OPS 807 Midterm Review

SMC

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Problem 1:

Student Enterprises sells two sizes of wall posters, a large 3- by 4-foot poster and a smaller 2- by 3-foot poster. The profit earned from the sale of each large poster is $3; each smaller poster earns $2. The firm, although profitable, is not large; it consists of one art student, Jan Meising, at the University of Kentucky. Because of her classroom schedule, Jan has the following weekly constraints: (1) up to three large posters can be sold, (2) up to five smaller posters can be sold, (3) up to 10 hours can be spent on posters during the week, with each large poster requiring 2 hours of work and each small one taking 1 hour. With the semester almost over, Jan plans on taking a three-month summer vacation to England and doesn't want to leave any unfinished posters behind. Find a solution that maximizes the profit using the following methods:

1. Graphical approach for the maximum profit (LP method).
2. Find an integer solution for the maximum profit.
3. Solve the problem with the help of a computer.
4. Explain the difference between the integer solution and truncating the LP solution if different.

Problem 2:

Innis Construction Company specializes in building moderately priced homes in Cincinnati, Ohio. Tom Innis has identified eight potential locations to construct new single-family dwellings, but he cannot put up homes on all of the sites because he has only $300,000 to invest in all projects. The accompanying table shows the cost of constructing homes in each area and the expected profit to be made from the sale of each home. Note that the home-building costs differ considerably due to lot costs, site preparation, and differences in the models to be built. Note also that a fraction of a home cannot be built.

Location	COST($)	PROFIT($)
Clifton	60000	5000
Mt. Auburn	50,000	6,000
Mt. Adams	82,000	10,000
Amberly	103,000	12,000
Norwood	50,000	8,000
Covington	41,000	3,000
Roselawn	80,000	9,000
Eden Park	69,000	10,000

The company wants to earn the maximum profit.

1. Formulate the optimization problem and determine what type of decision variables is needed.
2. Solve this using a computer.

Problem 3:

Geraldine Shawhan is president of Shawhan File Works, a firm that manufactures two types of metal file cabinets. The demand for her two-drawer model is up to 600 cabinets per week; demand for a three-drawer cabinet is limited to 400 per week. Shawhan File Works has a weekly operating capacity of 1,300 hours, with the two-drawer cabinet taking 1 hour to produce and the three-drawer cabinet requiring 2 hours. Each two-drawer model sold yields a $10 profit, and the profit for the large model is $15. Shawhan has listed the following as a plan it wishes to achieve in order of importance:
1. Attain a profit as close to $11,000 as possible each week.
2. Avoid underutilization of the firm's production capacity.
3. Sell as many two- and three-drawer cabinets as the demand indicates.

Formulate this optimization problem and use a computer to solve it.

Problem 4:

1. An integer programming solution can never produce a greater profit than the LP solution to the same problem.
   a. True
   b. False

2. In goal programming, if all the goals are achieved, the value of the objective function will always be zero.

a. True

b. False

3. The objective in a goal programming problem with one priority level is to maximize the sum of the deviational variables.

a. True

b. False