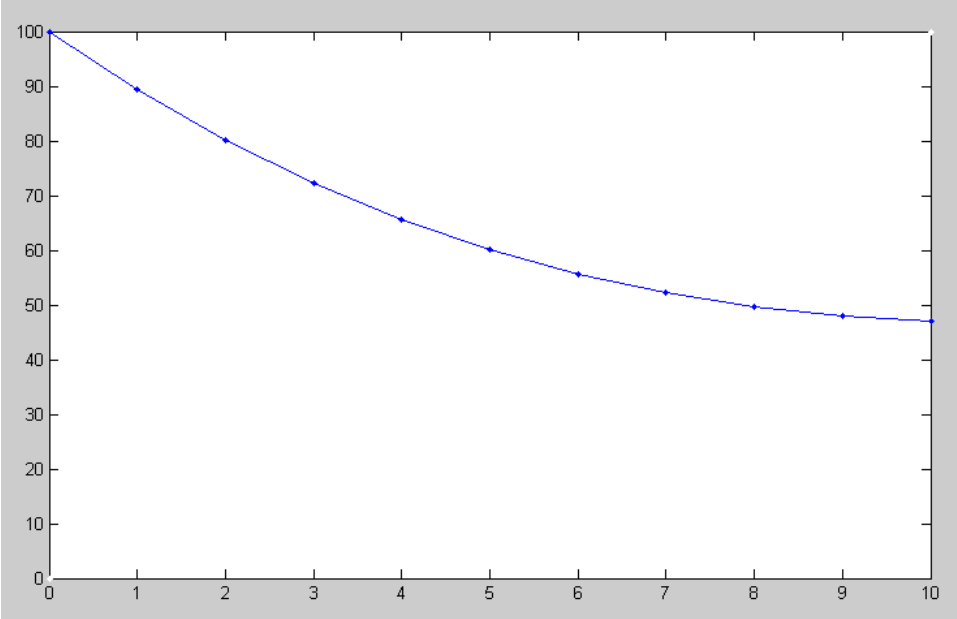
Homework #8: ECE 461

Gain, Lead, PID Compensation. Due Monday, October 30th

A 3rd-order approxiamtion for 10-stage heat equation from homework set #5 is

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



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

a) Design a gain compensator which results in 20% overshoot for a step input.

b) Verify your design by taking the step response of the closed-loop system using Matlab or VisSim (or like program)

c) Give a circuit to implement K(s)

d) Write a C program to implement your compensator (modify the program heat.m)

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

a) Design a lead compensator which results in 20% overshoot for a step input.

b) Verify your design by taking the step response of the closed-loop system using Matlab or VisSim (or like program)

c) Give a circuit to implement K(s)

d) Write a C program to implement your compensator (modify the program heat.m)

Problem 3: Integral (I) Compensation: $K(s) = \left(\frac{k}{s}\right)$

a) Design an I compensator which results in 20% overshoot for a step input.

b) Verify your design by taking the step response of the closed-loop system using Matlab or VisSim (or like program)

c) Give a circuit to implement K(s)

d) Write a C program to implement your compensator (modify the program heat.m)

Problem 4: PI Compensation: $K(s) = P + \frac{I}{s} = k(\frac{s+a}{s})$

a) Design a PI compensator which results in 20% overshoot for a step input.

b) Verify your design by taking the step response of the closed-loop system using Matlab or VisSim (or like program)

c) Give a circuit to implement K(s)

d) Write a C program to implement your compensator (modify the program heat.m)

Problem 5: Skip. We'll do that next week.