AAE 364 Control Systems Analysis
Problem Set 9

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Reading Assignment: Sections 7-8 in Chapter 6.

Problem 1

Solve B-6-20, B-6-21, B-6-23, and B-6-24 in Chapter 6.

Problem 2: Aircraft Control Example

Figure 1 shows the coordinate axes and forces acting on the aircraft in the longitudinal plane of motion assuming that the aircraft is cruising at constant velocity and altitude.

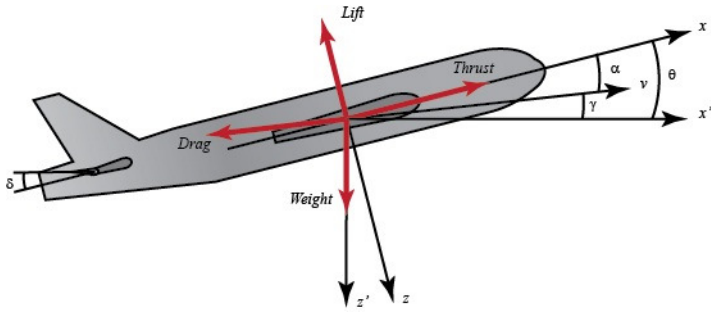

Figure 1: Forces acting on an aircraft in the Longitudinal plane.

where $G(s)$ is the transfer function representing the aircraft pitch angle response output to the elevator deflection input. Consider the unity-feedback system in Figure 2 with the plant $G(s)$ representing the aircraft shown in Figure 1.

$$G(s) = \frac{\Theta(s)}{\Delta(s)} = \frac{1.1057s + 0.1900}{s^3 + 0.7385s^2 + 0.8008s}$$

Design a controller $K(s)$ such that the unit step response has the following characteristics:

1. Settling time $\leq$ 2 sec (2% criterion)

2. Maximum overshoot $\leq 10\%$

3. Zero steady state error with respect to a unit ramp input

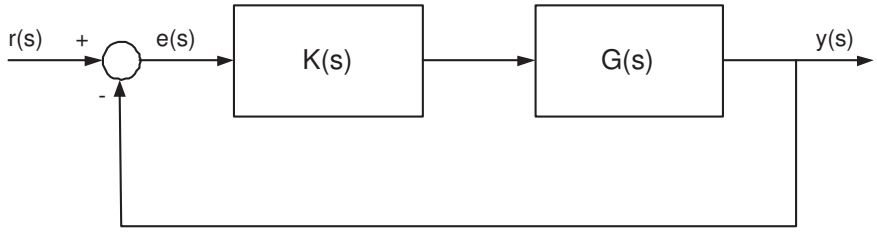

Figure 2: Unity-Feedback System with controller $K(s)$ and plant $G(s)$.