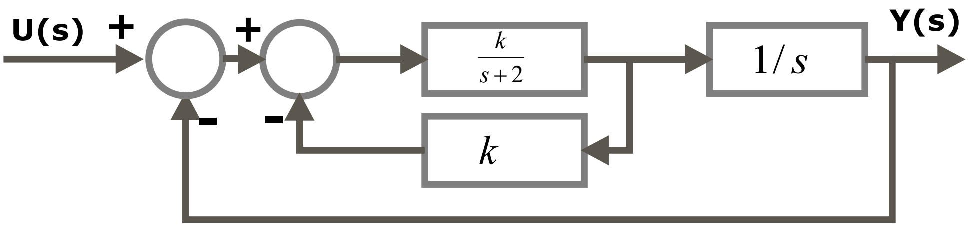
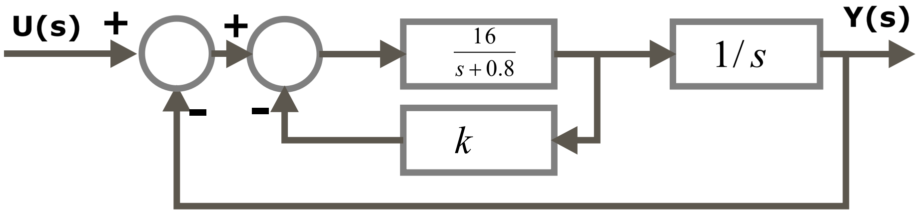
Automatic Control Systems

System Response

1. Given that the transfer function of a second-order system is $T(s) = \frac{100}{s^2+s+100}$ find:
   - Undamped natural frequency ω_n, Damping ration ζ
   - Damped natural frequency ω_d
2. Given that the transfer function of a second-order system is $T(s) = \frac{10}{s^2+40s+K}$, and $\zeta = 0.7$ find:
   - The value of K, Undamped natural frequency ω_n, Damped natural frequency ω_d,
3. Given that the transfer function of a second-order system is $T(s) = \frac{20s}{3s^2+2s+K+4}$, and $\zeta = 0.1$ find:
   - The value of K, Undamped natural frequency ω_n, Damped natural frequency ω_d
4. Determine whether the system that has that transfer function below is overdamped, critically damped, or underdamped
   - $T(s) = \frac{9s^2+3s+10}{s^2+5s+2}$, $\quad T(s) = \frac{s^2-2s}{s^2+6s+9}$
5. Given that the transfer function of a second-order system is $T(s) = \frac{100}{s^2+4s+100}$, and the input is step input, find
   - Rise time t_r, Settling time t_s,
   - Maximum overshoot M_p, Peak time t_p
6. Given that the transfer function of a second-order system is $T(s) = \frac{49}{s^2+4s+49}$, and the input is step input, find
   - Rise time t_r, Settling time t_s
   - Maximum overshoot M_p, Peak time t_p
7. For the block diagram shown below, find the value of k, K, if $\zeta = 0.7$ and $\omega_n = 4$



8. For the block diagram shown below, if $\zeta = 0.5$



   - Rise time t_r, Settling time t_s
   - Maximum overshoot M_p, Peak time t_p