Formulário

$$t_s = 4\tau = \frac{4}{\zeta\omega_n} \tag{1}$$

$$t_p = \frac{\pi}{\omega_n\sqrt{1-\zeta^2}} \tag{2}$$

$$t_r = \frac{2.16\zeta + 0.6}{\omega_n} \quad \text{(subamortecido)} \tag{3}$$

$$\%OS = e^{\frac{-\pi\zeta}{\sqrt{1-\zeta^2}}} \quad \rightarrow \quad \zeta = -\frac{ln(\%OS)}{\sqrt{\pi^2 + ln(\%OS)^2}} \tag{4}$$

$$p_{1,2} = -\zeta\omega_n \pm j\omega_n\sqrt{1-\zeta^2} \tag{5}$$

$$\theta = cos^{-1}(\zeta) \tag{6}$$

$$k_p = \lim_{s\to 0} G(s) \qquad k_v = \lim_{s\to 0} sG(s) \qquad k_a = \lim_{s\to 0} s^2G(s) \tag{7}$$

Número de Integradores de $G(s)$, Tipo de Sistema	Entrada: Degrau $r(t) = A$, $R(s) = A/s$	Entrada: Rampa At, A/s^2	Entrada: Parábola $At^2/2$, A/s^3
0	$e_{ss} = \frac{A}{1+K_p}$	Infinito	Infinito
1	$e_{ss} = 0$	$\frac{A}{K_v}$	Infinito
2	$e_{ss} = 0$	0	$\frac{A}{K_a}$

$$y_{ss} = y(\infty) = \lim_{s\to 0} sY(s) \tag{8}$$

$$e_{ss} = e(\infty) = \lim_{s\to 0} sE(s) \tag{9}$$