MISM 95-760: Decision Making Under Uncertainty

Homework 3

Submit your work electronically on blackboard by the posted due date. Submit a single PDF. Include all necessary screenshots and documentation for the graders to understand your answer. Include your name on the PDF.

Note: Problem 1 can be attempted after the first lecture on Integer Programs. Problems 2-3 can be attempted after the second lecture on Integer Programs

1. Rags. 6th edition, Ch 6, problem 9, parts a-c: “A power company is considering how to increase its generating capacity to meet expected demand…”

(Formulate this problem as an integer linear program)

1. Rags. 6th edition, Ch 6, problem 15, parts a-c: “Tropicsun is a leading grower and distributor of fresh citrus products with three large citrus groves…”

hint: the goal is to ship all of the oranges in your groves to the processing plants at minimum cost. Formulate this problem as an integer linear program.

hint: Solver had trouble solving this problem for me unless I turned on the option “Use Automatic Scaling” in the options of the solver parameters. I think this is because the numbers involved (100,000’s of bushels) were quite large. You could also rescale manually.

1. Rags. 6th edition, Ch 6, problem 23, parts a-c: “The Clampett Oil Company has a tanker truck that it uses to deliver fuel to customers. The tanker has five different storage compartments…”

note: There are two different Clampet oil company problems! make sure you are solving the one that begins with the sentence above.

hint: I personally didn’t need to use slack variables, even though the problem suggests doing so as a hint. (But you can use them if you want of course)

1. Consider the two-stage LP where Howie produces two kinds of hot tubs (Aqua-Spa and Hydro Lux), which require pumps, tubing, and labor. The amount of each part required and the total available is shown in the table below. Note that the amount of required labor changes depending on whether the hot tub is built now, or later on a rush schedule:

Aqua-Spa Hydro Lux Total Available

Pumps 1 1 200

Tubing 9 6 2880

Labor 12 (or 14 for rush) 16 (or 18 for rush) 1566

Howie is not sure yet what the per-unit profits will be for each type of hot tub, but he will know in two months after conducting a pricing experiment in his flagship location. There are 3 scenarios that are possible:

Scenario A: the profits are $350 for AQ, and $300 for HL

Scenario B: the profits are $300 for AQ, and $350 for HL

Scenario C: the profits are $300 for AQ, and $300 for HL

Howie estimates the probability for each scenario is 30% for A, 50% for B, and 20% for C.

Howie can build hot tubs now, or later once his per unit profits are known, or both. Any hot tubs that are built after his per unit profits are known will require rush scheduling, so the labor costs will be higher.

Formulate a 2-stage LP to compute the optimal decision tree. To help the grader, define any variables that you use.