Exam Topics

Combinatorial Optimization – Group K

Spring 2023

Linear Programming

- the basic problem of linear programming, also in (general) matrix form
- solving 2-variable problems by graphing in the plane
- solving LP problems with computer, the complexity of linear programming (without proof)
- solvability: Fourier-Motzkin elimination (with proof of correctness), Farkas-lemma (in two forms)
- boundedness: equivalent conditions (a.k.a. "Three-Cage Theorem"), relations to the dual
- optimum: the duality theorem (in two forms), complementary slackness
- two-player, zero-sum games: LP formulation of these, Neumann's theorem

Bipartite Matchings

- the augmenting path algorithm for the Maximum Bipartite Matching problem
- theorems of Kőnig and Hall
- the Maximum Weight Bipartite Matching and the Optimum Assignment problems, theorems of Egerváry
- Egerváry's algorithm

Network Flows

- the Maximum Flow problem: augmenting path algorithm, Ford–Fulkerson theorem; solution by linear programming
- the Minimum Cost Flow problem: solution by linear programming
- the Multicommodity Flow problem: solution by linear programming