

# Homework #8: ECE 461/661

Meeting Specs, Delays, Unstable Systems. Due Monday, October 25th  
20 points per problem

## Meeting Design Specs

1) Assume

$$G(s) = \left( \frac{170}{(s+0.47)(s+3.40)(s+9.00)(s+16.77)} \right)$$

Design a compensator,  $K(s)$ , For the 4th-order model that results in

- No error for a step input
- A 2% settling time of 2 seconds, and
- 20% overshoot for the step response

Check your design in Matlab or Simulink or VisSim

Give an op-amp circuit to implement  $K(s)$

## Systems with Delays

2) Assume a 100ms delay is added to the system

$$G(s) = \left( \frac{170}{(s+0.47)(s+3.40)(s+9.00)(s+16.77)} \right) e^{-0.1s}$$

Design a compensator,  $K(s)$ , For the 4th-order model that results in

- No error for a step input
- A 2% settling time of 2 seconds, and
- 20% overshoot for the step response

Check your design in Matlab or Simulink or VisSim

Give an op-amp circuit to implement  $K(s)$

## Unstable Systems

3) Assume the slow pole was unstable

$$G(s) = \left( \frac{170}{(s-0.47)(s+3.40)(s+9.00)(s+16.77)} \right)$$

Design a compensator,  $K(s)$ , For the 4th-order model that results in

- No error for a step input
- A 2% settling time of 2 seconds, and
- 20% overshoot for the step response

Check your design in Matlab or Simulink or VisSim