I.E.2001 OPERATIONS RESEARCH

(*Homework Assignment 6: Due Feb. 27, 2020*)

Question 1. Use *LINDO*, or *MS-Excel*'s *Solver* add-in, or any other software of your choice to find the optimum solution to Question 51, page 122 (the Silvco "transistor refiring" problem) which you formulated as part of your second homework assignment (the correct formulation is posted on the course web page as part of the solutions to the assignment) - hand in the computer output with the details of your final solution.

Question 2. Consider the following linear program:

Minimize $Z = 50X_1 + 20X_2 + 30X_3 + 80X_4$

st
$$1)\ 400X_1 + 200X_2 + 150X_3 + 500X_4 \le 800$$
$$2)\ 3X_1 + 2X_2 \ge 6$$
$$3)\ 2X_1 + 2X_2 + 4X_3 + 4X_4 \ge 10$$
$$4)\ 2X_1 + 4X_2 + X_3 + 5X_4 \ge 8$$
$$X_1, X_2, X_3, X_4 \ge 0.$$

1. Solve the problem using *LINDO* or the *Solver* add-in to *MS-Excel*. Then answer the following:
   a. What are the shadow prices corresponding to Constraints 1, 2 and 4? *Clearly* interpret these values.
   b. What happens to the value of Z in each of the following three cases (1) c_2=18, (2) c_3=50 (3) b_2=4?
   c. By how much can b_3 change before the current basis is affected? How (if at all) is Z affected?
   d. Give two interpretations of the reduced cost corresponding to the non-basic variable X_4.

2. Referring to the optimal tableau (with Z^* =90) shown below, answer the questions that follow:

Z	X_1	X_2	X_3	X_4	S_1	S_2	S_3	S_4	RHS	Basic
1	-27.5	0	0	-50	0	-2.5	-7.5	0	90	Z
0	137.5	0	0	350	1	62.5	37.5	0	50	S_1
0	1.5	1	0	0	0	-0.5	0	0	3	X_2
0	-0.25	0	1	1	0	0.25	-0.25	0	1	X_3
0	3.75	0	0	-4	0	-1.75	-0.25	1	5	S_4

   a. What would happen to Z if S_2 is increased by 1 units?

   b. Suppose we were maximizing (as opposed to minimizing), so that the above tableau is suboptimal, and suppose X_1 is selected to enter into the basis. Interpret the substitution rates of the basic variables with respect to X_1.

   Based on your answer, which variable would leave the basis? Why?
   Without any pivoting, find the value of Z after the next iteration and explain how you would get this.

Question 3. Answer Question 3 on page 254-255 (Review problems for Chapter 5) of the text (Wivco).

Question 4. Answer Question 16 on page 261 (Review problems for Chapter 5) of the text (Cornco). Define variables for production, sales and inventory of each product in each period, and for the total raw material required - assume that the availability of the raw material is for the entire 3-month period.