

$$y_{10} = \frac{K}{1} 60^\circ (1 - e^{-10/10}) = 37,93 + 20 \rightarrow \boxed{57,9^\circ\text{C}}$$

$$y_{20} = 60^\circ (1 - e^{-2}) = 51,88^\circ\text{C} + 20 = \boxed{71,9^\circ\text{C}}$$

2) a) $V = RC \frac{dV_c}{dt} + V_c$ (pág 83 Ej 2)

$$V_c = V (1 - e^{-t/RC}) \quad \begin{cases} G_{ss} = 1 \\ \tau = RC \end{cases}$$

3) (pág 85 - Ej 3)

b) $\left. \begin{array}{l} \text{Valor final } 10V \\ E = 5V \end{array} \right\} G_{ss} = \frac{10}{5} = 2$

a) para $0,63 \times 10V \approx 6,3V \rightarrow \tau = 3 \text{ seg}$

c) $\tau \frac{d\theta_o}{dt} + \theta_o = G_{ss} \theta_i$

$$3 \frac{dV_o}{dt} + V_o = 2V_i \rightarrow G(s) = \frac{2}{3s + 1}$$

4) (pág 105 - Ej 9)

$$\frac{d^2\theta_o}{dt^2} + 10 \frac{d\theta_o}{dt} + 25 = 25\theta_i$$

$$\tau^2 \frac{d^2y}{dt^2} + 2\tau\xi \frac{dy}{dt} + 1 = G_{ss} U$$

$$\frac{d^2y}{dt^2} + 2\xi\omega_m \frac{dy}{dt} + \omega_m^2 = b_1 \omega_m \theta_i$$

$$\tau^2 = \frac{1}{25}$$

$$\omega_m^2 = 25$$

$$\omega_m = 5 \text{ Hz}$$

$$2\xi\omega_m = 10$$

$$G_{ss} = 1$$

$$\xi = \frac{10}{2 \times 5} = 1$$

↓
amortiguado

a) $\omega_m = 5$ (freq. no amortig.)

b) $\omega = \omega_m \sqrt{1 - \xi^2}$ (freq. cdo está amortig.) $\rightarrow \omega = \omega_m$

c) $\theta_o = (-32 + 6t) e^{-5t} + 6$ $\tau = 0,2 \text{ seg}$

(pág 93) $\tau = 0,2 \text{ seg} \rightarrow \tau = \frac{1}{\omega_m} \rightarrow \omega_m = 5 \text{ Hz} \rightarrow u = (At + B)e^{-\omega_m t}$

$$9,5\% \theta_{ss} \text{ a)}$$

$$0,070 \text{ seg. b)}$$

$$= \theta_{ss} \cdot e^{\left(-\frac{\xi \pi}{\sqrt{1-\xi^2}}\right)} = \theta_{ss} \cdot e^{\left(-\frac{0,6 \pi}{\sqrt{1-0,6^2}}\right)} = \underline{0,095}$$

$$\text{Tiempo levantamiento } t_r = \frac{1}{2} \frac{\pi}{\omega} = \frac{1}{2} \frac{\pi}{100 \text{ Hz}} = 0,0157 \text{ seg}$$

(desde 0 a θ_{ss})

$$\text{Tiempo pico - } t_p = \frac{\pi}{\omega} = 0,04 \text{ seg}$$

(desde 0 al máximo)

$$\omega = \omega_m \sqrt{1-\xi^2} \Rightarrow \omega_m = 125 \text{ rad/s}$$

$$t_s = \frac{4}{\xi \omega_m} = \frac{4}{0,6 \times 125} = 0,053 \text{ seg}$$

