SEOUL NATIONAL UNIVERSITY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

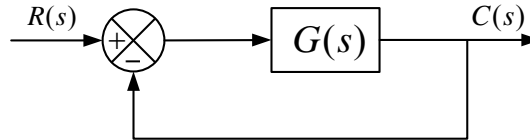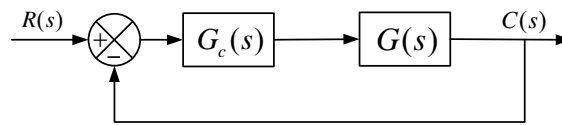|	
SYSTEM CONTROL	**Fall 2010**
HW #5	**Assigned: November 10 (we)**
	Due: November 22 (mo)

1. Lead Compensator Design / Simulation

- Open-loop Transfer function : $G(s) = \dfrac{4}{s(s+2)}$

- Closed-loop Transfer function : $\dfrac{C(s)}{R(s)} = \dfrac{4}{s^2 + 2s + 4} = \dfrac{4}{(s+1+j\sqrt{3})(s+1-j\sqrt{3})}$

- Closed-loop Poles : $s = -1 \pm j\sqrt{3}$

- Closed-loop Properties : $\zeta = 0.5, \quad \omega_n = 2\,rad/s, \quad K_v = 2\,\sec^{-1}$

▪Compensated System

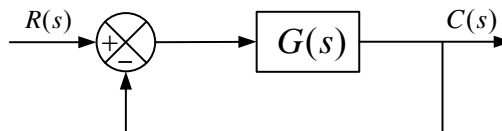- $G_c(s) = K_c \dfrac{s + \dfrac{1}{T}}{s + \dfrac{1}{\alpha T}}$: lead compensator

- Desired Properties : $\zeta = 0.5, \quad \omega_n = 4\,rad/s, \quad K_v : not\ given$

1) Find $\alpha,\ T,\ K_c$.

2) Compare step input responses of the compensated system with uncompensated system using MATLAB.

2. The transfer function of the closed-loop control system shown in the figure below is

$$G(s) = \dfrac{4}{s(s+0.5)}$$

Desired specifications of the compensated system are as follows:

$$\zeta = 0.5, \quad \omega_n = 5\,rad/s, \quad K_v = 80\,\sec^{-1}.$$

(1) Design a lead-lag compensator
(2) Plot root locus of the compensated and uncompensated systems.
(3) Compare step and ramp responses of the compensated and uncompensated systems.