Tarea Sist Amortiguados

$$\rightarrow \boxed{\frac{9}{s^2+2s+9}} \rightarrow$$

- $\omega_n = 3$

$\rightarrow 2\zeta\omega_n s \leq 2s$

$= \zeta = \frac{1}{3} \rightarrow$ Sub amortiguado

$\rightarrow$

$$\frac{-2 \pm \sqrt{2^2 - 4(1)(9)}}{2} = \frac{-2 \pm \sqrt{-32}}{2}$$

$s_1 = -1 + 2{,}83j \qquad s_2 = -1 - 2{,}83j$

$$\frac{A}{s} + \frac{B}{(s+1-2{,}83j)} + \frac{C}{(s+1+2{,}83j)} = \frac{9}{s(s+1)(s+1)}$$

$\downarrow d \qquad \downarrow e$

$\rightarrow A(s+1-2{,}83j)(s+1+2{,}83j) + B(s)(s+1+2{,}83j) + C(s)(s+1-2{,}83j) = 9$

- $s = 0$

$A(1-2{,}83j)(1+2{,}83j) = 9$

$A = 1$

- $s = -1 + 2{,}83j$

$B(-1+2{,}83j)(-1+2{,}83j+1+2{,}83j) = 9$

$B = -0{,}5 + 0{,}18j$

- $s = -1 - 2{,}83j$

$C(-1-2{,}83j)(-1-2{,}83j+1-2{,}83j) = 9$

$C = -0{,}5 - 0{,}18j$

$$= \frac{1}{s} + \frac{(-0{,}5+0{,}18j)}{(s+1-2{,}83j)} + \frac{(-0{,}5-0{,}18j)}{(s+1+2{,}83j)}$$

$\downarrow \mathcal{L}^{-1}$

$\rightarrow$ Transformada inversa de Laplace

- $$\frac{1}{s+\alpha-\beta j} = e^{-\alpha t}\cos(\beta t) + j e^{-\alpha t}\operatorname{sen}(\beta t)$$

$\rightarrow y(t) = 1 + (-0{,}5+0{,}18j)(e^{-t}\cos(2{,}83t) + j e^{-t}\operatorname{sen}(2{,}83t)) + (-0{,}5-0{,}18j)(e^{-t}\cos(-2{,}83t) + j e^{-t}\operatorname{sen}(-2{,}83t))$

Al considerar:

$$\cos(\alpha) = \cos(-\alpha)$$

$$\operatorname{sen}(-\alpha) = -\operatorname{sen}(\alpha)$$

$y(t) = -e^{-t}\cos(2{,}83t) - j e^{-t}\operatorname{sen}(-2{,}83t) - 0{,}36 e^{-t}\operatorname{sen}(2{,}83t) + 1$

$\rightarrow$ Respuesta real TR

$y(t) = e^{-t}\cos(2{,}83t) - 0{,}36 e^{-t}\operatorname{sen}(2{,}83t) + 1$

- $G(s) = \frac{9}{s^2+9} \rightarrow \omega_n = 3$

$2\zeta\omega_n s = 0$

$\rightarrow \frac{1}{s} \cdot \frac{9}{s^2+9} = \frac{9}{s^3+9s}$ $\qquad \zeta = 0 \rightarrow$ Oscilador

$\rightarrow s^2 + 9 = 0 \rightarrow s_1 = \sqrt{-9} \qquad s_2 = -\sqrt{-9}$

$= 3j \qquad = -3j$

$\rightarrow G(s) = \frac{9}{s(s+3j)(s-3j)}$

→ $G(s) = \frac{9}{s\,(s+3j)(s-3j)}$

→ $\frac{A}{s} + \frac{B}{(s+3j)} + \frac{C}{(s-3j)} = \frac{9}{s\,(s+3j)(s-3j)}$

$= A(s+3j)(s-3j) + B(s)(s-3j) + C(s)(s+3j) = 9$

- $s = 0$

$A(3j)(-3j) = 9 \qquad A = 1$

- $s = -3j$

$B(-3j)(-3j-3j) = 9 \qquad B = -1/2$

- $s = 3j$

$C(3j)(3j+3j) = 9 \qquad C = -1/2$

→ $G(s) = \frac{1}{s} - \frac{0.5}{(s+3j)} - \frac{0.5}{(s-3j)}$

$\downarrow \mathcal{L}^{-1}$

- $\frac{1}{s+\alpha-\beta j} = e^{-\alpha t}\cos(\beta t) + j e^{-\alpha t}\operatorname{sen}(\beta t)$

$= 1 - 0{,}5(\cos(3t) + j\operatorname{sen}(3t)) - 0{,}5(\cos(-3t) \operatorname{sen}(-3t))$

- $\cos(\alpha) = \cos(-\alpha) \quad \operatorname{sen}(-\alpha) = -\operatorname{sen}(\alpha)$

→ $y(t) = 1 - \cos(3t)$