GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

ECE 4410 Study Guide for Quiz No. Three November 17, 2006

General Information

(a) The quiz will be closed book and notes.

(b) Only those topics covered in class, covered in the homework assignments, or listed in this guide will be on the quiz.

(c) You should be able to work all homework problems, practice problems, and example problems. However, problems that require extensive algebra or arithmetic will not be given.

(d) All answers must be circled, underlined or otherwise indicated. Give numerical answers as a decimal number to four significant figures. Give units with all answers. Be sure to indicate if work is continued on another page. No credit will be given for unsupported answers.

(e) Lap-top or palm-top computers MAY NOT be used on the quiz. Likewise, calculators may not be used in "solve" mode. The root-finding function of a calculator may not be used. You must show all steps in your calculations.

(f) This document is thought to be reasonably complete. However, some minor topics of interest may have been inadvertently omitted. However, you remain responsible for all material covered in class and in the several assignments.

Chapter 8: Sensitivity

Sections Covered: Entire chapter

What you should know:

(a) Know the definition of classical sensitivity and be able to calculate sensitivity from its definition.

(b) Be able to calculate the sensitivity of pole position or zero position.

(c) Understand the concept of un-normalized sensitivities and be able to calculate them.

(d) Understand the significance of multiparameter and statistical sensitivities.

(e) Understand and be able to use the properties of first-order sensitivity described in Equations (8.5)-(8.17). These equations will be provided it they are needed.

Chapter 9: Basics of OP Amp-RC Circuits

Sections Covered: Entire chapter

What you should know:

(a) Understand the properties of the ideal op-amp and how the ideal op-amp differs from practical op-amps.

(b) Be able to analyze circuits containing ideal and practical op-amps.

(c) Understand how first-order sections are created using op-amps.

(d) Understand and be able to analyze op-amp circuits containing a grounded three-port network. Be able to determine the y-parameters of networks.

(e) Be able to determine the transmission zeros of filters containing three-port networks and op-amps.

(f) Know how to adjust the gain of a filter as needed. Be able to increase or decrease the gain.

(g) Understand the significance of the RC-CR transformation. Be able to apply it to a given circuit.

(h) What is a biquad? Understand how the transfer function of the biquad controls the shape of the frequency response.

Chapter 10: OP Amp-RC Biquad Circuits

Sections Covered: Entire chapter

What you should know:

(a) Be able to calculate sensitivities of typical biquads.

(b) Know the important properties of the several biquads discussed in this chapter. Be able to identify the circuit of the various biquads.

(c) What are the advantages and disadvantages of MFB and Sallen-Key biquads?

(d) Understand how the Q of biquads can be enhanced. Why would you want to enhance the Q of a particular biquad by these methods?

(e) Know the properties of band-reject and all pass biquads.

(f) Be able to realize a particular network function by the state-variable method discussed in class.

(g) Why are the more complicated biquads such as the KHN, Fleischer-Two, and Tow-Thomas useful?

Chapter 11: High-Order OP Amp-RC Filters

Sections Covered: Entire Chapter

What you should know:

(a) Understand how biquads and first-order sections can be cascaded to yield a desired high-order transfer function.

(b) Understand the importance of gain allocation among the several filter elements.

(c) Understand the concept of pole-zero pairing. How can filter performance be improved by proper pole-zero pairing?

(d) What is biquad sequencing? Why would you wish to change the sequence of biquads in a particular cascade?

(e) Know how to realize the canonic form of the all-pole transfer function as discussed in Section 11.2.1.

(f) Know how to realize the canonic form of the general transfer functions by using the method discussed in class.

(g) Know how to realize transfer functions using lossy integrators. If needed, equations for the f_n coefficients will be provided.

(h) Know how to realize bandpass transfer functions by using coupled biquads hiving infinite Q. Know how to extend this method to the use of primary resonator blocks. It is not necessary to know the circuit realization (Fig. 11.18) of the infinite-Q resonator.

(i) Know how to accomplish gain change within a state-variable realization block diagram.