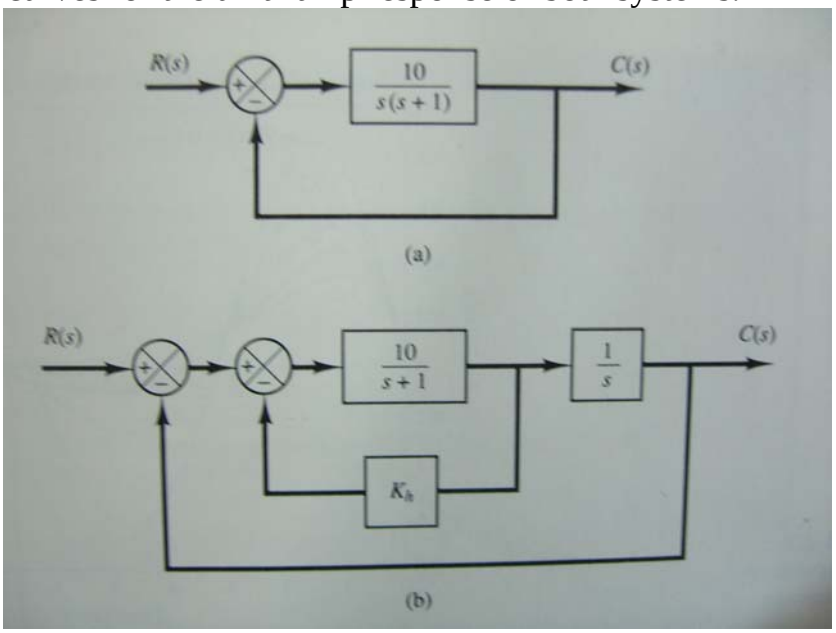
SEOUL NATIONAL UNIVERSITY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

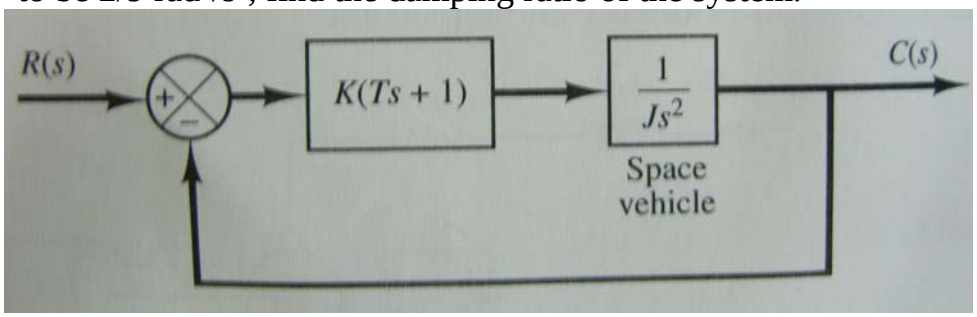
SYSTEM CONTROL **Fall 2010**

HW#2 **Assigned: September 27 (Mo)**
Due: October 6 (We)

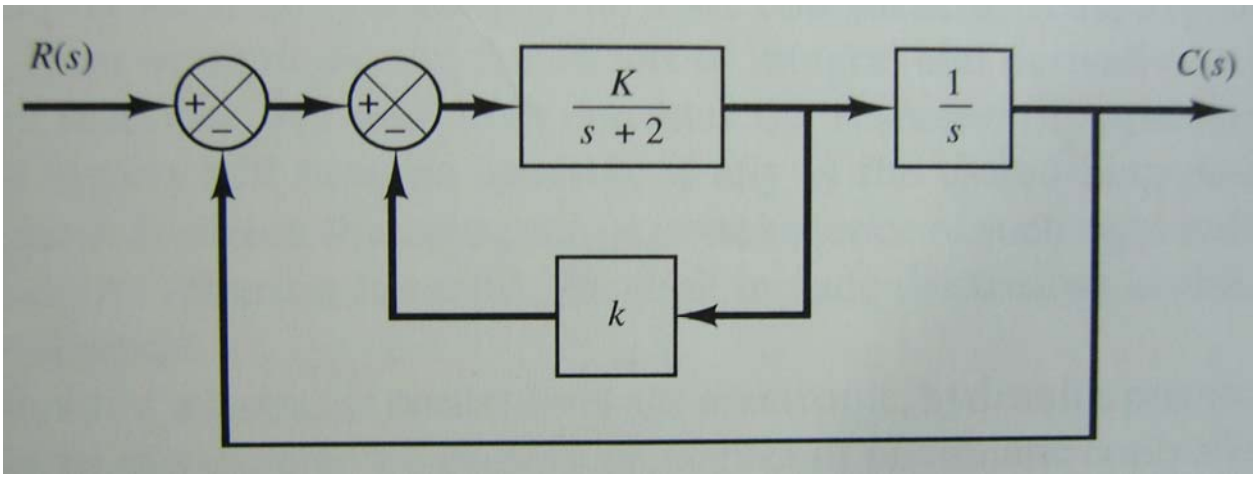
1. Consider the system shown below. The damping ratio of this system is 0.158 and the undamped natural frequency is 3.16rad/s. To improve the relative stability, we employ tachometer feedback. Figure (b) shows such a tachometer-feedback system.
Determine the value of K_h so that the damping ratio of the system is 0.5. Draw unit-step response curves of both the original and tachometer-feedback systems. Also draw the error-versus-time curves for the unit-ramp response of both systems.



2. Figure shown below is a block diagram of a space-vehicle attitude-control system. Assuming the time constant T of the controller to be 3sec and the ratio of torque to inertia K/J to be 2/9 rad^2/s^2, find the damping ratio of the system.



3. Referring to the system shown below, Determine the values of K and k such that the system has a damping ratio ζ of 0.7 and an undamped natural frequency ω_n of 4 rad/sec.



4. Using MATLAB, obtain the unit-step response, unit-ramp response, and unit-impulse response of the following system:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & -0.5 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0.5 \\ 0 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$