PROBLEMS[1]

To the left of each of the following problems (or their parts), we have inserted a D (for Demo), I (for Interactive routine), or A (for Automatic routine) whenever a corresponding routine listed above can be helpful. An asterisk on the I or A indicates that this routine definitely should be used (unless your instructor gives you contrary instructions) and the printout from this routine is all that needs to be turned in to show your work in executing the algorithm. An asterisk on the problem number indicates that at least a partial answer is given in the back of the book.

4.1-1.* Consider the linear programming model (given in the back of the book) that was formulated for Prob. 3.2-3.

(*a*) Use graphical analysis to identify all the *corner-point solutions* for this model. Label each as either feasible or infeasible.

(*b*) Calculate the value of the objective function for each of the CPF solutions. Use this information to identify an optimal solution.

(*c*) Use the solution concepts of the simplex method given in Sec. 4.1 to identify which sequence of CPF solutions might be examined by the simplex method to reach an optimal solution. (*Hint*: There are *two* alternate sequences to be identified for this particular model.)

4.1-2. Repeat Prob. 4.1-1 for the following problem.

$$\text{Maximize} \qquad Z = x_1 + 2x_2,$$

subject to

$$x_1 + 3x_2 \leq 8$$

$$x_1 + x_2 \leq 4$$

and

$$x_1 \geq 0, \qquad x_2 \geq 0.$$

4.1-3. Repeat Prob. 4.1-1 for the following model.

$$\text{Maximize} \qquad Z = 3x_1 + 2x_2,$$

subject to

$$x_1 \leq 4$$

$$x_1 + 3x_2 \leq 15$$

$$2x_1 + x_2 \leq 10$$

and

$$x_1 \geq 0, \qquad x_2 \geq 0.$$

4.1-4. Label each of the following statements about linear programming problems as true or false, and then justify your answer.

(*a*) For minimization problems, if the objective function evaluated at a CPF solution is no larger than its value at every adjacent CPF solution, then that solution is optimal.

(*b*) Only CPF solutions can be optimal, so the number of optimal solutions cannot exceed the number of CPF solutions.

(*c*) If multiple optimal solutions exist, then an optimal CPF solution may have an adjacent CPF solution that also is optimal (the same value of Z).

[1] Problems 4.3-5, 4.3-6, 4.4-6 to 4.4-8, 4.5-1, 4.6-10, 4.6-12, 4.7-4, and 4.7-5 have been adapted, with permission, from previous operations research examinations given by the Society of Actuaries.