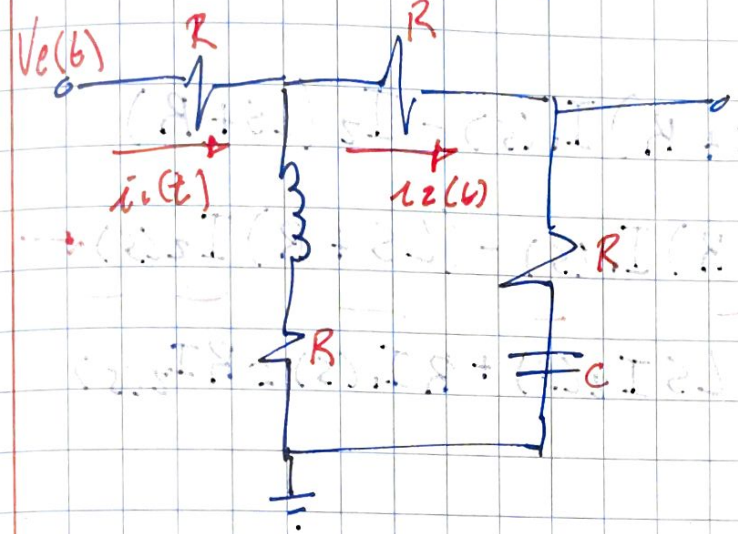


$$V_e(t) = R\,i_1(t) + L\frac{d[i_1(t) - i_2(t)]}{dt} + R[i_1(t) - i_2(t)]$$

$$L\frac{d[i_1(t) - i_2(t)]}{dt} + R[i_1(t) - i_2(t)] = 2R\,i_2(t) +$$

$$\frac{1}{C}\int i_2(t)\,dt$$

$$V_s(t) = \frac{1}{C}\int i_2(t)\,dt + R\,i_2(t)$$

Transformada de Laplace

$$V_e(s) = R\,I_1(s) + LS[I_1(s) - I_2(s)] + R[I_1(s) - I_2(s)]$$

$$LS[I_1(s) - I_2(s)] + R[I_1(s) + I_2(s)] = 2R\,I_2(s) + \frac{I_2(s)}{CS}$$

$$V_s(s) = R\,I_2(s) + \frac{I_2(s)}{CS}$$

Algebraico

$$V_E(s) = (R + Ls + R) I_1(s) - I_2 (Ls + R)$$

$$= (Ls + 2R) I_1(s) - (Ls + R) I_2(s)$$

$$Ls I_1(s) - Ls I_2(s) + R I_1(s) - R I_2(s)$$

$$+ \frac{I_2(s)}{Cs}$$

$$Ls I_1(s) + R I_1(s) = 3R I_2(s) + Ls(I_2) + \frac{I_2(s)}{Cs}$$

$$(Ls + R) I_1(s) = (3R + Ls + \frac{1}{Cs}) I_2(s)$$

$$I_1(s) = \frac{3CRs + CLs^2 + 1}{Cs(Ls + R)} * I_2(s)$$

$$= \frac{CLs^2 + 3CRs + 1}{Cs(Ls + R)} * I_2(s)$$

num = [(4.7E-6)(3.3e-3)(3.3E3), (4.7E-6)(3.3E3)^2

+ 3.3E-3, 3.3E3

$$V_E(s) = \frac{(Ls+2R)(CLs^2+3CRs+1)\cancel{I_2(s)}}{Cs(Ls+R)} (Ls+R)\, I_2(s)$$

$$= \left[\frac{(Ls+2R)(CLs^2+3CRs+1) - Cs(Ls+R)(Ls+R)}{Cs(Ls+R)}\right] I_2(s)$$

$$= \Big[\underline{CL^2s^3} + 3CLRs^2 + Ls + \cancel{2CLRs^2} + \cancel{6}\,5\,CR^2s^2 + 2R - \underline{CL^2s^3}$$

$$- \cancel{2CLRs^2} - \cancel{CR^2s}\Big]$$

$$V_E(s) = \frac{3CLRs^2 + (5CR^2s^2 + L)s + 2R}{Cs(Ls+R)}\, I_2(s)$$

$$\frac{V_S(s)}{V_E(s)} = \frac{\dfrac{CRs+1}{Cs}\cancel{I_2(s)}}{\dfrac{3CLRs^2 + (5CR^2\cancel{sR} + L)s + 2R}{Cs(Ls+R)}\cancel{I_2(s)}}$$

$$(CRs+1)(Ls+R) = CLRs^2 + CR^2s + Ls + R$$

$$= \frac{CLRs^2 + (CR^2 + L)s + R}{3CLRs^2 + (5CR^2+1)s + 2R}$$

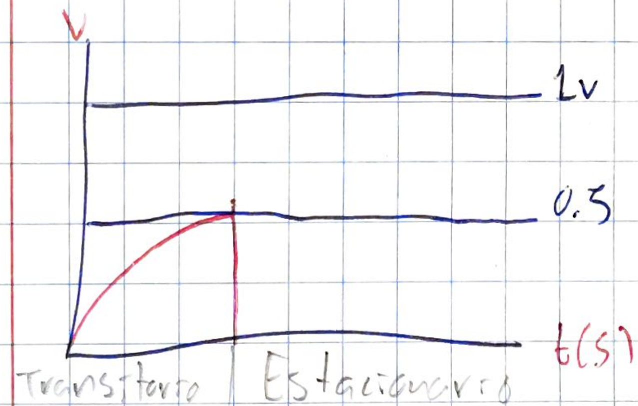
Calcular los polos de la funcion de transferencia

L = np.roots(den)

fprint = Las raices son {L[0]} y {L[1]}

$\lambda = -1{,}151{,}960.754 \quad \lambda_2 = -0.181$

Respuestas estable sobre amortiguada



$Ve(t) = 1v$

$Ve(s) = \frac{1}{s}$

Error

$$e(s) = \lim_{s \to 0} s\,Ve(s)\left[1 - \frac{Vs(s)}{Ve(s)}\right]$$

$$= \lim_{s \to 0} s \cdot \frac{1}{s}\left[1 - \frac{CRs^2R + (CR^2+L)s + R}{3CLRs^2 + (5CR^2+L)s + 2R}\right]$$

$$= \frac{R}{2R}$$

$$e(s) = \frac{1}{2}$$