INTERNATIONAL UNIVERSITY OF JAPAN
Public Management and Policy Analysis Program
Graduate School of International Relations

DCC5350 (2 Credits)
Public Policy Modeling
Spring 2017

Homework 3: Linear Programming (150 points)

Instruction: Please write down your student ID and name at the top of your answer. PLEASE handwrite. Submit your answer and hardcopies of your Excel worksheets to TA by 18:00 Tuesday, May 2, 2017. Pay special attention to the followings.

- When you are asked to report numbers (e.g., optimal solution, reduced costs, and shadow prices), you <u>MUST MARK (circle) them</u> on the printout of Excel worksheets and then HANDWRITE them on your answer sheet explicitly.
- Substantive interpretation means that your interpretation should be sufficient and acceptable to those who don't know much about policy modeling concept.
- <u>You may not communicate (including written, verbal, gestural, any other communication) with others</u> except for TAs and the instructor to do this homework. Collaboration (cheating) is NOT tolerable. Of course, you may ask TAs or other students for general "technical help" for using Excel, not for solving questions.

Excel Worksheet Printing: When printing out your Excel worksheet, add four rows to the top of the worksheet and provide course title, question number to be answered, student id and name as shown in the following screenshot. Apply this rule to every worksheet (i.e., LP formulation worksheet, Answer Report, and Sensitivity Report). Then change Page Setup (choose <u>Sheet</u> tab and then check <u>Row and column headings</u>) so that row and column headings are printed out.

	A	B	C	D	E	F
1	**Public Policy Modeling 2017 (DCC5350)**					
2	**Question 3 in Homework Assignment 3 (LP)**					
3	**ID: 1234567**					
4	**Name: Hun Myoung Park**					
5						
6	Microsoft Excel 14.7 Answer Report					
7	Worksheet: [LP_2017.xls]Super_grain					
8	Report Created: . 4. 23. 3:49:49 ⁇⁇					
9	Result: Solver found a solution. All constraints and optimality conditions are satisfied.					
10	Solver Engine					
11	Engine: Simplex LP					
12	Solution Time: 0.400778 Seconds.					
13	Iterations: 5 Subproblems: 0					
14	Solver Options					
15	Max Time Unlimited, Iterations Unlimited, Precision 0.000001, Use Automatic Scaling					
16	Max Subproblems Unlimited, Max Integer Sols Unlimited, Integer Tolerance 1%, Assum					

Question 1 (20 points). Read Question 2.15 on page 57 and solve *a*. You must obtain the feasible region and then show how you get the optimal solution (solving a simultaneous equation system—a two equation system).

Question 2 (40 points). Read pp. 83-87 and Question 3.16 on page 109. Larry has four time periods as shown in the table. A part-time consultant works only four consecutive hours per day. "[A]t least two full-time consultants on duty for every part-time consultant on duty" is the same as "at least two full-time consultants have to work in each time period."

Q 2.1 (20 Points) Formulate this LP problem. Define seven decision variables (x_1 through x_7) clearly. You need to have two sets of constraints (four constraints per each set).
Q 2.2 (10 Points) Solve this problem using Excel Solver and attach the LP formulation worksheet and Answer Report. Circle the optimal solution and optimal value on Answer Report.
Q 2.3 (10 Points) Which LP assumption do you think is most problematic in this LP problem? Tell me your reasoning.

Question 3 (90 points). Read 3.4 Mixed Problems (pp. 88-95) carefully. When you report numbers from Excel Answer and Sensitivity Report, you MUST circle these figures on the Report. Use four digits below the decimal point for fractions.

Q 3.1 (10 Points) Check the unit of measurement in the objective function and constraints.
Q 3.2 (10 Points) Solve this problem using Excel Solver and attach the LP formulation worksheet, Answer Report, and Sensitivity Report.
Q 3.3 (10 Points) Show how the optimal value was calculated.
Q 3.4 (10 Points) Report a constraint(s) whose surplus is not zero and how it is calculated.
Q 3.5 (10 Points) Interpret the allowable increase and decrease of Sunday Supplement Ad. (SS) substantively. Do not just report numbers.
Q 3.6 (10 Points) Explain the meaning of complementary slalckness using two Excel report worksheets.
Q 3.7 (15 Points) Interpret the largest shadow price substantively. Write down a complete sentence that explains its meaning correctly.
Q 3.8 (15 Points) Suppose the coupon budget increases by $300,000. Explain what will happen in the optimal solution, optimal value (of the objective function), and shadow price of this constraint (RHS). Provide your reasoning <u>without</u> running a revised LP.

Checklist: (1) Your answer, (2) LP formulation worksheet and Answer Report for Q2.2, (3) LP formulation worksheet, Answer Report, and Sensitivity Report for Q3.2.

End of homework assignment 3.