

Decision Making Assignment 2

DUE DATE: Thursday, April 1, by 4pm in the course mailbox, SH108. (This mail slot has a dayglo pink label “MA2210 Assignments”.)

Please carefully read the presentation rules on the back of this sheet. **Any paper submitted which is sloppy or uses two sides of a page will be returned immediately with no credit.**

- 1.) [10 points] (a) Construct the dual of the following linear program:

$$\begin{array}{ll}
\text{maximize} & 3x_1 + 2x_2 + 6x_3 \\
\text{subject to} & x_1 + x_2 + 2x_3 \leq 4 \\
& 2x_1 + 3x_3 \leq 7 \\
& 2x_1 + x_2 + 3x_3 \leq 5 \\
& x_1, x_2, x_3 \geq 0
\end{array}$$

- (b) Exhibit a basic feasible solution to this dual LP.
(c) Exhibit a feasible solution to this dual LP which is not basic.

- 2.) [10 points] At the Dorf Motor Company, painting of automobile bodies is carried out by teams of two or three workers. A study of productivity measures over a two-month period yields the following daily statistics.

| Team | A | B | C | D |
|----------|-------|-------|-------|-------|
| Standard | 22.3 | 10.7 | 15.1 | 8.7 |
| Custom | 5.1 | 0.2 | 2.4 | 8.1 |
| Fails | 0.2 | 3.3 | 1.9 | 1.3 |
| Wages | \$960 | \$480 | \$700 | \$640 |

(The statistics collected are as follows: Avg. number of standard car bodies painted per day, avg. number of custom jobs per day, average number of bodies failing quality control inspection in a day, total team wages per day.) Using common sense when possible and using Data Envelopment Analysis when necessary, determine if any team has overall efficiency less than the others. Give full explanation (but no computer printouts!).

- 3.) [10 points] Complete Problem 11 on page 289. Note that our in-class tableau format is obtained by ignoring both the c_B and z_j rows of the tableau in the text.
4.) [10 points] Complete Problem 13 on page 289. Try not to use a computer. In any case, write things up by hand.

5.) [10 points] In this problem, we compare four ways to solve the following knapsack problem:

Your knapsack has a capacity of 20 lbs.

| Item | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------------|----|---|----|---|----|----|----|---|----|----|
| Weight (lb.) | 4 | 1 | 7 | 3 | 2 | 5 | 8 | 1 | 6 | 3 |
| Value | 22 | 4 | 38 | 9 | 11 | 26 | 44 | 7 | 29 | 20 |

(a) What solution is obtained by the greedy approach where the items are ordered most valuable to least?

(b) What solution is obtained by the greedy approach where the items are ordered lightest to heaviest?

(c) What solution is obtained by the greedy approach where the items are ordered by the ratio of “value per pound” (highest ratio to lowest)?

(d) Either by hand or using a computer, find the combination of items having maximum value subject to your given total capacity restriction. Explain your process.

BASIC RULES FOR ASSIGNMENTS

I) Each student must compose his/her assignments independently. However, rough work may be done in groups;

II) Write legibly and use only one side of each sheet of paper;

III) Show your work. Explain your answers using FULL SENTENCES;

IV) No late assignments will be accepted for credit.