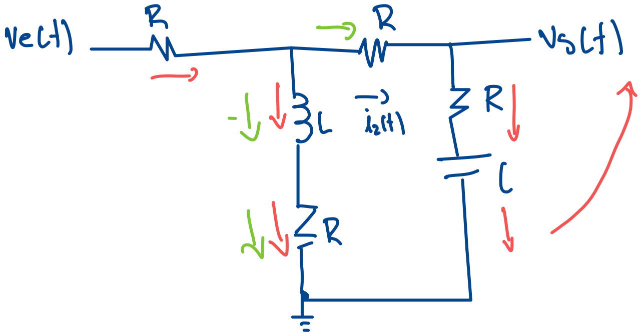


Práctica 7

26-09-25

Ecuaciones Principales

$$Ve(t) = Ri_1(t) + Ld[i_1(t)-i_2(t)] + R[i_1(t)-i_2(t)]$$

$2Ri_1(t)$

$Ri_1(t) - Ri_2(t)$

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

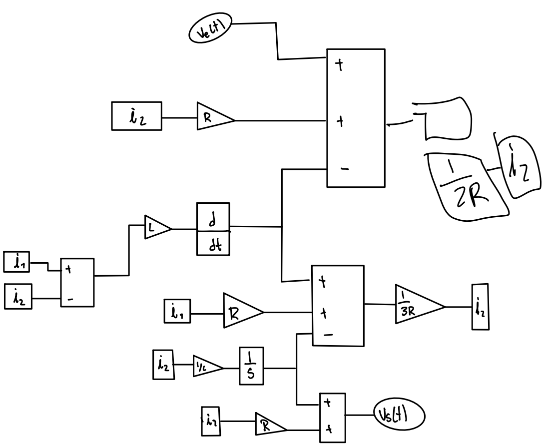
$$vs(t) = Ri_2(t) + \frac{1}{C}\int i_2(t)\,dt$$

Modelo de ecuaciones Integro-diferenciales

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

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

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



Transformada de La place

Practica 1

$$\frac{V_s(S)}{V_e(S)} = \frac{?}{?}$$

Nota: No debe de haber términos negativos

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

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

$$V_s(s) = RI_2(s) + \frac{I_2(S)}{CS}$$

Procedimiento algebraico

$$V_e(S) = (R + LS + R)I_1(s) - (LS + R)I_2(s)$$

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

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

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

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

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

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

$L^2S^2 + 2LRS + R^2$

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

$\cancel{CL^2S^3} + 3CLRS^2 + LS + \cancel{2CLRS^2} + 6CR^2S + 2R$

$\cancel{CL^2S^3} + \cancel{2CLRS^2} - CR^2S$ $\quad 5CR^2S$

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

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

$(CRS+1)(LS+R)$

$R = 3.3\,K\Omega = 9\,K\Omega$

$C = 4.7\,\mu F$ $\quad L = 3.3\,mH$

$22\,\mu F$ $\quad 33\,mH$

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

num = [(4.7E-6) * (3.3E-3) * (3.3E3), (4.7E-6) * (3.3E) ** 2 + 3.3 E-3, 3.3E3

2-oct-2025

Estabilidad en lazo abierto

· calcular los polos de la función de transferencia

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

den = [3*C*L*R, 5*C*R**2 + L, 2*R]

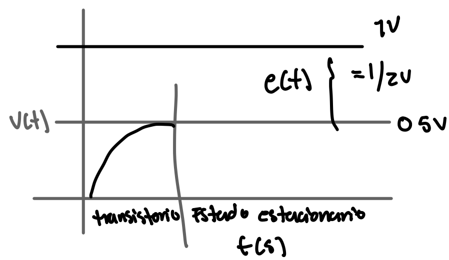
L = np. roots (den)

-> F. print

$\lambda_1 = -454545.117$

$\lambda_2 = -2.020$

El sistema presenta una respuesta estable y sobreamortiguada



Error en el estado estacionario

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

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

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

$V_e(t) = 1V$

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

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