ECE 3510    Exam 1 Study Guide

First Exam will be on Monday 2/6/12

The first part will be closed book, no-calculator, but will include the information shown below, if needed. When you hand in the first part you will get the second part, which will be open book, notes, & calculator.

The exam will cover

1. Signals and blocks in a feedback loop

2. Laplace transforms
   You may have to find a simple Laplace transform from the basic relation.
   You may have to look up and adapt a table entries

3. Inverse Laplace transforms (partial fractions)

4. Relationship of signals to pole locations

5. Boundedness and convergence of signals

6. H(s) of circuits

7. Block Diagrams & their transfer functions
   Including general interconnected systems

8. BIBO Stability

9. Impulse & step responses

10. Steady-state (DC gain) & transient step responses

11. Effects of pole locations on step response

12. Sinusoidal responses, effects of poles & zeros, etc.

   Steady-state AC analysis to get \( y_{ss}\) (Won't be in closed-book part)

13. Transient response to sinusoidal inputs

   \[
   Y(s) = \frac{b_2 s^2 + b_1 s + b_0}{s^2 + a_1 s + a_0} X(s) + \frac{s y(0) + \frac{d}{dt} y(0) + a_1 y(0) - b_2 s x(0) - b_2 s \frac{d}{dt} x(0) - b_1 s y(0)}{s^2 + a_1 s + a_0} X(s) \]

14. Know the advantages of the state-space method

   Easily handles multiple inputs, multiple outputs and initial conditions
   Can be used with nonlinear systems
   Can be used with time-varying systems
   Reveals unstable systems that have stable transfer functions (pole-zero cancellations). You can determine:
   Controllability: State variables can all be affected by the input
   Observability: State variables are all "observable" from the output
   Basis of Optimal and Adaptive control methods

15. Homeworks 1 - 7

16. Labs 1 & 2