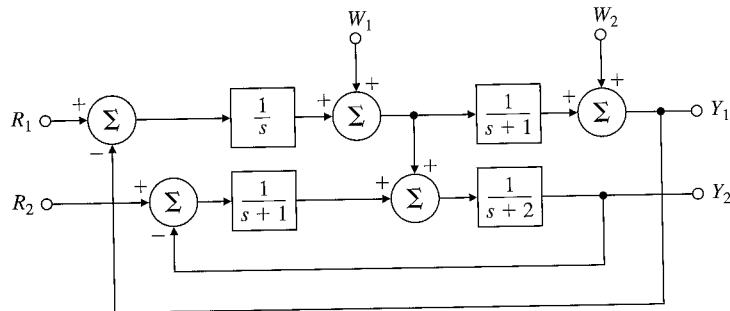
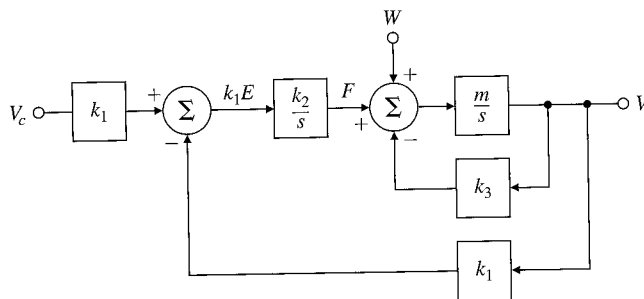


Figure 4.51
Multivariable system



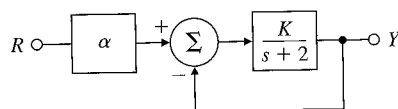
- 4.28.** One possible representation of an automobile speed-control system with integral control is shown in Fig. 4.52.
- With a zero reference velocity input ($v_c = 0$), find the transfer function relating the output speed v to the wind disturbance w .
 - What is the steady-state response of v if w is a unit ramp function?
 - What type is this system in relation to reference inputs? What is the value of the corresponding error constant?
 - What is the type and corresponding error constant of this system in relation to tracking the disturbance w ?

Figure 4.52
System using integral control



- 4.29.** For the feedback system shown in Fig. 4.53, find the value of α that will make the system type 1 for $K = 5$. Give the corresponding velocity constant. Show that the system is not robust by using this value of α and computing the tracking error $e = r - y$ to a step reference for $K = 4$ and $K = 6$.

Figure 4.53
Control system for
Problem 4.29



- 4.30.** A position control system has the closed-loop transfer function (meter/meter) given by

$$\frac{Y(s)}{R(s)} = \frac{b_0s + b_1}{s^2 + a_1s + a_2}$$