Technische Universität Berlin WS 1994/95
Fachbereich 3
Prof. M. Grötschel/N. Kamin

Combinatorial Optimization
6. Set of Exercises

21. Exercise **(5 Points)**
The acyclic subdigraph problem (ASP) is the problem of finding in a digraph with arc weights a subdigraph without directed cycles of maximal total weight. Try to give arc weights for the complete digraph D_n such that the greedy algorithm for ASP applied to D_n yields an acyclic digraph which is as bad as possible (in comparison with the value of the optimal solution).

22. Exercise **(5 Points)**
Let A be the adjacency matrix of a graph $G = (V, E)$ and A^k, for $k \in \mathbb{N}$, the k-th power of A. Then, for all nodes i and j and all $k \in \mathbb{N}$, $(A^k)_{ij}$ is the number of different (i, j)-chains in G with length k.

23. Exercise **(5 Points)**

(a) Formulate the shortest-path problem for digraphs as an integer linear program.

(b) Formulate the problem of finding in a digraph a shortest (s, t)-path with even respectively odd length as an integer linear program.

24. Exercise **(Due date: 9.12.1994)**
Implement an algorithm that determines a shortest paths tree for a connected graph with edge weights. Test your algorithm with the DIMACS-examples that you find in the directory "uebung/sp/data". Routines for reading the DIMACS-examples are given in the directory "uebung/sp/c".

Due date (exercises 21-23): 1.12.1994

Solutions have to be delivered in English!!!