

ECE 3510 Exam 1 Study Guide

First Exam will be on Monday 2/5/18

The exam will be **closed book**, with calculator, but will include the information shown below, if needed.

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

Information you will be given
(closed book part, if needed)

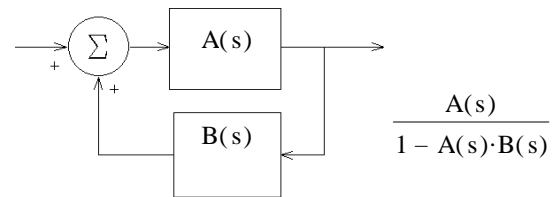
$$F(s) = \int_0^{\infty} f(t) \cdot e^{-s \cdot t} dt$$

Euler's equations

Laplace Transform table class handout

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 $y_{ss}(t)$
13. Transient response to sinusoidal inputs

Standard feedback loop transfer function



14. Effect of initial conditions

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

15. 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

16. Homeworks 1 - 7
17. Labs 1 & 2

You can download old exams from **Homework and Notes** page on class web site.
But remember, they may cover more than we did in our class.