Technische Universität Chemnitz
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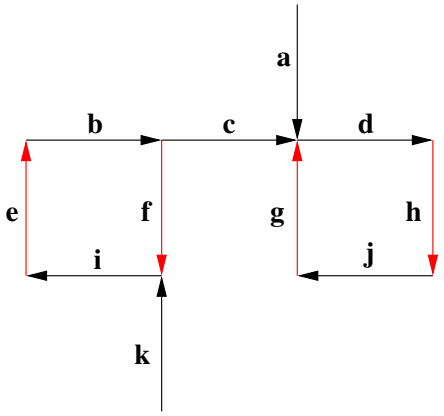
Chemnitz, 12. December 2007
Deadline: 18. December 2007

Disposal until 14:00, in room Rh. 39/715!!

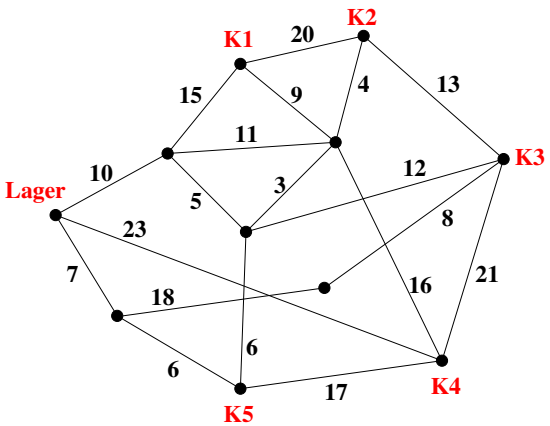
Introduction to Discrete Mathematics
Task 8

1. (3 scores) Compute for the following bipartite graph a maximum branching using Edmonds' matroid intersection algorithm. Start with the branching $X = \{e,\ f,\ g,\ h\}$. Present in every iteration the sets $S_x,\ T_x$ and if $S_x \cup T_x = \emptyset$ the graph D_x.



Hint: Use for matroid 1 the matroid of task 6.4(b) with $k_s = 1\ \forall s \in S$ and for matroid 2 the graphic matroid of the undirected graph.

2. (3 scores) On one day a truck driver wants to supply 5 department stores. He loads some goods on his truck in the warehouse. Then he drives them as fast as possible to a department store. At the end he drives back to the warehouse to reload his truck. How many kilometers he has to drive at least?



3. (3 scores) Run the Floyd's algortithm for the following directed graph! How can one construct the shortest paths from the informations produced by this run?

	1	2	3	4	5
1		6	5		
2			7	3	-2
3				-4	8
4		-1			
5	2			7	

4. (3 scores) Modify Dijkstras algorithm for solving the bottleneck-path problem: Given a directed graph $D = (V, A)$ with edge-length $c(a) \geq 0, \forall a \in A$ and $s,\ t \in V$. Find a (directed) s-t-path, whose longest edge is short as possible.

5. (3 scores) Calculate a maximum flow from s to t in the following network (the number on a edge is the maximum capacity, the minimum capacity is 0). Use the algorithm of Ford and Fulkerson. Always choose the shortest augmenting paths. Which edges are contained in the minimal cut?