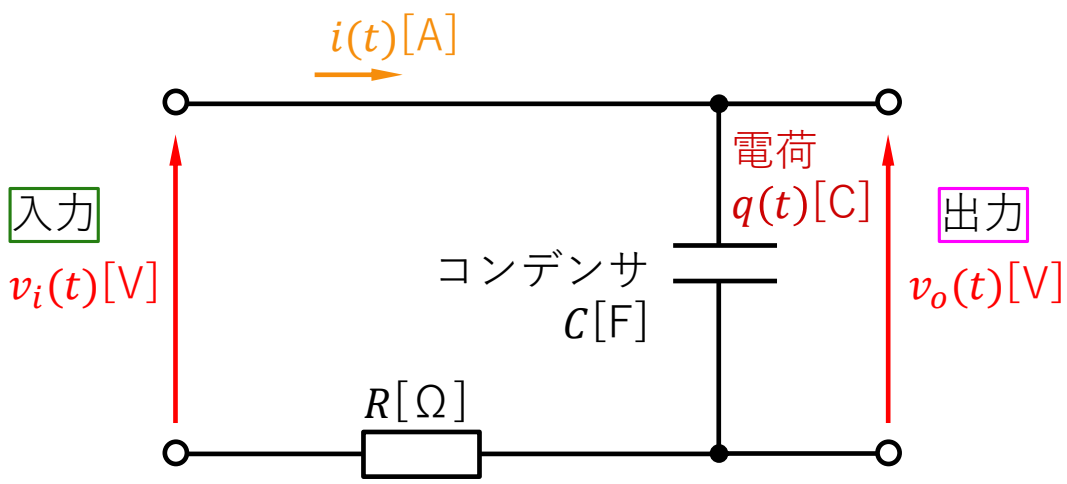
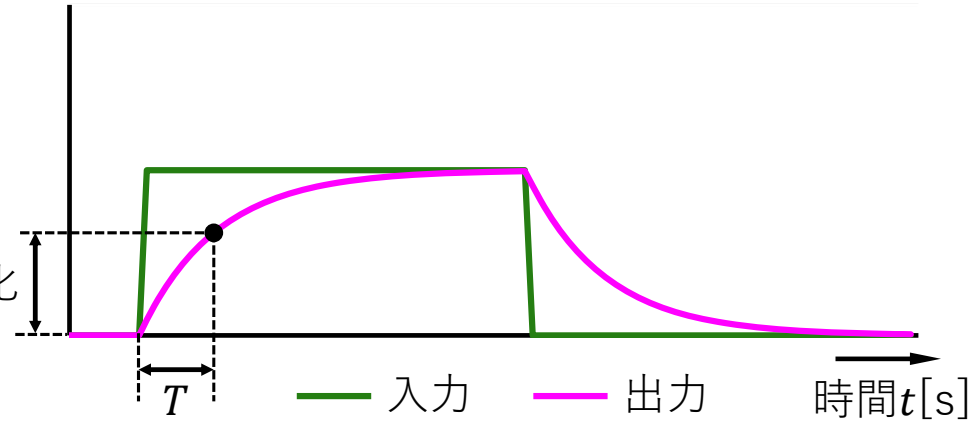


制御 (10) 《伝達関数要素：一次遅れ》



$$v_i(t) = v_o(t) + Ri(t) \quad \dots \textcircled{1}$$

$$i(t) = \frac{dq(t)}{dt} = \frac{dCv_o(t)}{dt} = C \frac{dv_o(t)}{dt} \quad \dots \textcircled{2}$$

$$\textcircled{1}, \textcircled{2} \text{より、} v_i(t) = v_o(t) + CR \frac{dv_o(t)}{dt} \quad \dots \textcircled{3}$$

