Exam 3 Study Guide

Tue, 11/15/22

The exam will be **closed book**, but you may use the colored sheets from exam 1 and 2 the new one for exam 3.

The exam will cover

1. Root - Locus method
   a) Main rules
   b) **Gain** at any point on the root locus: $k = \frac{1}{|\mathbf{G}(s)|}$
   c) Additional rules.

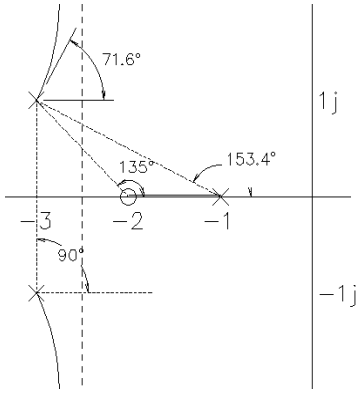
   The **breakaway/in points** are also solutions to: $\sum_{\text{all}} \frac{1}{(s + -p_i)} = \sum_{\text{all}} \frac{1}{(s + -z_i)}$

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

   Departure angles from complex poles:

   Example. $180 - 90 - 153.4 + 135 = 71.6$ deg



2. **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

   Choose points on the s-plane to achieve given required characteristics based on the 2nd-order assumption (RL Crib)
   Know that the 2nd-order assumption may be inaccurate if other CL poles and/or zeros aren't 5x farther from Imaginary axis and are not canceling one another.

   Design of a compensator to force the RL point through a given point (like RL7).

3. **Unconventional root-locus**

4. Compensator circuits & Instrumentation amplifier

5. PID tuning.

6. PLCs and **Ladder logic**. Basic switching logic.

7. Concentrate on Homeworks RL5 - FC2

8. Up to Lab 6 (Basic PLL)