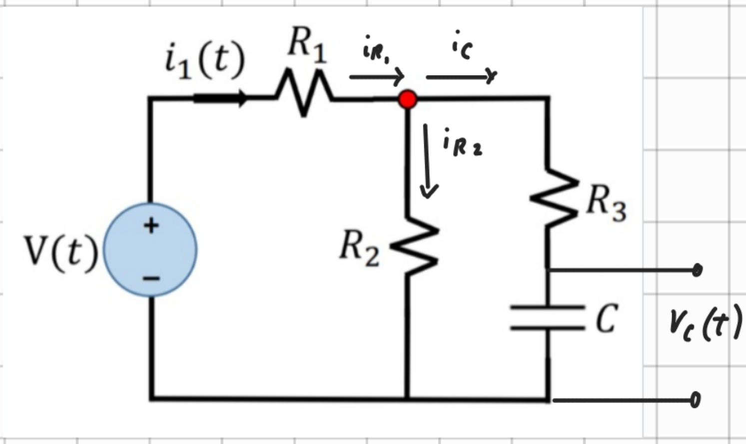

KVL

1) $V(t) = V_{R_1} + V_{R_3} + V_C(t)$

$V_{R_1} + R_3 i_C(t) + V_C(t)$

$R_1 i_{R_1} + R_3 C \frac{d}{dt} V_C(t) + V_C(t)$

KIL

2) $i_{R_1} = i_C + i_{R_2}$

3) $V_{R_2} = V_{R_3} + V_C(t)$

$i_{R_2} = \frac{V_{R_2}}{R_2}$

$\therefore i_{R_2} = \frac{V_{R_3}}{R_2} + \frac{V_C(t)}{R_2}$

$\hookrightarrow \frac{R_3}{R_2} C \frac{d}{dt} V_C(t) + \frac{V_C(t)}{R_2}$

4) $i_{R_1} = i_C + i_{R_2}$

$C \frac{d}{dt} V_C(t)$

$\frac{R_3}{R_2} C \frac{d}{dt} V_C(t) + \frac{V_C(t)}{R_2}$

$i_{R_1} = C \frac{d}{dt} V_C(t) + \frac{R_3}{R_2} C \frac{d}{dt} V_C(t) + \frac{V_C(t)}{R_2}$

5) Sustituimos (E.C. 4) i_{R_1} en la (E.C. 1)

$V(t) = R_1 \left(C \frac{d}{dt} V_C(t) + \frac{R_3}{R_2} C \frac{d}{dt} V_C(t) + \frac{V_C(t)}{R_2} \right) + R_3 C \frac{d}{dt} V_C(t) + V_C(t)$

6) Aplicar Laplace en $V(t)$ (E.C. 5)

$$V(t) = R_1\left(C\frac{d}{dt}V_c(t) + \frac{R_3}{R_2}C\frac{d}{dt}V_c(t) + \frac{V_c(t)}{R_2}\right) + R_3 C\frac{d}{dt}V_c(t) + V_c(t)$$

$$\mathcal{L}\{V(t)\} = R_1 C\,\mathcal{L}\left\{\frac{d}{dt}V_c(t)\right\} + \frac{R_1R_3C}{R_2}\mathcal{L}\left\{\frac{d}{dt}V_c(t)\right\} + \frac{R_1}{R_2}\mathcal{L}\{V_c(t)\} + R_3C\,\mathcal{L}\left\{\frac{d}{dt}V_c(t)\right\} + \mathcal{L}\{V_c(t)\}$$

$$V(s) = R_1Cs\,V_c(s) + \frac{R_1R_3C}{R_2}s\,V_c(s) + \frac{R_1}{R_2}V_c(s) + R_3Cs\,V_c(s) + V_c(s)$$

$$V(s) = V_c(s)\left(R_1Cs + \frac{R_1R_3C}{R_2}s + \frac{R_1}{R_2} + R_3Cs + 1\right)$$

$$\boxed{\frac{V_c(s)}{V(s)} = \frac{1}{\left(R_1Cs + \frac{R_1R_3C}{R_2}s + \frac{R_1}{R_2} + R_3Cs + 1\right)}}$$

7) Simplificar

$$\frac{V_c(s)}{V(s)} = \frac{1}{\left(R_1Cs + \frac{R_1R_3C}{R_2}s + \frac{R_1}{R_2} + R_3Cs + 1\right)}$$

$$R_1Cs + \frac{R_1R_3C}{R_2}s + \frac{R_1}{R_2} + R_3Cs + 1$$

$$\frac{R_2R_1Cs}{R_2} + \frac{R_1R_3Cs}{R_2} + \frac{R_2R_3Cs}{R_2} + \frac{R_1}{R_2} + \frac{R_2}{R_2}$$

$$\left(\frac{R_2R_1C + R_1R_3C + R_2R_3C}{R_2}\right)s + \frac{R1 + R_2}{R_2}$$

$$\left[\left(\frac{R_2R_1C + R_1R_3C + R_2R_3C}{R_2}\right)s + \frac{R1 + R_2}{R_2}\right] \div \left[\frac{R1 + R_2}{R_2}\right]$$

$$\frac{(R_2R_1C + R_1R_3C + R_2R_3C)}{(R_1 + R_2)}s + 1$$

$$\boxed{\frac{V_c(s)}{V(s)} = \frac{\frac{R_2}{R_1 + R_2}}{\frac{(R_2R_1C + R_1R_3C + R_2R_3C)}{(R_1 + R_2)}s + 1}}$$

$$R_1 = R_2 = R_3 = 100\ K\Omega = 100 \times 10^3\ \Omega$$
$$C = 0.22\ \mu F = 2.2 \times 10^{-7}\ F$$

$$\frac{100 \times 10^3}{100 \times 10^3 + 100 \times 10^3} = \frac{1}{2}$$

$$\frac{V_c(s)}{V(s)} = \frac{\frac{R_2}{R_1 + R_2}}{\frac{(R_2 R_1 C + R_1 R_3 C + R_2 R_3 C)}{(R_1 + R_2)} s + 1}$$

$$\frac{(100 \times 10^3 \cdot 100 \times 10^3 \cdot 2.2 \times 10^{-7})(100 \times 10^3 \cdot 100 \times 10^3 \cdot 2.2 \times 10^{-7})(100 \times 10^3 \cdot 100 \times 10^3 \cdot 2.2 \times 10^{-7})}{(100 \times 10^3 + 100 \times 10^3)} = 0.033$$

$$\frac{33}{1000} s + 1 \longrightarrow s = -\frac{1}{0.033} = -30.\frac{10}{33}$$

$$\boxed{\frac{V_c(s)}{V(s)} = \frac{\frac{1}{2}}{\frac{33}{1000} s + 1}}$$

$$\tau = \frac{33}{1000}$$
$$K = \frac{1}{2}$$
Polo $s = -33\frac{10}{33} = -\frac{1000}{33}$ estable