4.28. One possible representation of an automobile speed-control system with integral control is shown in Fig. 4.52.

(a) With a zero reference velocity input ($v_r = 0$), find the transfer function relating the output speed $v$ to the wind disturbance $w$.
(b) What is the steady-state response of $v$ if $w$ is a unit ramp function?
(c) What type is this system in relation to reference inputs? What is the value of the corresponding error constant?
(d) What is the type and corresponding error constant of this system in relation to tracking the disturbance $w$?

4.29. For the feedback system shown in Fig. 4.53, find the value of $\alpha$ 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 $\alpha$ and computing the tracking error $e = r - y$ to a step reference for $K = 4$ and $K = 6$.

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

$$\frac{Y(s)}{R(s)} = \frac{b_0 s + b_1}{s^2 + a_1 s + a_2}.$$