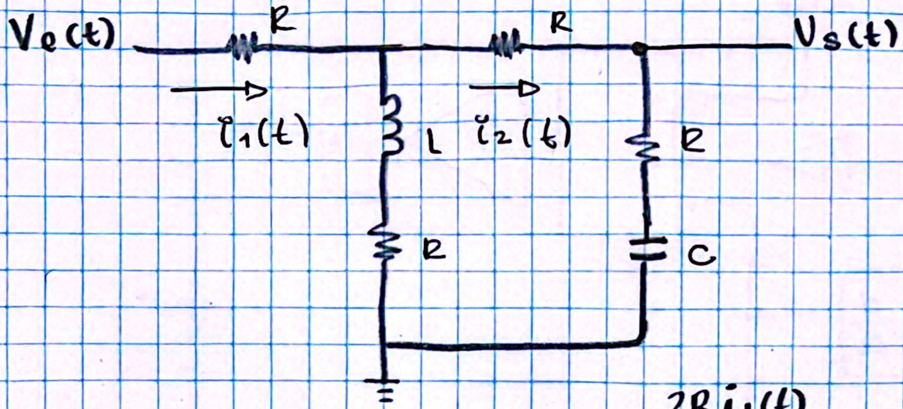


$2Ri_1(t)$

$Ri_1(t) - Ri_2(t)$

Ecuaciones principales

$$Ve(t) = Ri_1(t) + L\frac{d[i_1(t) - i_2(t)]}{dt} + R[i_1(t) - i_2(t)]$$

$$L\frac{d[i_1(t) - i_2(t)]}{dt} + \underbrace{R[i_1(t) - i_2(t)]}_{Ri_1(t) - Ri_2(t)} = \underbrace{Ri_2(t) + Ri_2(t)}_{2Ri_2(t)} + \frac{1}{C}\int i_2(t)\,dt$$

$3Ri_2(t)$

$$Vs(t) = Ri_2(t) + \frac{1}{C}\int i_2(t)\,dt$$ esta se queda así.

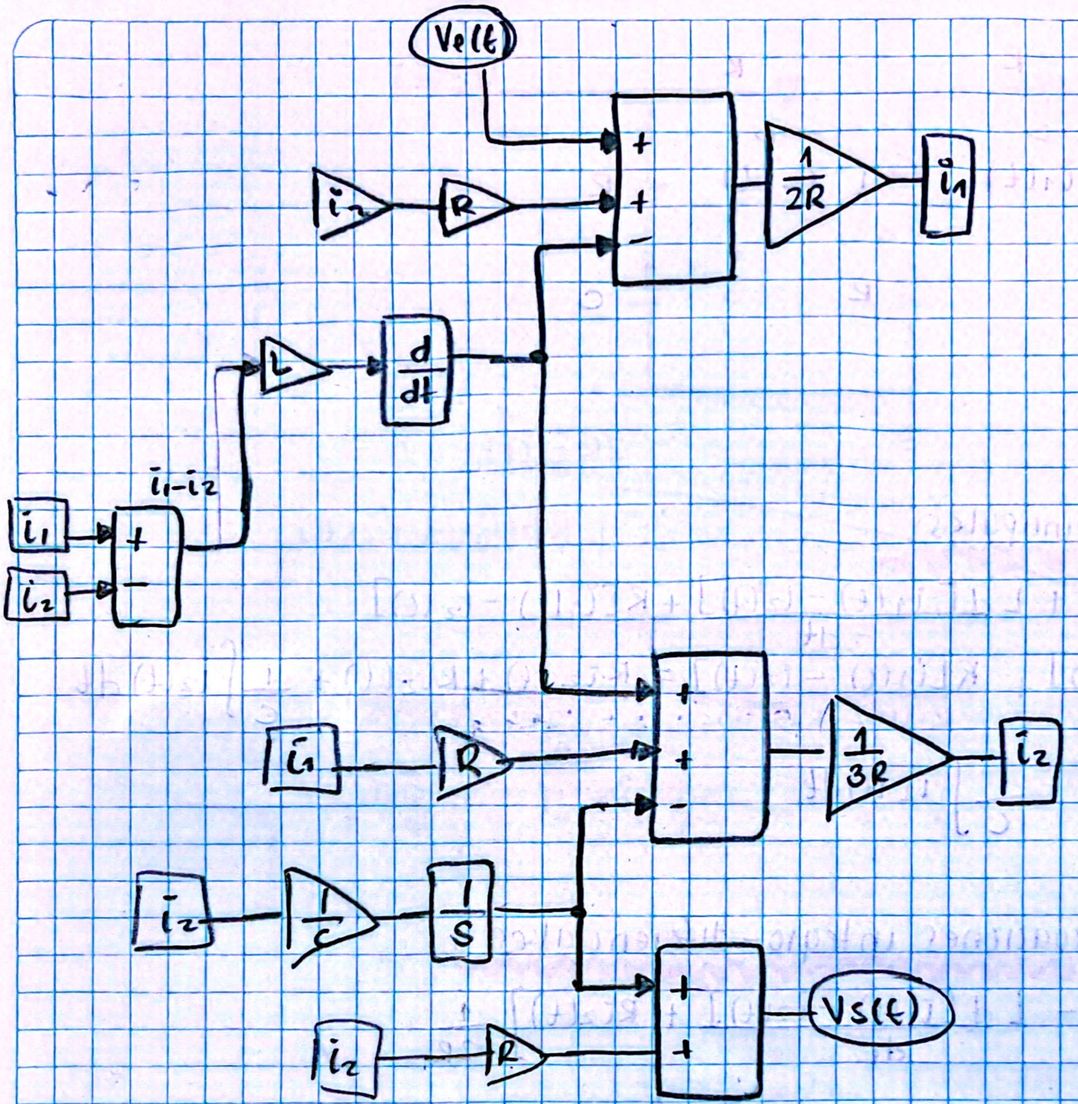
Modelo de ecuaciones integro-diferenciales.

