Operations Research, Spring 2019 (107-2)
Case Assignment 3

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The company NEC Taiwan's story and challenges are the same as those in Case 1. Relevant data are also available in the MS Excel file "OR107-2_case01_data.xlsx" provided with Case 1. Therefore, below we will list your tasks directly.

1 Your tasks

1. (25 points) Formulate a mixed integer program that may find an optimal plan for facility construction, engineer allocation, and customer assignment plan for NEC Taiwan.

   To submit: A mathematical formulation of a mixed integer program in the PDF file.

2. (25 points) Submit a (set of) computer program that may solve the mixed integer program you formulated in Problem 1. You may submit an AMPL model file and an AMPL data file. Alternatively, you may submit a (set of) computer programs that invoke gurobi to solve this problem. Then summarize the optimal plan you obtain with your program(s).

   To submit: A (set of) computer programs in the ZIP file and a summary of your plan in the PDF file.

3. (25 points) Suppose that, for some reason, the Nangang facility cannot be shutdown. Moreover, if the Tainan facility is open, the Kaohsiung facility must also be open. Finally, at least two out of the the three facilities in Yilan, Hualien, and Taitung must be open. Write down the constraints you need to add into the mixed integer program you formulated in Problem 1. Then modify your program(s) you wrote in Problem 2 to solve the problem with these new constraints. Summarize the optimal plan you obtain with your program(s). DO NOT submit your program(s) you use in this problem.

To submit: Some additional constraints and a summary of your plan in the PDF file.

4. (25 points) NEC Taiwan is considering a new type of facility: one-person-one-car (OPOC) facility. The idea is the following. Recall that we have twelve "physical" facilities currently. Instead of shutting down one physical facility completely, we may change it to an OPOC facility. To do so, each morning we let one engineer driving one company car to that location and standby there for one day. If there are some things to do, the engineer does it; otherwise she or he just stay there and relax. Let's assume an OPOC facility does not have any operating cost (as it does not need an office building); though there are still some costs (e.g., the driving cost from a nearby physical facility to an OPOC facility), they are so insignificant and may be assumed to zero.

   In short, for each facility location, we may decide whether there is no facility, an OPOC facility, or a physical facility. If there is an OPOC facility, there is no operating cost but there can be at most one engineer. Given this new alternative, please formulate a new mixed integer program and solve it to find an optimal plan. Write down the formulation and plan. DO NOT submit your computer programs.

   To submit: A mathematical formulation of a mixed integer program and a summary of your plan in the PDF file.

2 Submission rules

- **Teams.** Students should form teams to work on this case study. Each team should have three to four students. Each team should make only one submission.
- **Things to submit.** Please submit a (set of) computer programs (for Problem 2 above) and a PDF file (for the other problems). Include the student IDs and names of all team members in both files.
- **Where to submit.** Please submit all files to NTU COOL. Each team should make only one submission, i.e., only one student should make a submission.
- **Deadline.** The deadline of this assignment is 2:00 pm, May 13, 2019. Works submitted between 2:00 pm and 3:00 pm will get 10 points deducted as a penalty. Submissions later than 3:00 pm will not be accepted.