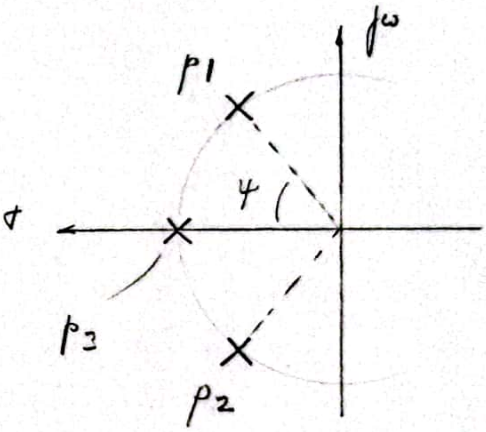
$$|T(j\omega)|^2 = \frac{1}{1+\xi^2\left(\frac{\omega}{\Omega\omega}\right)^{2n}} = \frac{1}{1+\frac{1}{\xi^{-2}}\left(\frac{\omega}{\Omega\omega}\right)^{2n}} = \frac{1}{1+\left(\frac{\omega}{\xi^{-1/n}\,\Omega\omega}\right)^{2n}}$$

$$= \frac{1}{1+\left(\frac{\omega}{\xi^{-1/n}\,\omega_p}\right)^{2n}}$$

$$\omega_B = \xi^{-1/n}\,\omega_p = \xi^{-1/n}\cdot 2\pi\cdot f_p = 0{,}5088^{-1/3}\cdot 2\pi\cdot 1500\,Hz = 11{,}8056\,k\,\frac{rad}{s}$$

$$T(s) = \frac{d}{(s+a)(s^2+b\cdot s+c)}$$



Como en continua $|T(s)|=1$, adoptamos $a=c=d=1$

$$T(s) = \frac{1}{(s+1)(s^2+\underbrace{b}_{2\cos\psi \,=\, 2\cos\pi/3 \,=\, 1}\cdot s+1)} = \frac{1}{(s+1)(s^2+s+1)}$$

Con calculadora o en Python, numpy.roots(den) con den los coef's del denominador:

$p_1 = -0{,}5 + j\sqrt{3}/2$

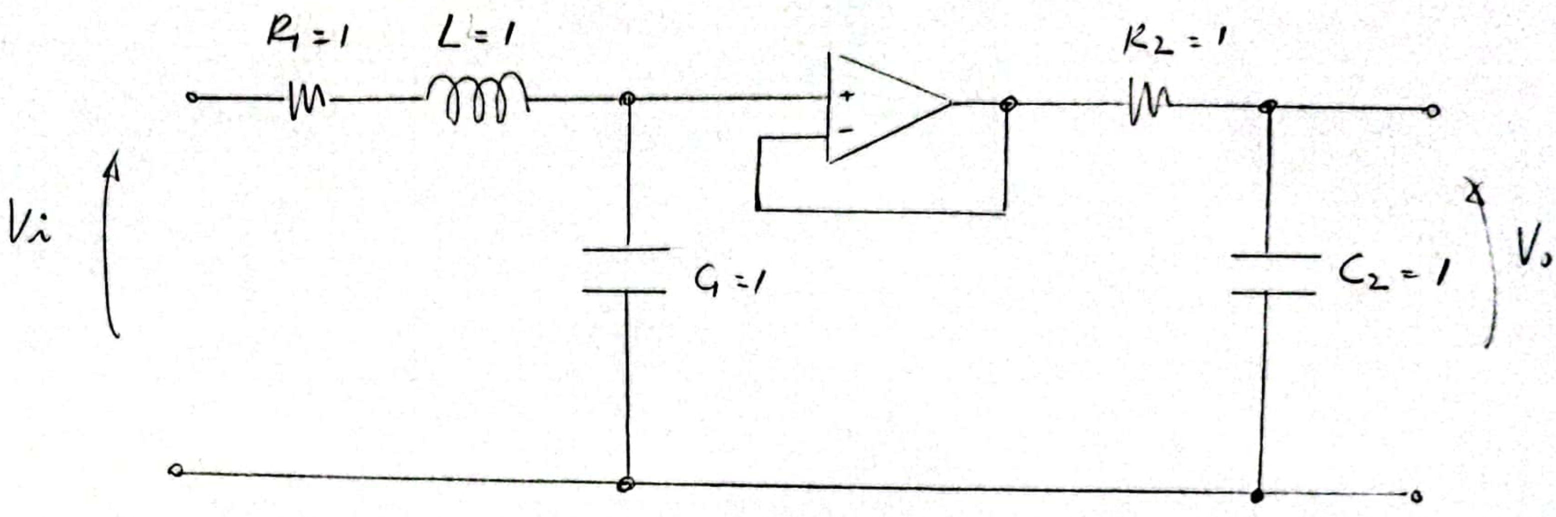
$p_2 = -0{,}5 - j\sqrt{3}/2$

$p_3 = -1$

Los resultados coinciden con la tabla 6.1 de la página 260

Escaneado con CamScanner

del Schaumann: Pole Location for Butterworth responses



$\omega_0^2 = 1$; $\omega_0 = 1$

$\frac{\omega_0}{q} = \frac{R_1}{L}$; $L = \frac{R_1}{\omega_0} q$; Tomando $\Omega_Z = R_1$, $L = \frac{q}{\omega_0} = q = 1$

$\omega_0 = \frac{1}{LC_1}$; $C_1 = \frac{1}{\omega_0 L}$; $C_1 = \frac{1}{\omega_0 \frac{q}{\omega_0}} = \frac{1}{q} = 1$

$\omega_0 = \frac{1}{R_2 C_2}$; $\omega_0 = 1$; $\Omega_Z = R_2$; $C_2 = 1$

Tomando $C_1 = C_2 = 100nF$:

$$C_{1n} = C_1 \cdot \Omega_Z \cdot \underbrace{\Omega_\omega}_{\Omega_B} = C_1 \Omega_Z \Omega_B \rightarrow \Omega_Z = \frac{C_{1n}}{C_1 \Omega_B} =$$

$$= \frac{1}{100nF \cdot 11{,}8056\, k \frac{rad}{s}}$$

$\Omega_z = 847{,}0556\ \Omega$; $R_1 = \Omega_z = 847{,}0556\ \Omega$

$$L_n = \frac{L \cdot \Omega_w}{\Omega_z} \ ; \quad L = \frac{L_n \Omega_z}{\Omega_w} = \frac{847{,}0556\ \Omega}{11{,}8056\,K\ \frac{rad}{s}} = 71{,}7503\ mHy$$

Ω_B

$$C_{2_n} = C_2\, \Omega_z\, \Omega_w \longrightarrow \Omega_z = \frac{C_{2n}}{C_2\, \Omega_w} = \frac{1}{100nF \cdot 11{,}8056\,K\ \frac{rad}{s}}$$

$$= 847{,}0556\ \Omega$$

$R_2 = \Omega_z = 847{,}0556\ \Omega$

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