$$i_1(t) = \left[Ve(t) - L\frac{d[i_1(t) - i_2(t)]}{dt} + Ri_2(t)\right]\frac{1}{2R}$$

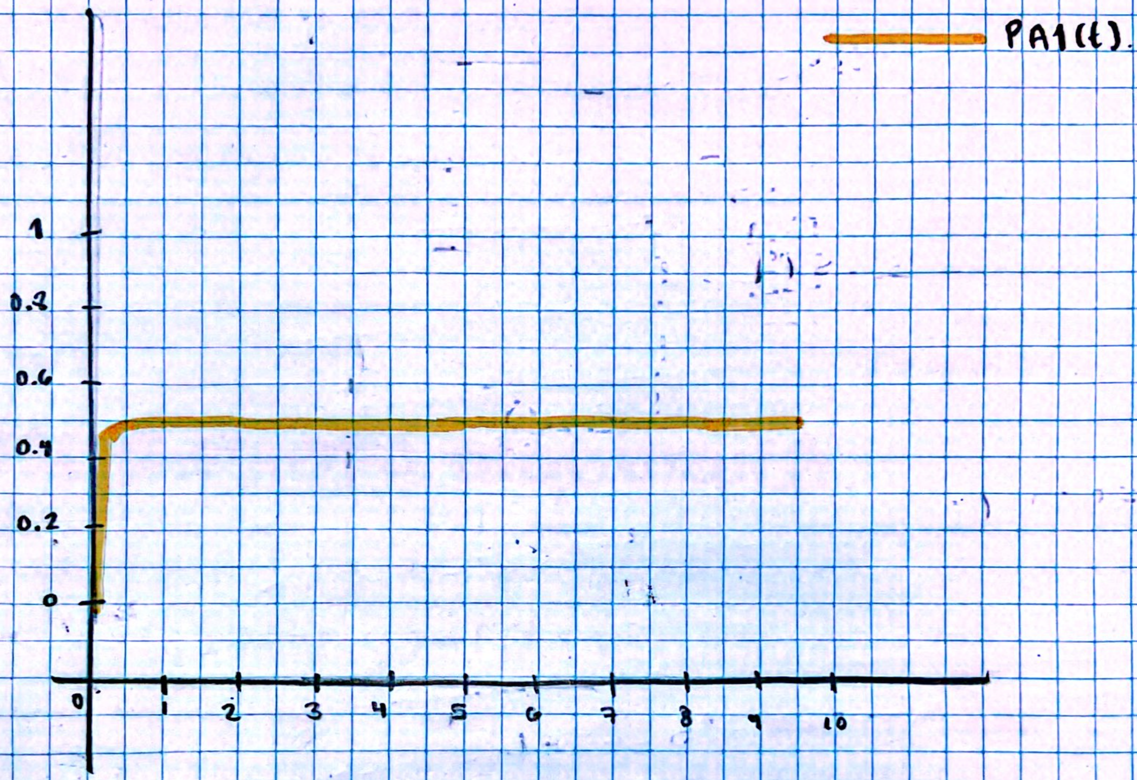
$$i_2(t) = \left[L\frac{d[i_1(t) - i_2(t)]}{dt} + Ri_1(t) - \frac{1}{C}\int i_2(t)\,dt\right]\frac{1}{3R}$$

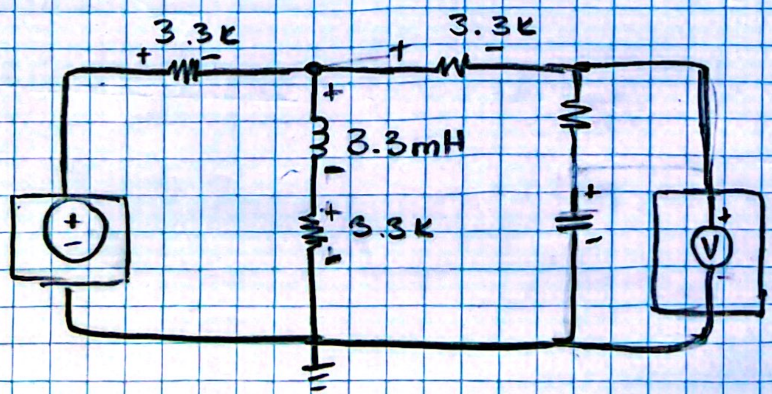
$$Vs(t) = Ri_2(t) + \frac{1}{C}\int i_2(t)\,dt$$