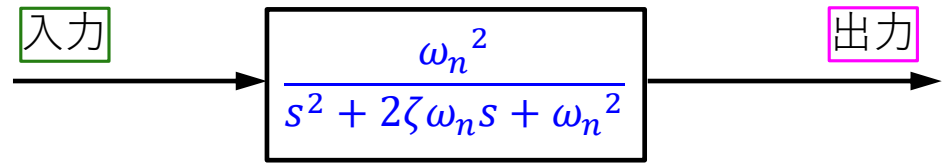
③をラプラス変換すると、

$$V_i(s) = V_o(s) + CR \cdot sV_o(s) = V_o(1 + CRs)$$

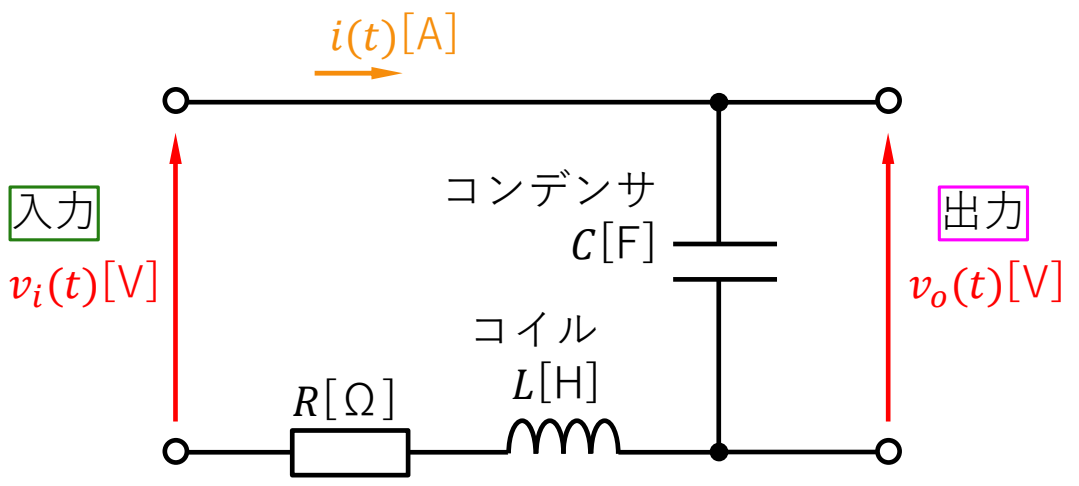
$$\therefore G(s) = \frac{\text{出力}}{\text{入力}} = \frac{V_o(s)}{V_i(s)} = \frac{1}{1 + CRs} \quad \text{時定数：} CR$$

制御 (11) 《伝達関数要素：二次遅れ》

二次遅れ要素



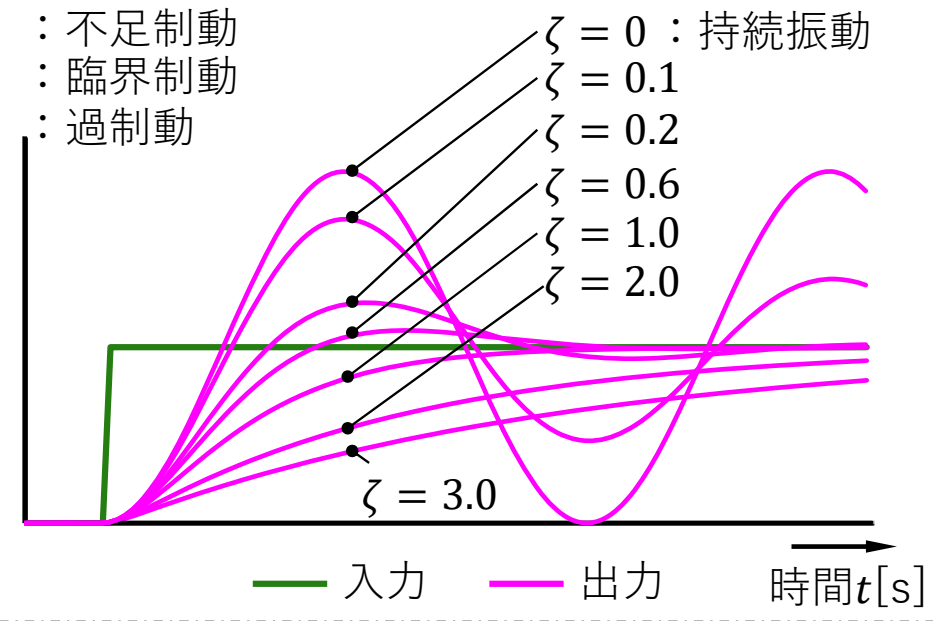
固有周波数： $\omega_n$       減衰率： $\zeta$



$$v_o(t) = \frac{1}{C} \int i(t) dt \quad \dots \textcircled{1}$$

$$v_i(t) = \frac{1}{C} \int i(t) dt + L \frac{di(t)}{dt} + Ri(t) \quad \dots \textcircled{2}$$

$\zeta < 1$  : 不足制動  
 $\zeta = 1$  : 臨界制動  
 $\zeta > 1$  : 過制動



①②をラプラス変換して、 $G(s)$ を求めると、

$$G(s) = \frac{\text{出力}}{\text{入力}} = \frac{V_o(s)}{V_i(s)} = \frac{\frac{I(s)}{Cs}}{\left(\frac{1}{Cs} + Ls + R\right)I(s)} = \frac{\frac{1}{LC}}{s^2 + \frac{R}{L}s + \frac{1}{LC}} \quad \dots \textcircled{3}$$

③について、 $\omega_n = \frac{1}{\sqrt{LC}}$ 、 $\zeta = \frac{R}{2} \sqrt{\frac{C}{L}}$ と置くと、

$$\therefore G(s) = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \quad \text{固有周波数：} \frac{1}{\sqrt{LC}}$$

$$\text{減衰率：} \frac{R}{2} \sqrt{\frac{C}{L}}$$

制御 (12) 《その他 伝達関数要素》

