AAE 364 Control Systems Analysis
Problem Set 8

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Reading Assignment: Sections 5-6 in Chapter 6.

Problems

Solve B-6-15, B-6-16, B-6-17, and B-6-26 in Chapter 6.
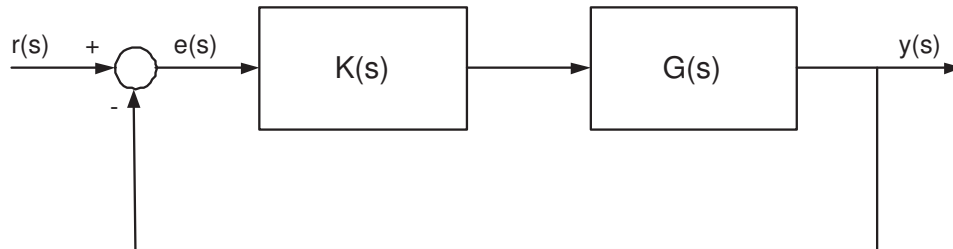
Problem

Figure 1: A unity feedback system.

1. Consider the unity feedback system in Figure 1 with

$$G(s) = \frac{5}{s^2 + 2}$$

Design a controller $K(s)$ such that the unit-step response will exhibit the maximum overshoot of less than 40% and settling time (2% criterion) of 5 sec or less.

2. Using the controller thus designed, show the unit-step response of the closed-loop system with MATLAB.

Problem: Spacecraft

Consider the unity-feedback system in Figure 1 with the plant $G(s)$ representing the spacecraft attitude dynamics:

$$G(s) = \frac{1}{s^2}$$

1. Design a controller $K(s)$ such that the closed-loop system has the maximum overshoot of 4.6% and a settling time (2%) of 8.16 seconds with respect to the unit-step input.

2. Using the controller thus designed, show the unit-step response of the closed-loop system with MATLAB.

Remarks: First, draw the root loci by hand and then use MATLAB. When you present results obtained with MATLAB as your solutions, you should explain your results clearly to get full credits. (Just giving figures and numbers is not enough for answers)