Homework #11: ECE 461

Digital Control. Due Monday, November 20th

1) For the following system:

$$G(s) = \left(\frac{0.2796}{(s+0.195)(s+1.074)(s+2.753)} \right)$$

design a digital controller, K(z), so that

- The sampling rate is 0.1 second (T = 0.1)
- The resulting closed-loop system has no error for a step input,
- With a 2% settling time of 4 seconds, and
- 20% overshoot for a step input.

a) Specify K(z)

b) Verify your design using Matlab or VisSim (VisSim preferred: it allows you to plot G(s) and K(z)

c) Write a program to implement your K(z).

2) For the following system:

$$G(s) = \left(\frac{0.2796}{(s+0.195)(s+1.074)(s+2.753)} \right)$$

design a digital controller, K(z), so that

- The sampling rate is 0.5 seconds (T = 0.5)
- The resulting closed-loop system has no error for a step input,
- With a 2% settling time of 4 seconds, and
- 20% overshoot for a step input.

a) Specify K(z)

b) Verify your design using Matlab or VisSim (VisSim preferred: it allows you to plot G(s) and K(z)

c) Write a program to implement your K(z).

3) For the following system with a 0.65 second delay:

$$G(s) = \left(\frac{0.2796}{(s+0.195)(s+1.074)(s+2.753)} \right) \cdot e^{-0.65s}$$

design a digital controller, K(z), so that

- The sampling rate is 0.5 seconds (T = 0.5)
- The resulting closed-loop system has no error for a step input,
- With a 2% settling time of 10 seconds, and *change: Ts = 10 seconds. Same as HW#9*
- 20% overshoot for a step input.

a) Specify K(z)

b) Verify your design using Matlab or VisSim (VisSim preferred: it allows you to plot G(s) and K(z)

c) Write a program to implement your K(z).