

15.066j System Optimization and Analysis
Summer 2003
Professor Stephen C. Graves

Group Problem Set 4

This problem set is due at the end of recitation on 10th July.

Please work in groups and hand in only ONE copy for each group. The problem set can be handwritten, but please make sure what you hand in is NEAT and CLEAR. Please also attach an Excel spreadsheet printout if you are required to solve the LP using the Excel Solver.

Problem 1: During the next four quarters Dorian Auto must meet (on time) the following demands for cars: 4000 in quarter 1; 2000 in quarter 2; 5000 in quarter 3; 1000 in quarter 4. At the beginning of quarter 1, there are 300 cars in stock. The company has the capacity to produce at most 3000 cars per quarter. At the beginning of each quarter, the company can increase (but not decrease) its production capacity.

No – this is not the same problem as before – since *any increase in production capacity requires a fixed cost of \$25,000*. There are also variable costs associated with production capacity increases - it costs \$100 to increase production capacity by one unit. For example, it would cost $\$25,000 + \$10,000 = \$35,000$ to increase capacity from 3000 cars per quarter to 3100 cars per quarter.

It also costs \$50 per quarter to maintain each unit of production capacity (whether it is used or not). The variable cost of producing a car is \$2000. A holding cost of \$150 per car is assessed against each quarter's ending inventory. It is required that at the end of quarter 4, plant capacity must be at least 4000 cars. Determine how to minimize the total cost incurred during the next four quarters. Formulate an LP and solve in Excel.

Problem 2: Radio station WABC schedules radio commercials in 60-second blocks. This hour, they have sold commercial time for commercials of length 15,16,20,25,30,35,40 and 50 seconds. Formulate and solve an integer program to determine the minimum number of 60-second blocks of commercials that must be scheduled to fit in the current hour's commercials. (In other words there are eight commercials of the time duration given above and you need to determine the minimum number of 60-second blocks to accommodate these. Each commercial must be completely aired within a 60-second block.

[**Note:** It is acceptable that a 60-second block may not be fully used, e.g. if commercials of length 25 and 30 were scheduled together there would be 5 seconds unused.]

Problem 3: Exercise 4 on page 6.35 in textbook.

Problem 4: Exercise 6 on page 6.36 in textbook.