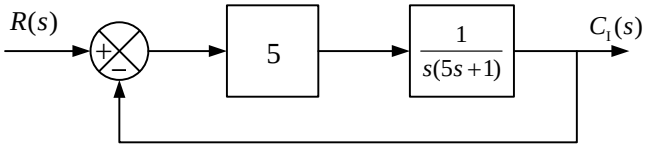
SEOUL NATIONAL UNIVERSITY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

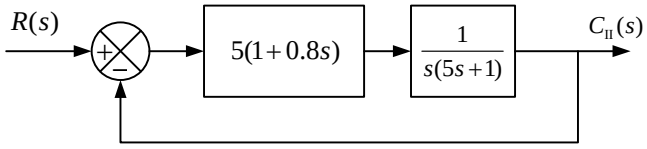
SYSTEM CONTROL **Fall 2010**

HW#4 **Assigned: November 3(we)**
Due: November 10(we)

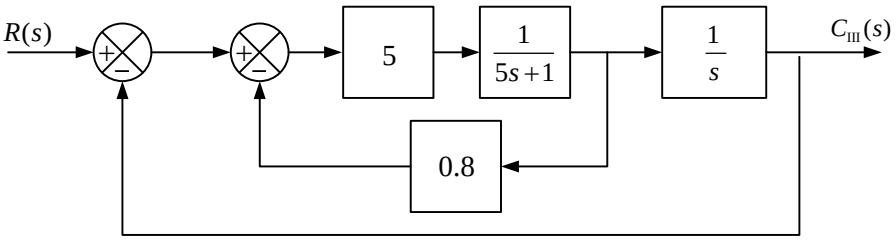
[1] Figure shows three systems. System I is a positional servo system. System II is a positional servo system with PD control action. System III is a positional servo system with velocity feedback. Compare the unit-step, unit-impulse, and unit-ramp responses of the three systems. Which system is best with respect to the speed of response and maximum overshoot in the step response?



System I



System II



System III

Figure : Positional servo system (System I), positional servo system with PD control action (System II), and positional servo system with velocity feed back (System III).

[2] Consider the closed-loop system shown in Figure below. Determine the range of K for stability. Assume that $K > 0$.

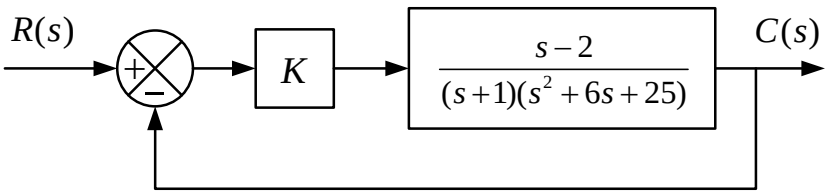


Figure: Closed-loop system.

[3] Consider a unity-feedback control system with the closed-loop transfer function

$$\frac{C(s)}{R(s)} = \frac{Ks + b}{s^2 + as + b}$$

Determine the open-loop transfer function *G(s)*.

Show that the steady-state error in the unit ramp response is given by

$$e_{ss} = \frac{1}{K_v} = \frac{a - K}{b}$$

2008
[1] B-5-13. Ogata 4th ed.

[2] B-5-15.

[3] B-5-26.

[4] B-5-30.

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[1] B-5-15.

[2] B-5-26.

[3] B-5-30.