ECE317

Midterm #2 Study Guide

- **This is an approximately 60 minute test during the first part of the class on Nov. 21. Exam will start at 6:40pm.**
- **It is a multiple choice exam.**
- **You are required to bring a Scantron Form No. 882-E to the exam, where you will record your answers. Use of No. 2 pencil is also recommended.** These are available from the PSU bookstore. You may want to bring an eraser as well.
- No calculators are permitted to be used
- Closed book/closed notes except for a one page (8 ½" x 11") formula sheet (written on both sides is OK)
- No spare (scratch) paper.
- I will provide the Summary Bode Plot sheet available on the class web page.

Main topics:

1) Stability analysis using Routh-Hurwitz
   - i) Examine the stability of polynomials, in particular being able to handle irregular cases:
     a) Left hand column zero (with non-zero values to the right)
     b) Rows of all zeros in the Routh table
   - ii) Stability analysis of a system dependent on a parameter(s) to find the stable range for the parameter(s).

2) Forced sinusoidal solution of a system.

3) Bode plots

   - i) Asymptotic approximations for both magnitude and phase for basic transfer functions.
   - ii) Construction of asymptotic Bode plot of a system transfer function that is a product of basic transfer functions.
   - iii) Full annotation of constructed Bode which includes: labeling of all break frequencies, slopes of sloping lines, gains of sloping lines and gain and phase levels on zero slope lines.
   - iv) Evaluation of gain and phase at any frequency using the asymptotic Bode plot. In particular, being able to determine phase and gain margins and their associated frequencies, i.e. unity gain crossover frequency and -180° phase crossover frequency.

4) Phase margin test: Stability analysis of a closed loop system based on the phase margin (obtained from the loop gain).