Exam 3 Study Guide Exam 3 is Fri, 4/10/09

The first part will be **closed book**, **no-calculator,** but may include information.

When you hand in the first part you will get the second part, which will be **open book, notes, & calculator**.

The exam will cover **Download old exams from HW page on class web site.**

1. Review to Review Questions you were asked on the homeworks.
2. **Root - Locus method**

   Memorize **Gain at any point** on the root locus: $k = \frac{1}{|G(s)|}$

   Memorize **Phase angle of G(s) at any point** on the root locus: $\arg(G(s)) = \arg(N(s)) - \arg(D(s)) = \pm 180^o, \pm 540^o, \ldots$

   Or: $\arg\left(\frac{1}{G(s)}\right) = \arg(D(s)) - \arg(N(s)) = \pm 180^o, \pm 540^o, \ldots$

   The breakaway points are also solutions to: $\sum_{\text{all}} \frac{1}{(s + -p_i)} = \sum_{\text{all}} \frac{1}{(s + -z_i)}$ Open-book part only.
3. **Root - Locus Interpretation and design**

   Concepts of what a root locus plot is and what it tells you. Movement of poles

   Good vs bad, fast response vs slow, OK damping vs bad.

   Compensators

   Know pole & zero locations of P, PI, lag, PD, lead & PID Compensators.

   PI and Lag, purpose and design, ties in with steady-state error

   PD and Lead, purpose and design ties in with root locus angle rules

   PID & lead-lag design order & why (good closed-book question)
4. Unconventional root-locus
5. Compensator Circuits
6. Phase-locked loops How does it work The loop block diagram Material from labs
7. Bode Plots (memorize page 1 of notes)

   Be able to draw both magnitude and phase plots

   Be able to draw the smoth curves as well as the the asymptotic lines

   I may ask you to start with a circuit

   Basic rules

   Complex poles an zeros Open-book part only.

   Bode to transfer function

   GM, PM & DM
8. Nyquist plots

   You may be asked to draw a simple one. At minimum you should;

   Be able to find the start point (DC gain ($s = 0 = \omega$)) from the transfer function)

   Find the final value ($\omega = \infty$) and the approach angle to the final value.

   Concepts of what a Nyquist plot is and what it tells you. $Z = N + P$

   Be able to count encirclements, with or without the $\omega < 0$ part of the plot.

   GM & PM
9. Up to HW Nq1 10. Up to Lab 7 (Advanced PLL)