King Saud University
Computer Engineering Department
College of Computer and Information Sciences

1st semester 1436/1437 H
CEN455: Introduction Digital Control

HW # 1

Name: ID#

Question 1 (design via pole placement)

Use a PD controller to control the system $G(s) = \frac{1}{s^2+2s}$ to meet the specifications $\zeta = 0.5$ *and* $\omega_n = 3\ rad/sec$.

Question 2(design via rootlocus)

A unity feedback system with the forward transfer function $G(s) = \frac{1}{s(s+5)}$ is operating with a closed-loop step response that has 30% overshoot. Do the following:

a. Evaluate the steady-state error for a unit ramp input (use Matlab).
b. Design a lag compensator to improve the steady-state error by a factor of 10.
c. Evaluate the steady-state error for a unit ramp input to your compensated system.
d. Evaluate how much improvement in steady-state error was realized.

Question3(digital controller)

Given the system of Figure, a lead compensator $G_c(s)$ yields a 20% overshoot (ζ= 0.456) and K_v = 40, with a peak time of 0.1 second. In order to meet the requirements, the design yielded K = 1440 and a lead compensator,

$$G_c(s) = 2.38\ \frac{s+25.3}{s+60.2}$$

If the system is to be computer controlled, find the digital controller, $G_c(z)$