

550.252 Fall 2011 Exam I Study Guide

GENERAL INFO: You are responsible for all the material covered from 08/29/11 to 09/30/11. This includes material from lecture, section, assigned reading, handouts, and Homeworks 1 through 4.

This exam is closed book, no calculator. You may bring a ONE sheet of notes (8.5x11 or smaller; front and back). Your notes may be typed or handwritten. Do NOT use photocopies of another student's notes or of the course text or material from this or a similar course.

Probability Basics

1. Be able to compute the probabilities for certain events (e.g., complements, equal likelihood, independent events, mutually exclusive events)
2. Be able to compute conditional probabilities
3. Be able to use the simple form of the inclusion-exclusion principle: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
4. Define: sample space (universe), event, simple event, compound event, union, intersection, complement, mutually exclusive, collectively exhaustive, disjoint
5. Know: Axioms of Probability

Matrix Algebra

1. Key Terms: matrix, row, column, inverse, row vector, column vector, dot product, inner product, scalar product, partitioned matrix
2. Be able to add and subtract matrices of the same size.
3. Be able to multiply two appropriately sized matrices together.
4. Be able to find the inverse of a 2×2 matrix

Chapter 12: Markov Process Models

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. Key Terms: stage, state, transition probability, state vector, state probability, mean time to recurrence, fundamental matrix, limiting transition matrix, steady state probability (limiting state probability), mean time to absorption
2. Be able to calculate state probabilities for a given finite stage.
3. Be able to set up the linear program to calculate steady state probabilities; use the steady state probabilities to find the mean time to recurrence
4. Be able to find the limiting transition matrix for a system with absorbing states. What do the values in the fundamental matrix represent? What about the sum of the row entries in the fundamental matrix? What do the entries in the limiting transition matrix represent? How do you compute the mean time to absorption?
5. Be able to use steady state probabilities for (economic) analysis of Markov processes (includes gambling).

Discrete and Continuous Random Variables

1. What is a random variable?
2. What is a Bernoulli random variable?
3. What is a discrete random variable?
4. What is a continuous random variable?
5. What is a probability mass function and to what types of random variables does it apply?
6. What is a probability density function and to what types of random variables does it apply?
7. What is a cumulative distribution function? How is it computed using a pmf or pdf?
8. How do you compute $\Pr(a \leq X \leq b)$ when X is a discrete random variable? What about when X is a continuous random variable?
9. How do you compute the expected value, variance, and standard deviation for a discrete random variable
10. How do you compute the expected value, variance, and standard deviation for a continuous random variable?
11. How do you compute the expected value of a function of a random variable?

12. What is the pmf for the Binomial probability distribution?
13. What is the pmf for the Poisson probability distribution?
14. What is the pdf for the Exponential probability distribution?