Concordia University

ELEC372 Fundamentals of Control Systems

Homework #7

Professor Amir G. Aghdam

1. Problem E7.23 from the 8th, 9th, 10th, 11th, 12th, 13th or 14th edition of the main textbook.

2. (Automatic Control Systems by Farid Golnaraghi and Benjamin C. Kuo, Eighth Edition, John Wiley & Sons, Inc., 2010) "The characteristic equation of a linear control system is given as follows. Construct the root loci for $K \geq 0$."

$$s^3 + 2s^2 + 2s + K(s^2 - 1)(s + 2) = 0$$

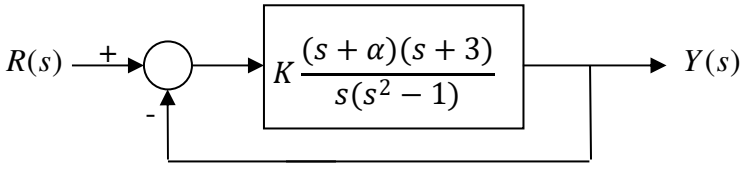
3. (Automatic Control Systems by Farid Golnaraghi and Benjamin C. Kuo, Eighth Edition, John Wiley & Sons, Inc., 2010) "The forward-path transfer function of a unity-feedback control system is:

$$G(s) = \frac{K(s+3)}{s(s^2 + 4s + 4)(s+5)(s+6)}$$

Construct the root loci for $K \geq 0$. Find the value of K that makes the relative damping ratio of the closed-loop system (measured by the dominant complex characteristic equation roots) equal to 0.707 if such solution exists."

4. Problem AP7.3 from the 8th, 9th, 10th, 11th, 12th, 13th or 14th edition of the main textbook.

5. (Automatic Control Systems by Farid Golnaraghi and Benjamin C. Kuo, Eighth Edition, John Wiley & Sons, Inc., 2010) Consider the following system:



a) "Construct the root loci for $K \geq 0$ with $\alpha = 5$."

b) "Construct the root loci for $\alpha \geq 0$ with $K = 10$."

6. Problem DP7.5 from the 8th, 9th, 10th, 11th, 12th, 13th or 14th edition of the main textbook, but in the 14th edition you will need to replace the denominator of the aircraft dynamics with $(s - 1).(s^2 + 10s + 41)$.

   Note: You do not need to predict the step response and compare it to the actual response.