Pēdējais darbs

Iļja Dočuks

May 31, 2019

Bilde

PROBLEMS

Group A

1 Suppose that Mondo no longer must meet demands on time. For each quarter that demand for a motorcycle is unmet, a penalty or shortage cost of \$110 per motorcycle short is assessed. Thus, demand can now be backlogged. All demands must be met, however, by the end of quarter 4. Modify the formulation of the Mondo problem to allow for backlogged demand. (*Hint:* Unmet demand corresponds to $i_t \leq 0$. Thus, i_t is now urs, and we must substitute $i_t = i_t^+ - i_t^-$. Now i_t^- will be the amount of demand that is unmet at the end of quarter t.)

2 Use the simplex algorithm to solve the following LP:

$$\max z = 2x_1 + x_2$$
$$\text{s.t.} \quad 3x_1 + x_2 \leq 6$$
$$x_1 + x_2 \leq 4$$
$$x_1 \geq 0,\ x_2 \text{ urs}$$

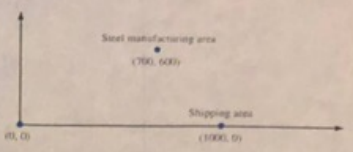
Group B

3 During the next three months, Steelco faces the following demands for steel: 100 tons (month 1); 200 tons (month 2); 50 tons (month 3). During any month, a worker can produce up to 15 tons of steel. Each worker is paid \$5,000 per month. Workers can be hired or fired at a cost of \$3,000 per worker fired and \$4,000 per worker hired (it takes 0 time to hire a worker). The cost of holding a ton of steel in inventory for one month is \$100. Demand may be backlogged at a cost of \$70 per ton month. That is, if 1 ton of month 1 demand is met during month 3, then a backlogging cost of \$140 is incurred. At the beginning of month 1, Steelco has 8 workers. During any month, at most 2 workers can be hired. All demand must be met by the end of month 3. The raw material used to produce a ton of steel costs \$300. Formulate an LP to minimize Steelco's costs.

4 Show how you could use linear programming to solve the following problem:

$$\max z = |2x_1 - 3x_2|$$
$$\text{s.t.} \quad 4x_1 + x_2 \leq 4$$
$$2x_1 - x_2 \leq 0.5$$
$$x_1, x_2 \geq 0$$

FIGURE 13



5† Steelco's main plant currently has a steel manufacturing area and shipping area located as shown in Figure 13 (distances are in feet). The company must determine where to locate a casting facility and an assembly and storage facility to minimize the daily cost of moving material through the plant. The number of trips made each day are as shown in Table 50.

Assuming that all travel is in only an east–west or north–south direction, formulate an LP that can be used to determine where the casting and assembly and storage plants should be located in order to minimize daily transportation costs. (*Hint:* If the casting facility has coordinates (c1, c2), how should the constraint $c1 - 700 = e_1 - w_1$ be interpreted?)

6 Show that after any number of pivots the coefficient of x_i^- in each row of the simplex tableau will equal the negative of the coefficient of x_i^+ in the same row.

7 Clothco manufactures pants. During each of the next six months they can sell *up to* the numbers of pants given in Table 51.

Demand that is not met during a month is lost. Thus, for example, Clothco can sell up to 500 pants during month 1. A pair of pants sells for \$40, requires 2 hours of labor, and uses \$10 of raw material. At the beginning of month 1, Clothco has 4 workers. A worker can work at making pants up to 200 hours per month, and is paid \$2,000 per month (irrespective of how many hours worked). At the beginning of each month, workers can be hired and fired. It costs

TABLE 50

From	To	Daily Number of Trips	Cost (¢) Per 100 Feet Traveled
Casting	Assembly and storage	40	10
Steel manufacturing	Casting	8	10
Steel manufacturing	Assembly and storage	8	10
Shipping	Assembly and storage	2	20

TABLE 51

Month	Maximum Demand
1	500
2	600
3	300
4	400
5	300
6	800

†Based on Love and Yerex (1976).

P R O B L E M S.

Group A 1 Suppose that Mondo no longer must meet demands on time. For each quarter that demand for a motorcycle is unmet, a penalty or shortage cost of $100 per motorcycle short is assessed. Thus, demands can now be backlogged. All demands must be met, however, by the end of quarter 4. Modify the formulation of the Mondo problem to allow for backlogged demand. (Hint: Unmet demand corresponds to i$\leq$ 0. Thus, i is now urs, and we must substitute i=i - i. Now i will be amount of demand that in unmet at the end of quarter t.)

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4.14 Unrestricted-in-Sign Variables