



EE-154/CMPE-241
Winter 2007
Due: 6PM, 06-Mar-2007

Homework #8: Bode Synthesis.

1. Read Chapter #6 in FPE (again).
2. Sketch the Bode diagrams (frequency response plots) for $G(s) = \frac{s-1}{s^2-64}$.
3. Sketch the Nyquist plots for each of these systems. For what range of gain, K , will the system be stable?

a. $G(s) = K \frac{s+100}{s^2(s+10)}$.

b. $G(s) = K \frac{s+1}{s^2(s+10)}$.

4. What is the phase margin for the system: $G(s) = \frac{10(s+0.5)}{s^2(s+2)(s+10)}$? Do this by hand, and then check with MATLAB.

5. Consider the system: $G(s) = \frac{10}{(s+0.1)(s^2+s+100)}$.

- a. Design a compensator, $K(s)$ to meet the following specifications:
 1. Closed Loop Bandwidth, $\omega_{BW} \approx 1$ rad/sec.
 2. Phase margin ≥ 30 degrees.
 3. Gain margin ≥ 10 .
 4. Steady-state error due to a unit step input ≤ 0.01 .
 - b. Plot a root locus of your system (and compensator) vs. the loop gain.
6. Draw enough Bode Plots and Nyquist Diagrams to make sure you can do it on the final exam! You can check your work with MATLAB (nothing to turn in).