system is based on the following activities:

Activity	Immediate Predecessors
A Determine equipment needs	None
B Obtain vendor proposals	None
C Select vendor	A, B
D Order system	C
E Design new warehouse layout	C
F Lay out warehouse	E
G Design computer interface	C
H Interface computer	D, F, G
I Install system	D, F
J Train system operators	H
K Test system	I, J

- (a) Construct a network representing this problem.
- (b) Find the longest path in the network constructed in Part (a).
- (c) Let $E(x)$ be the earliest time at which event x can possibly be completed and let $L(x)$ be the latest time at which event x has to be completed such that the project will still be completed on time. Find two algorithms to compute $E(x)$ resp. $L(x)$ for all events x in the network constructed in Part (a).

Consider the following network with upper bounds on the edges:



Write down the linear programming formulation for the maximum flow problem with source node $s = 1$ and sink node $t = 5$, its dual problem and the complementary slackness conditions. Interpret your results.