ECE 3510   Exam 1 Study Guide   First Exam will be on Friday 2/7/20

The first part will be **closed book**, **no-calculator,** no cheat-sheet. 0 - 35 points

When you hand in the first part you will get the second part, which will be **closed book & notes,** calculator & colored information sheet are OK. 65 - 100 points

The exam will cover   Information on cheat sheet

1. Signals and blocks in a feedback loop

2. Laplace transforms
   You may have to find a simple Laplace
   transform from the basic relation.

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

   You may have to look up and adapt a table entries   Euler's equations

3. Inverse Laplace transforms (partial fractions)   Laplace Transform table class handout

4. Relationship of signals to pole locations

5. Boundedness and convergence of signals

6. $H(s)$ of circuits

7. Block Diagrams & their transfer functions   Standard feedback loop transfer function
   Including general interconnected systems

$$\frac{A(s)}{1 - A(s) \cdot B(s)}$$

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

14. Effect of initial
    conditions

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

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 "observeable" from the output
    Basis of Optimal and Adaptive control methods

16. Homeworks 1 - 7

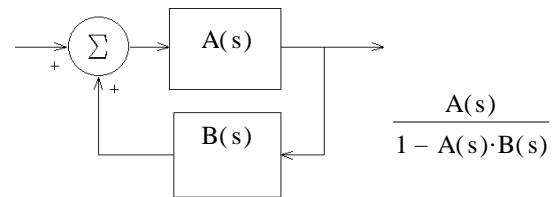17. Labs 1 & 2

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.

http://www.ece.utah.edu/~ece3510/   **ECE 3510   Exam 1 Study Guide**