

641 FINAL EXAM

(15 pts)

1. Discuss the qualifications you would place on the use of shadow prices from
 - a. Linear programming
 - b. Quadratic programming
 - c. Risk programming
 - d. Multiple objective programming under a weighted tradeoff objective function
 - e. Pure integer programming
 - f. Mixed integer programming

(25 pts)

2. Suppose you were helping someone decide how to set up a new enterprise and had formulated the model

$$\begin{aligned} \max \quad & \sum_j \sum_k c_{jk} x_{jk} \\ \text{s.t.} \quad & \sum_j \sum_k a_{ijk} x_{jk} \leq b_i \quad \text{for all } i \\ & \sum_j d_{jk} x_{jk} \leq \text{cap}_k \quad \text{for all } k \\ & x_{jk} \geq 0 \quad \text{for all } k \text{ and } j \end{aligned}$$

where j is activity type and k identifies the new enterprises and you now need to reflect

- a. the fixed costs of the enterprises (F_k) as well as the fact that you only get capacity (cap_k) if the fixed cost is incurred.
- b. the fact that across all the possible new enterprises (k) only 3 of them can be chosen with the rest zero.
- c. risk in the capacity availability and d_{jk}

Modify the model accordingly.

(5 pts)

3. Suppose you have a problem with two objectives: why might you use a lexicographic or a weighted tradeoff model?

(15 pts)

4. Explain using an example the differences between a non sequential and a sequential risk model and how you would include

- a) decisions reflecting risk aversion toward variability in the objective function in each model type
- b) probabilities of the risky events

(10 pts)

5. State the assumptions of linear programming, 2 ways to relax each of them (if there are that many) and qualifications you might place on whether the assumptions are truly relaxed by the ways you identify.

(30 pts)

6. Given the linear programming problem:

$$\begin{array}{rcl}
 \max & cX & -rQ \\
 \text{s.t.} & X & -dY & -Q \leq 0 \\
 & & AY & \leq b \\
 & X, & Y, & Q \geq 0
 \end{array}$$

where X is a vector of product sales, Y is a vector of domestic production, and Z is a vector of imports.

- a. What is the nature of the demand and supply curves in the model for X, Q and the resources in the second constraint set.
- b. Modify the model so it includes linear downward sloping demand curves for X, as well as upward sloping supply curves for Q and the resources in the second constraint.
- c. Develop and explain the Kuhn tucker conditions
- d. Explain the consequences of the integrability assumptions as it affects the empirical specification of the demand curve for X and the supply curve for Q.