550.252 Fall 2011 Exam III Review Guide

GENERAL INFO: This exam IS CUMULATIVE. The following is a summary (not necessarily exhaustive) of the material covered from 11/11/11 to 12/02/11 (and some material covered previously). You are responsible for everything covered in lecture, section, assigned reading, and homework from 08/29/11 to 12/02/11. This exam is closed book.

Cheat Sheet. You are allowed one 8.5x11 page of notes, front and back. Your notes may be typed or handwritten (by yourself) but NOT a photocopy of material you did not write or type out yourself. Do NOT use photocopies of another students notes or of the course text or material from this or a similar course.

You will be provided with a Standard Normal Distribution table and a list of appropriate formulas for queuing models.

Material covered prior to 10/29/10

- Probability basics: Be comfortable working with discrete and/or continuous distributions; conditional probability, Bayes rule, computing expected values and variances. Be comfortable with the following distributions: Bernoulli, Binomial, Poisson, Discrete Uniform, Continuous Uniform, Exponential, Normal, Triangular
- Matrix Basics: Be comfortable with matrix arithmetic. Be able to find the inverse of a 2×2 matrix. Be able to transpose a matrix.
- Chapter 12: Be able to find steady state probabilities for a Markov Process. Be able to create transition matrices.
- Chapter 5: Be able to find a critical path for a project. Be comfortable with probabilistic project scheduling.
- Chapter 6: Be comfortable with techniques for decision making under uncertainty; decision making under risk. Be able to compute EVSI, EVPI.

Chapter 13: Nonlinear Optimization (Sections 13.6–13.8)

Note: Since many of the techniques listed below are calculation intensive, student may only be required to list a formula. If a complete calculation is required, it will be indicated on the exam.)

1. Be able to find (locally) optimal solutions for single variable nonlinear programs (NLPs).
2. Be able to find critical points for multi-variable NLPs. Be able to use the Hessian to determine local optimality of a critical point.
3. Key terms: (ordinary) derivative (e.g., y', $f'(x)$, df/dx, d^2f/dx^2, etc.); partial derivative (e.g., $\partial f/\partial x$, $\partial^2 f/\partial y^2$, $\partial^2 f/\partial x \partial y$, etc.), critical point (where first derivatives are zero)
4. Be able to formulate simple problems involving a nonlinear objective function and/or constraints.

Chapter 8: Inventory Models (Sections 8.1–8.3; 8.5–8.6; 8.8)

Given a problem statement, the student should be able to identify and use the appropriate inventory model. This may include analyzing alternative policies for a given problem and deciding which policy is the better. This may also include some analysis of how sensitive the solution is to variations in problem data.

1. Components of an inventory policy (Q and R)
2. Types of costs: holding, order/setup, shortage, procurement / manufacturing, holding costs due to safety stock
3. EOQ model assumptions; calculation of reorder point for EOQ model
4. Key Terms: lead time, safety stock, total annual costs, total variable costs, cycle time, number of orders per year, reorder point
5. Production lot size model assumptions; cost function; optimal solution; interpretation of inventory profile (be able to describe the cyclical change in inventory over time)
6. Planned shortage model assumptions; what to do when the "special condition" is not met; interpretation of inventory profile (be able to describe the cyclical change in inventory over time); interpretation of special cases
7. Single period inventory model: (Note new notation in this section.) Be able to find Q^* and EP(Q^*).

Chapter 9: Queuing Models

1. What are the components of a queuing system?
2. Be able to use the Poisson and Exponential probability distributions.
3. Waiting line issues: configuration, jockeying, balking (blocking), priority rules (e.g., FIFO/FCFS, LIFO/LCLS), tandem queue, homogeneity
4. What does the "memoryless (Markovian)" property imply?
5. Relationship between Poisson and Exponential distributions.
6. Be able to use and distinguish among M/M/1, M/M/k, and M/M/k/F queuing systems.
7. Be familiar with queuing system performance measures.
8. What are Little's formulas?