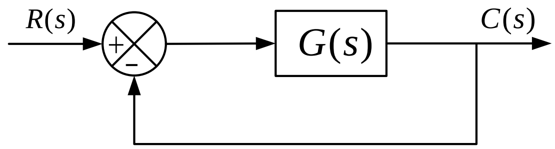
SEOUL NATIONAL UNIVERSITY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

SYSTEM CONTROL **Fall 2014**

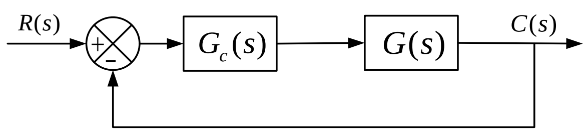
HW #4 **Assigned: October 28 (Tu)**
Due: November 4 (Tu)

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

▪Compensated System

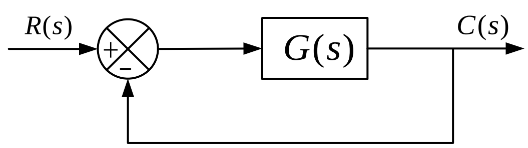


- $G_c(s) = K_c \dfrac{s+\frac{1}{T}}{s+\frac{1}{\alpha T}}$: lead compensator
- Desired Properties : $\zeta = 0.5, \quad \omega_n = 4rad/s, \quad K_v : not\ given$

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

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



Desired specifications of the compensated system are as follows:

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

(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.