# Exam 3 Study Guide  Exam 3 is Thur, 4/5/07

1. Root Locus

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

   Be able to determine which closed-loop poles will dominate the response.

   $$\text{relative coefficient} = \frac{\Sigma \text{ distance to CL zeros}}{\Sigma \text{ distance to OL poles}}$$

   Consider both complex poles together as one

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

   Effects of adding a compensator

   Know pole & zero locations of P, PD, PI, & PID Compensators as well as Lag and Lead

   Conclusions, see section 4.4.5, p.82

2. Phase-locked loops

   How does it work

   The loop block diagram

   Material from labs

3. Bode Plots

   Be able to draw both magnitude and phase plots

   I may ask you to start with a circuit

   Basic rules

   Complex poles an zeros

   $$(s+a)^2+b^2 = s^2+2\cdot a\cdot s+a^2+b^2$$

   $$= s^2+2\cdot\zeta\cdot\omega_n\cdot s+\omega_n{}^2 \qquad \text{max at } \omega_n \text{ , } \frac{1}{2\cdot\zeta}$$

   Bode to transfer function (like problem 5.2b)

   GM, PM & DM

4. Nyquist plots

   You may be asked to draw one

   Be able to 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.

   Be able to deal with poles at zero.

   Concepts of what a Nyquist plot is and what it tells you.  $Z = N+P$  Make sure you understand problem 5.11

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

   GM, PM & DM

5. Phase-lead compensator (p.133)

6. HW 11 - 19

7. Labs 5 - 8