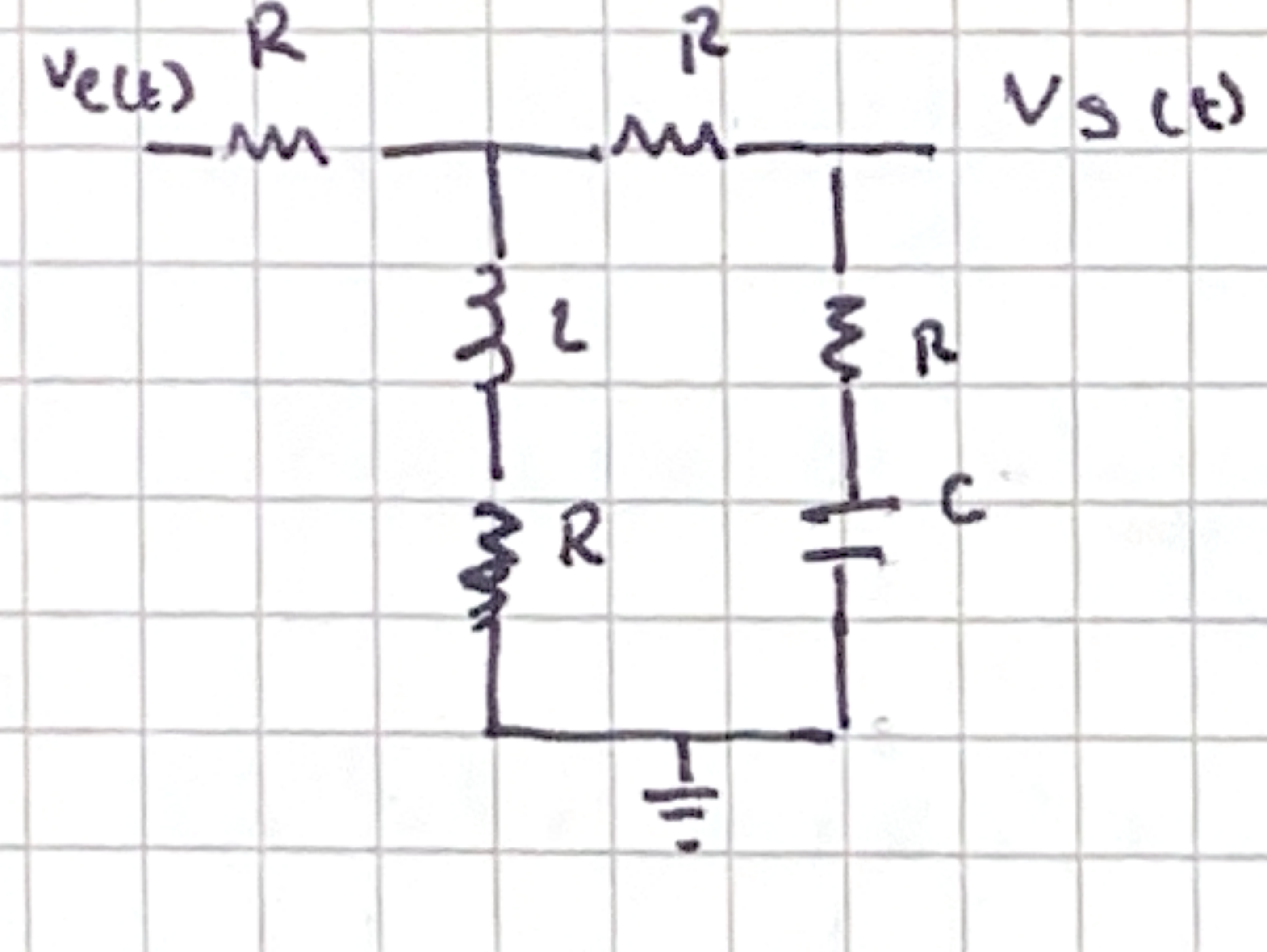

No debe haber términos negativos (inestabilidad)

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

$$\frac{Ld[i_1(t) - i_2(t)]}{dt} + R[i_1(t) - i_2(t)] =$$

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

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

Transformada de Laplace

$$Ve(s) = RI_1(s) + LS[I_1(s) - i_2(s)] + R[I_1(s) - i_2(s)]$$

$$LS[i_1(s) - i_2(s)] + R[I_1(s) - i_2(s)] = RI_2(s) + Ri_2(s) + \frac{I_2(s)}{CS}$$

$$V_s(s) = Ri_2(s) + \frac{I_2(s)}{CS} = \frac{CRS + 1}{CS} I_2(s)$$

Procedimiento algebraico

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

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

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

$$(LS + R) I_1(s) = (3R + LS + \frac{1}{CS}) i_2(s)$$

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

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

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

$$CL^2S^3 + 3CLRS^2 + LS + 2CLRS^2 + 6CR^2S + 2R$$

$$-CL^2S^3 - 2CLRS^2 - CR^2S$$

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

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

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

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

Estabilidad en lazo abierto

Martes y Viernes

Calcular los polos de la función de transferencia

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

68=5.91657

den = np. roots (den)

$\lambda_1 = -3666662.368$

$\lambda_2 = -25.290$

Respuesta estable y sobreamortiguada

Error en estado estacionario

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

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

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