HOJA Nº

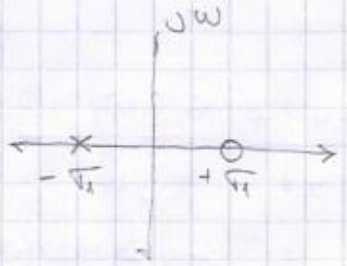
FECHA

TAREA SEMANA 4

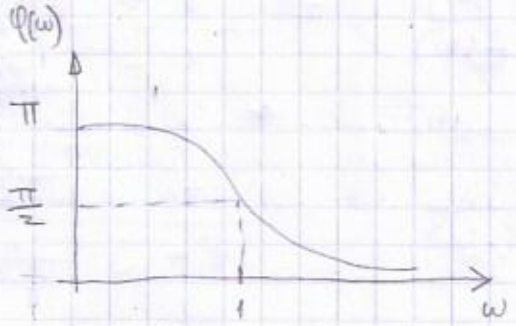
EJERCICIO 1.

a) $T(\$) = K \dfrac{\$ - \frac{1}{\tau_1}}{\$ + \frac{1}{\tau_1}}$

a.1)



a.2)



a.3) $\varphi(\omega) = \pi - 2 \arctg(\omega/\tau_1)$

$\tau(\omega) = -\dfrac{d\varphi(\omega)}{d\omega} = -\dfrac{d}{d\omega}\left[\pi - 2\arctg\left(\dfrac{\omega}{\tau_1}\right)\right]$

$\left[\tau(\omega) = \dfrac{2\tau_1}{1+\omega^2\tau_1^2}\right]$

b) $\varphi(\omega=1) = 15° \rightarrow 15° = \pi - 2\arctg(\omega RC)$ ($\omega=1$, $C=1$)

$\left(\dfrac{15° - 180°}{-2}\right) = \arctg(R)$

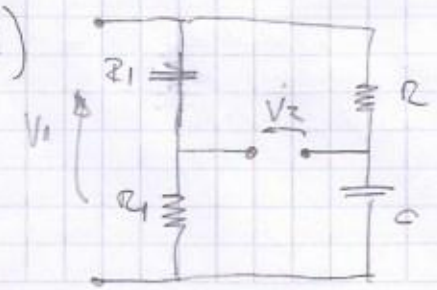
$\text{TAN}(82{,}5) = R$

$\left[R = 7{,}6\right]$

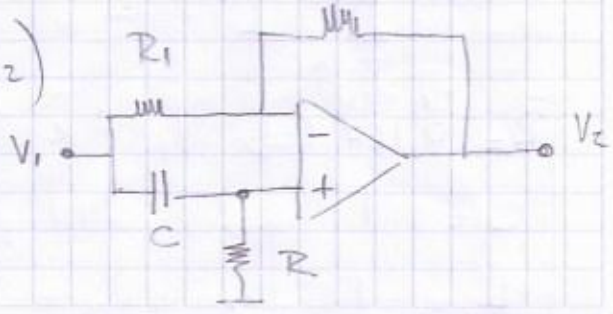
$R = 7{,}6$; $C=1$

$R_1 = R_2 = 1$

b.1)



b.2)

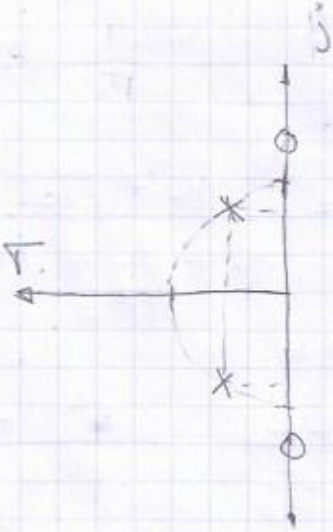


NOTA

Ejercicio 3

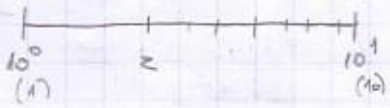
a.1) Notch Pasabajos $(\omega_N^2 \to \omega_p^2,\ K)$

$$T_{LPN} = \frac{\$^2 + K^2 \omega_{pn}^2}{\$^2 + \$\frac{\omega_p}{Q_p} + \omega_p^2} \Big\}\ \omega_m^2$$



$\omega_p = 1$ $\quad Q_p = \frac{\sqrt{2}}{2}$ Tipo Butter.

