Operations Research

Homework 9

Due via Moodle or Mailbox Wednesday, December 2, 2020

1. *(From HL, Exercise 19.3-4.)* The Blue Cab Company is the primary taxi company in the city of Maintown. It uses gasoline at the rate of 8 500 gallons per month. Because this is such a major cost, the company has made a special arrangement with the Amicable Petroleum Company to purchase a huge quantity of gasoline at a reduced price of \$1.05 per gallon every few months. The cost of arranging for each order, including placing the gasoline into storage, is \$1 000. The cost of holding the gasoline in storage is estimated to be \$0.01 per gallon per month.

   Use the EOQ model to find the optimal order quantity.

2. An airplane manufacturer is contracted to produce a small number of a particular type of airplane during the coming years. The manufacturer will need to decide each year whether to set up a production run with a fixed set-up cost of EUR 1 000 000 per run. During each production run, the manufacturer can make at most 6 airplanes. If an airplane is not delivered during the year it is produced, it will incur a holding cost of EUR 100 000 per year. The number of airplanes required are $r_1 = 1$, $r_2 = 6$, $r_3 = 2$, and $r_4 = 3$ during each of the years.

   Which production schedule(s) minimize the total cost for setup and storage?

3. (a) Use the graphical method to maximize

$$z = x_1 + 2\,x_2$$

   subject to

$$x_1^2 + x_2^2 \leq 1\,,$$
$$x_1, x_2 \geq 0\,.$$

   (b) Write a Pyomo program to confirm your answer. (Use the `ipopt` solver instead of `glpk`.)