

**1. Use Two Phase method to solve the following LP problem.**

- Shows step by step procedure as seen in the lecture note.
- I don't need software output, but you may check your output with software result.
- You may use Excel for your convenience.

$$\begin{array}{ll} \text{a) Min} & x_1 + 3x_2 \\ \text{s.t.} & \\ & -x_1 + x_2 \leq 7 \\ & \quad \quad x_2 \geq 5 \\ & 3x_1 + x_2 \geq 2 \\ & x_1, x_2 \geq 0 \end{array}$$

$$\begin{array}{ll} \text{b) Max} & x_1 + 3x_2 \\ \text{s.t.} & \\ & -x_1 + x_2 \geq 7 \\ & \quad \quad x_2 \geq 5 \\ & 3x_1 + x_2 \leq 8 \\ & x_1, x_2 \geq 0 \end{array}$$

## 2. LP modeling: Investment Problem.

An investor has money-making activities A and B available at the beginning of each of the next 5 years.

- Each dollar invested in A at the beginning of 1 year returns \$1.50 (a profit of \$0.50), 2 years later (in time for immediate re-investment).
- Each dollar invested in B at the beginning of 1 year returns \$1.70, 3 years later.

In addition, investments C and D will each be available at one time in the future.

- Each dollar investment in C at the beginning of year 2 returns \$1.80 at the end of year 5.
- Each dollar invested in D at the beginning of year 5 returns \$1.50 at the end of year 5.

Money not invested in a given year earns 2.5% annually. The investor begins with \$100,000 and wishes to know which investment plan maximizes cash balance at the beginning of year 6.

- a) Please formulate this problem as a LP to find the maximum investment return at the beginning of year 6.
  - MUST define the decision variables first! Then, identify the objective function and constraints.
- b) Solve the problem using LINDO or Solver and attach the output.
- c) Explain your investment plan; such as how much you invest in which activities, etc.

**No handwriting for model and outputs! No grade for handwriting!**

### 3. LP modeling: Inventory Control Problem.

A plant assembles chairs and tables. The average assembly times are 20 minutes/chair and 40 minutes/table. The monthly available labor for assembly is 1600 hours. Sales forecasts for the next three months are given in the table.

Product	March	April	May	Current inventory
Chair	2800	2300	3350	30
Table	500	800	1400	100

The production costs and the selling prices for the products are shown next.

Product	Unit cost	Unit price
Chair	\$80/chair	\$250/chair
table	\$250/table	\$750/table

Monthly inventory charges are 2% of the production cost.

- a) Please formulate this problem as a LP to find the maximum profit while satisfying the demands and labor hours.
  - MUST define the decision variables first! Then, identify the objective function and constraints.
- b) Solve the problem using LINDO or Solver and attach the output.
- c) Explain your production plan for each month, including inventory for each month.

**No handwriting for model and outputs! No grade for handwriting!**