$\omega_N = 1$



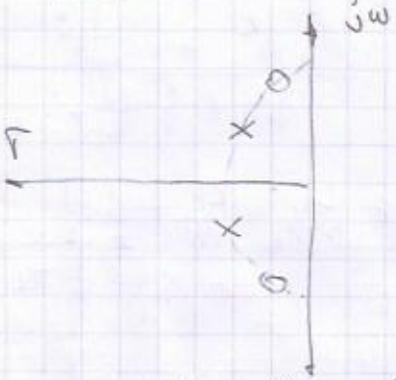
$K = 2$ $\quad (N_{LP})$

$$P_{1,2} = -\frac{\sqrt{2}}{2} \pm j\frac{\sqrt{2}}{2} \Big\} \text{ Roots}$$

$$z_{1,2} = \pm 2$$

a.2) Elimina Banda

$$T_{BE} = \frac{\$^2 + \$^2 \frac{\omega_N}{Q_N} + \omega_N^2}{\$^2 + \$\frac{\omega_p}{Q_p} + \omega_p^2}$$



$\omega_p = 1$ $\quad Q_p = \frac{\sqrt{2}}{2}$ Tipo Butter.

$$\Rightarrow \omega_p = \omega_z = 1$$

$$P_{1,2} = -\sqrt{2}/2 \pm j\sqrt{2}/2 \Big\} \text{ Roots}$$

$$z_{1,2} = -\frac{\sqrt{2}}{4} \pm j\frac{\sqrt{14}}{4}$$

$|T_{BE}(1)| = -6\,dB$

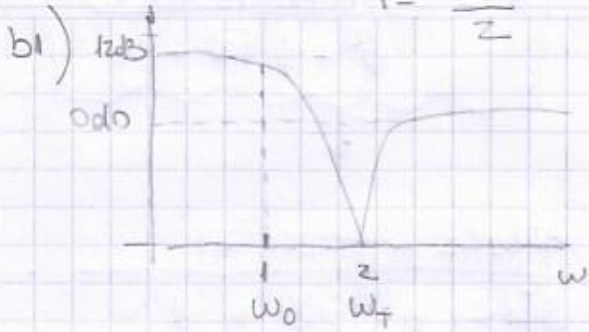
$$T_{BE} = \frac{\$^2 + \$\frac{1}{Q_z} + 1}{\$^2 + \$\sqrt{2} + 1} \overset{j\omega}{=} \frac{(1-\omega^2) + j\omega\frac{1}{Q_z}}{(1-\omega^2) + j\omega\sqrt{2}}$$

$$|T_{BE}| = \frac{\sqrt{(1-\omega^2)^2 + \frac{\omega^2}{Q_z^2}}}{\sqrt{(1-\omega^2)^2 + 2\omega^2}}$$

