Homework #9

Engineering Optimization (ISyE 4231) - Spring 2001

Due April 6, 2001

Show all your steps to get full credit.

Reading assignment: Read Chapter 7.

1. (25 points) Answer questions 5 and 6 of the case. An **exact optimal solution** is a feasible solution to an optimization model that provably has the best possible objective function value. A **heuristic solution** is a feasible solution derived from a heuristic algorithm that is not guaranteed to yield and exact optimum. In designing your heuristic, make sure that it takes a feasible solution, modifies it and generates another feasible solution to the aircraft scheduling problem. Try to design your algorithm such that the new solution it generates is better than (or at least as good as) the solution it takes as input.
In problem 5, apply your heuristic(s) to the initial feasible solution given in the case.
In both problems, be creative and thorough with your answers. Clearly write down the steps of your heuristic(s), preferably in a pseudocode format, specify what kind of input data it will need (besides a feasible solution) and explain why you think your heuristic will perform well. The quality and clarity of your heuristics should be at a level where a company could implement them and use them to improve their flight schedules. Similarly, be thorough with your answer to question 6. A company operating time-shared jets should be able to use your answer to question 6 if they want to implement an optimization-based decision support system for flight scheduling.

2. (25 points) Consider the following linear program:

max $6x_1 + 5x_2$
subject to

$2x_1 + x_2 \leq 10$
$x_1 + x_2 \leq 8$
$x_1 \leq 4$
$x_1, x_2 \geq 0$

Put this LP into standard form. Consider the basic solution x=(2,6,0,0,2) to this LP in standard form.

a) (7 points) Suppose the right hand side of the first constraint changes from 10 to 10+Δ. What is the range for Δ such that the current basis remains optimum? Express the new values of the variables and the objective function as a function of Δ. What is the shadow price of the first constraint?
c) (5 points) Solve this LP graphically.
Using the graph, answer the following questions:
d) (6 points) If Δ is 1 unit larger than the upper bound of the range for Δ you specified in part (a), how does the basis and the optimum solution change? What if Δ is 1 unit smaller than the lower bound of the range?
e) (2 points) Find the range for the coefficient of x_2 in the objective function for which the current basis remains optimum.
f) (5 points) Solve this problem using Lindo. Print your input and output files and attach to your homework.