Homework #8: ECE 461

Gain, Lead, PID Compensation. Due Monday, October 1, 2018 Due Monday, October 29, 2018

Assume

$$G(s) = \left(\frac{200}{(s+2)(s+5)(s+10)(s+15)} \right)$$

Problem 1: Gain Compensation (K(s) = k)

- Design a gain compensator which results in the closed-loop system having
  - 20% overshoot for a step input.
- Design an op-amp circuit to implement K(s)
- Determine the dominant poles of the closed-loop system
- Plot the step response of the closed-loop system using Matlab (or similar program)

Problem 2: Lead Compensation $\left(K(s) = k\left(\frac{s+a}{s+10a} \right) \right)$

- Design a lead compensator which results in the closed-loop system having
  - 20% overshoot for a step input.
- Design an op-amp circuit to implement K(s)
- Determine the dominant poles of the closed-loop system
- Plot the step response of the closed-loop system using Matlab (or similar program)

Problem 3: PI Compensation

- Design a PI compensator which results in the closed-loop system having
  - 20% overshoot for a step input.
  - No error for a step input
- Design an op-amp circuit to implement K(s)
- Determine the dominant poles of the closed-loop system
- Plot the step response of the closed-loop system using Matlab (or similar program)

Problem 4: General Compensator

- Design a compensator which results in the closed-loop system having
  - 20% overshoot for a step input.
  - No error for a step input, and
  - A 2% settling time of 2 seconds.
- Design an op-amp circuit to implement K(s)
- Determine the dominant poles of the closed-loop system
- Plot the step response of the closed-loop system using Matlab (or similar program)