

COMPUTATIONAL OPERATIONS RESEARCH

MATH 4320/8326

Homework 3 – Using Pandas DataFrame in Mathematical Optimization

General Instructions

Complete the following problems and turn in your answers in Canvas. You must use Python and CPLEX to solve the problems. You must submit your .py file(s) and a .pdf/spreadsheet reporting your solutions to Canvas.

Coding Guidelines

Codes will be graded based on correctness, completeness, clarity of the code and documentation, and elegance. A perfect assignment is an elegant solution to the problem, complete with well-documented, easily understood code. A correct solution is necessary for a satisfactory grade, but incomplete solutions, sloppy code, and poor documentation will result in less than full credit. You learn by doing and working with others, not by copying. Discussing problems with fellow students is encouraged; however, when the time comes to write code, you must do your own work. You should not share your files in whole or part in any form. On the other hand, using pieces of code that you did not write, but that you understand, is permitted, with the caveat that you cite your source. In each of your assignments, you should include a header that includes such citations and a list of collaborators. Here is an example:

```
#HW3
#Sheldon Cooper
#Collaborators: Howard Wolowitz, Rajesh Koothrappali
#Resources:
#   http://beastie.cs.ua.edu/cs150/book/index_14.html
#   http://www.davekuhlman.org/python_101.html#dictionaries
```

Problems

- 1) Modify the nurses assignment problem by adding the following constraints/changes to the model:
 - a) No nurse can work more than two consecutive shifts;
 - b) Each shift must have an average qualification of at most 3;
 - c) Each shift must have an average seniority of at least 4;
 - d) Every shift must have the minimum number of nurses with the required skill for the department;
 - e) Each nurse must work at least 30 hours per week;
 - f) Every nurse working from 8pm to 8am is paid 150% of her/his pay rate per hour;

- 2) For each change implemented in (1), investigate how the solution changed. Plotting graphs may be easier to show your findings.

- 3) Test the sensitivity of your model. What changes can be made so that it becomes infeasible?