23 SEPTIEMBRE 2025



23 SEPTIEMBRE 2025





26 SEPTIEMBRE 2025.

Transformada de Laplace

$$LSI_1(S) - LSI_2(S) + RI_1(S) - RI_2(S)$$

$$Ve(s) = RI_1(S) + LS[I_1(S) - I_2(S)] + R[I_1(S) - I_2(S)]$$

$$LS[I_1(S) - I_2(S)] + R[I_1(S) - I_2(S)] = RI_2(S) + RI_2(S) + \frac{I_2(S)}{CS}$$

$$Vs(S) = RI_2(S) + \frac{I_2(S)}{CS} = \frac{CRS+1}{CS} I_2(S)$$

$$\frac{Vs(S)}{Ve(S)} = \frac{?\ I_2(S)}{?\ I_2(S)}$$

Nota: No debe haber términos negativos!

Procedimiento algebraico.

$$Ve(S) = (R + LS + R) I_1(S) - (LS + R) I_2(S)$$

$$= (LS + 2R) I_1(S) - (LS + R) I_2(S)$$

$$LSI_1(S) - LSI_2(S) + RI_1(S) - RI_2(S) = 2RI_2(S) + \frac{I_2(S)}{CS}$$

$$LSI_1(S) + RI_1(S) = 3RI_2(S) + LSI_2(S) + \frac{I_2(S)}{CS}$$

$$(LS + R) I_1(S) = \left(3R + LS + \frac{1}{CS}\right) I_2(S)$$

$$I_1(S) = \frac{3CRS + CLS^2 + 1}{CS(LS+R)} I_2(S) = \frac{CLS^2 + 3CRS + 1}{CS(LS+R)} I_2(S)$$

$$Ve(S) = \frac{(LS+2R)(CLS^2+3CRS+1)}{CS(LS+R)} I_2(S) - (LS+R) I_2(S)$$

$$= \left[\frac{(LS+2R)(CLS^2+3CRS+1) - \overbrace{CS(LS+R)(LS+R)}^{LS^2+2LRS+R^2}}{CS(LS+R)}\right] I_2(S)$$

26 SEPTIEMBRE 2026

$R = 3.3K$ $L = 3.3mH$
$C = 4.7\mu F$

① $C\cancel{L^2}S^3 + 3CLRS^2 + LS + \cancel{2CLRS^2} + 6CR^2S + 2R$

② $-C\cancel{L^2}S^3 - \cancel{2CLRS^2} - CR^2S$ $\quad 5CR^2S$

$$Ve(S) = \frac{3CLRS^2 + (5CR^2 + L)S + 2R}{CS(LS+R)}$$

0.9
setting time

$$Vs(S) = \frac{\frac{CRS+1}{\cancel{CS}} I_2\cancel{(S)}}{\frac{3CLRS^2 + (5CR^2+L)S + 2R}{\cancel{CS}(LS+R)} I_2\cancel{(S)}}$$

$$(CRS+1)(LS+R) = CLRS^2 + CR^2S + LS + R$$

$$\boxed{\frac{Vs(S)}{Ve(S)} = \frac{CLRS^2 + (CR^2+L)S + R}{3CLRS^2 + (5CR^2+L)S + 2R}}$$

02 octubre 2025

Estabilidad en lazo abierto.

- Calcular los polos de la función de transferencia

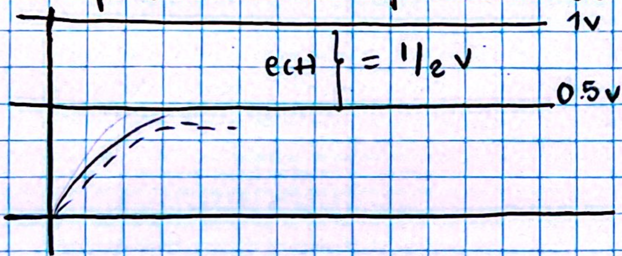
$\lambda_1 = -1666662.3682979832$

$\lambda_2 = -25.789879536501907$

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

```
den = [3*C*L*R, 5*C*R**2 +L, 2*R]
L = np.roots(den)
→ fprint: las raíces son {L[0]} y {L[1]}
```

El sistema presenta una respuesta estable y sobreamortiguada



$V_e(t) = 1V$

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

Error en estado estacionario

$$e(s) = \lim sV_e(s)\left[1 - \frac{V_s(s)}{V_e(s)}\right]$$

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

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

$$e(t) = \frac{1}{2} V$$