



Islamic University of Gaza
Electrical and Computer Engineering Department
EELE 3360 Feedback Control Systems
Final Exam
May 18, 2008

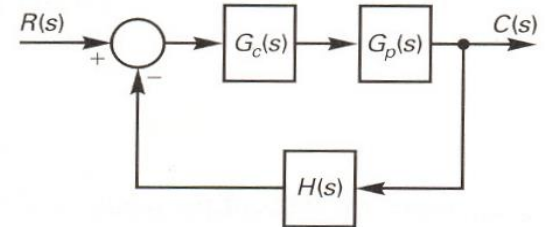


Dr. Basil Hamed
Name:

Exam Time 9:00-11:00
ID. #

1. Sketch the unit step response for the shown system (8Pt.)

$G_c(s) = 10, \quad H(s) = 1, \quad G_p(s) = 8 / (s^2 + 5s + 10)$



Linearise the following differential equation around the point $x_1(t)=x_2(t)=u(t)=0$

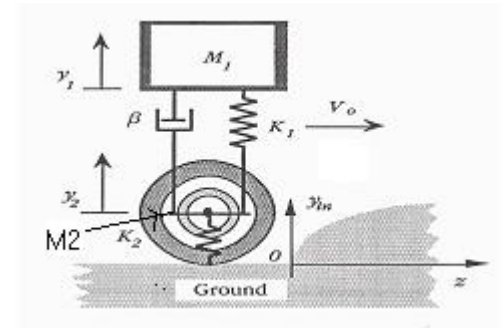
(4 Pt.)

$$\dot{x}_1(t) - 2x_1(t) - u(t) * x_2(t) = 0$$

, and obtain the state equation for the system.

$$\dot{x}_2(t) - 3x_2(t) - \sin(x_1(t)) - u(t) = 0$$

2. a) For the Mechanical system shown, Write the differential equations, and find the state equations (8 Pt.)

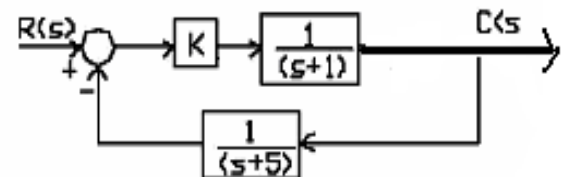


b) Find the value of K which will give a settling time of 2 seconds ($\zeta=0.707$).

(3 PT.)

Find the value of K which will give a steady-state error of 2%

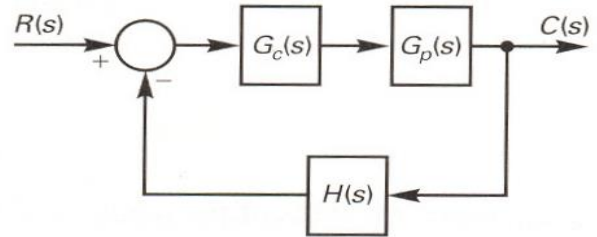
(3 PT.)



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

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

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



4. Find state model and Transfer Function of Shown Figure.

(10 PT.)

