

ECE 461/661 - Homework Set #9

Systems with Delays, Oscillatory Systems, Unstable Systems. Due November 7th. 20pt / problem

1) A better model for the 10-stage RC filter from homework #5 uses a 480ms delay to approximate the effect of the poles that are dropped:

$$G(s) \approx \left(\frac{0.4}{(s+2.181)(s+0.4234)} \right) \cdot e^{-0.48s}$$

Design a gain compensator, $K(s)$, which results in

- No error for a step input,
- 20% overshoot for a step input, and
- $T_s = 4$ seconds.

Check your design in VisSim / Simulink / or similar program.

2) The transfer function for an oscillator system is:

$$G(s) = \left(\frac{10}{s(s+j2)(s-j2)} \right)$$

Design a gain compensator, $K(s)$, which results in

- No error for a step input,
- 20% overshoot for a step input, and
- $T_s = 4$ seconds.

Check your design in VisSim / Simulink / or similar program.

3) The transfer function for an unstable system is:

$$G(s) = \left(\frac{10}{(s-2)(s+2)(s+5)} \right)$$

Design a gain compensator, $K(s)$, which results in

- No error for a step input,
- 20% overshoot for a step input, and
- $T_s = 4$ seconds.

Check your design in VisSim / Simulink / or similar program.