

Islamic University of Gaza
Electrical and Computer Engineering Department
EELE 3360 Feedback Control Systems
Final Exam
June 16, 2009



Dr. Basil Hamed
Name:

Exam Time 12:00-2:00
ID. #

1. Find state model and Transfer Function using Mason Gain Formula of Shown Figure. (10 Pt)

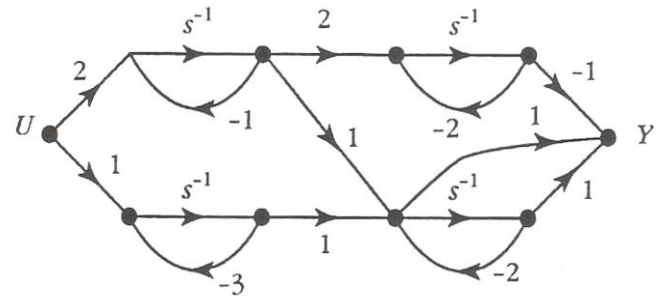


Figure 1

2. The block diagram of a control system is shown in Figure 2

$$G_c = k(s + 3), \quad G_p(s) = \frac{.5}{s}, \quad H(s) = \frac{1}{(s - 1)}$$

- Sketch the root locus with respect to K for the system showing in the Figure. (4 PT)
- Find the value of K with locations of poles when the R-L crosses the imaginary- axis, if any. (4 PT)
- Find the range of K, $K > 0$, for which the root of the system characteristic equation are all real. (3PT)
- Show that if the controller can satisfy the following design specifications: % O.S $\leq 4.32\%$, $t_s \leq 2.3$ Sec (3 PT)

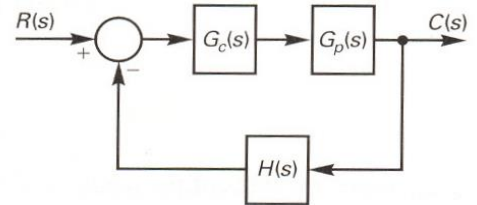
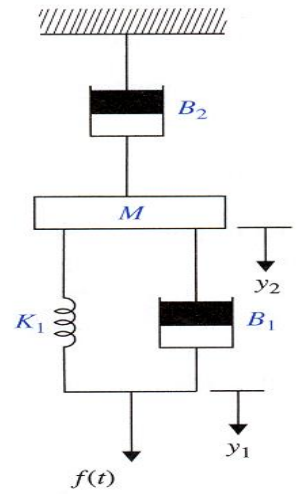


Figure 2

3. a) For the Mechanical system shown, Write the differential equations, and find the state equations. (7 Pt)



b) Given, $G(s) = \frac{Y(s)}{R(s)} = \frac{S^2 + 8S + 12}{S^2 + 5S + 4}$ Determine state space model of the system using; Parallel method (7 Pt)

4. **a)** For the system shown in Figure 2, $G_c(s) = K$, $H(s) = (s+4)/(s+3)$, $G_p(s) = (s+1) / s^2 (s+2)$, what is the steady-state error for a unit step, and unit ramp input. (6 Pt)

- b)** Given the system shown in Figure 2, $G_c(s) = K$, $H(s) = (s+a)$, $G_p(s) = 1 / s(s+1)(s+4)$, find the Sensitivity of the steady-state error to parameter a . Assume a step input. (6 pt)