

Concepts and Algorithms of Optimization – Series 6

www.math.uni-magdeburg.de/institute/imo/teaching/wise19/cao/

November 22, 2019

Exercise 1

The department manager of a successful consultant agency has to decide about how to assign five available employees to five upcoming projects. The projects are characterized by the main aspects they cover. There are two projects focusing on credit issues, two projects mainly dealing with insurance matters and one composite project involving problems of both types.

Considering the personnel, there are two employees specialized on credits, whereby one of them can also manage composite projects. Similarly, there are two employees specialized on insurances of which one can also manage a composite project. The fifth employee is qualified to work on all types of projects.

The employees receive a project- and qualification-dependent salary. The credit specialists earns 400 € per project and the insurance specialists earn 500 € per project. The allround employee receives 800 € per project. If one of the specialists is assigned to the composite project, he or she will receive extra 200 €, whereby the allround employee will receive 300 € in addition in this case.

The department manager is willing to assign the employees to the projects so that the total costs of personnel are minimal.

- Give a graph-based representation of the situation and formulate the problem of the department manager.
- Determine a linear programming formulation for the problem given in (a).
- Solve the problem given in (a) using AMPL.
- The assignment problem is extended by the facts that employees can work on different projects for certain amounts of their total working hours, projects require certain amounts of working time and can be assigned to more than one employee.

Each employee is available for 8 h per day and the given salary is paid per hour. The credit-related projects require 6 h and 4 h of working time and the insurance-related projects need 5 h and 3 h, respectively. For the composite project, there are 15 h of working time required.

To which theoretical problem formulation (defined on a network) does this extension of the assignment problem correspond? Give a graphical representation.