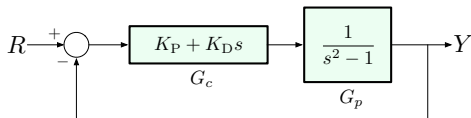


From Root Locus to Time Response Specs

For concreteness, let's see what happens when

$$K_P/K_D = -z_1 = 2 \quad \text{and} \quad K = K_D = 5 \implies K_P = 10$$



$$G_c(s) = 10 + 5s$$

$$u = 10e + 5\dot{e}, \quad e = r - y$$

$$\text{Characteristic equation: } 1 + 5 \left(\frac{s + 2}{s^2 - 1} \right) = 0$$

$$s^2 + 5s + 9 = 0$$

$$\text{Relate to 2nd-order response: } \omega_n^2 = 9, \quad 2\zeta\omega_n = 5 \implies \zeta = 5/6$$