$-6dB \to$

$$0{,}5 = \frac{1}{Q_z\sqrt{2}} \longrightarrow \boxed{Q_z = \sqrt{2}}$$

$Q = \frac{\sqrt{2}}{2}$ UTILIZO ACK-MOSS

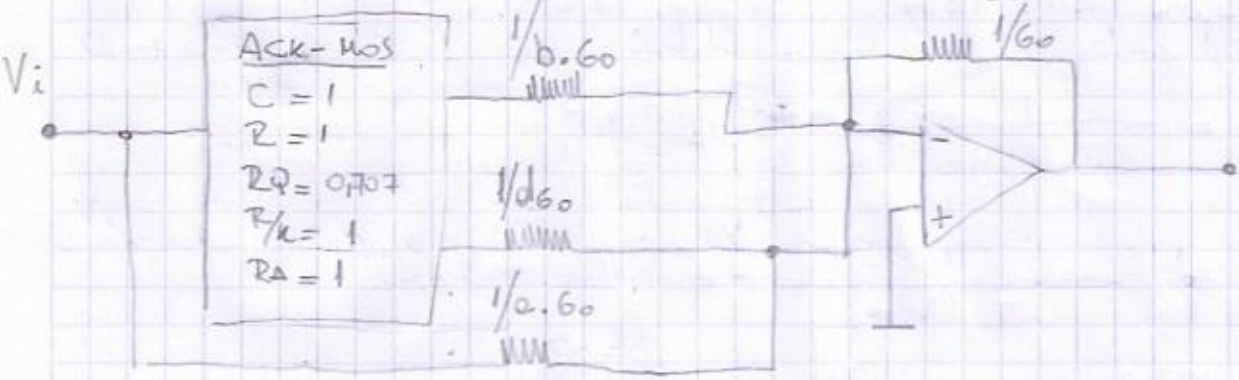
b) 

$$\frac{V_o}{V_i} = \frac{a\$^2 + w_0^2 [a + dk]}{\$^2 + \$\frac{w_0}{Q} + w_0^2}$$

$\rightarrow \$\frac{w_0}{Q} = 0 \rightarrow a - bkQ = 0$

- $a = 10^{0/20} = 1$ GANANCIA $\rightarrow \infty$
- $a + dk = 10^{12/20} \Rightarrow dk = 4 - 1$ con $k=1 \rightarrow d = 3$
- con $C = 1 \rightarrow R = \frac{1}{w_0 C} \rightarrow R = 1$; $\frac{R}{K} = 1$
- $Q \cdot R = \frac{\sqrt{2}}{2} \cdot 1 = 0,707$
- $b = \frac{a}{K \cdot Q} = \frac{1}{1 \frac{\sqrt{2}}{2}} = 1,41$
- SUPONGO $[R_0 = 1] \rightarrow G_0 = 1$

$\left[a G_0 = \frac{1}{1.1}\right]$; $\left[b G_0 = \frac{1}{2.1} = 0,5\right]$; $\left[d = \frac{1}{3.1} = 0,333\right]$



c.1) DESNORMALIZO $\Omega w = 2\pi \cdot 1kHz$; PROPONGO $\Omega_z = 1k\Omega$

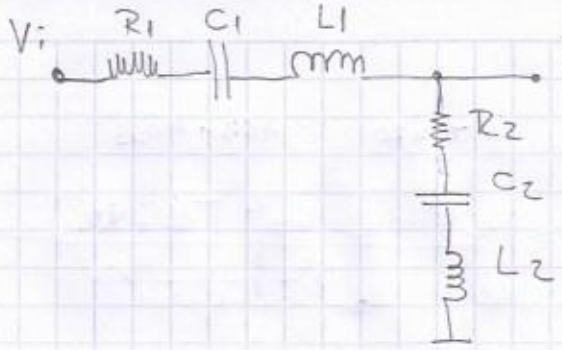
$C = \frac{1}{2\pi \, 1kHz \, 1k\Omega} = 160\,pF$

$R = \frac{R}{K} = RA = \frac{1}{G_0} = \frac{1}{2G_0} = 1k\Omega$

$RQ = 707\,\Omega$;

$\frac{1}{b.G_0} = 500\,\Omega$ $\frac{1}{d.G_0} = 333\,\Omega$

b.2)



$$T = \frac{\$^2 + \$\sqrt{2}/2 + 1}{\$^2 + \$\sqrt{2} + 1}$$

$$\frac{V_o}{V_i} = \frac{R_2 + \$L_2 + \frac{1}{\$C_2}}{R_1 + \$L_1 + \frac{1}{\$C_1}} = \frac{\$^2 L_2 C_2 + \$ C_2 R_2 + 1}{\$^2 L_1 C_1 + \$ C_1 R_1 + 1} \cdot \frac{\$C_1}{\$C_2}$$

$$\frac{V_o}{V_i} = \frac{L_2 C_2}{L_1 C_1} \cdot \frac{C_1}{C_2} \cdot \frac{\$^2 + \$\frac{R_2}{L_2} + \frac{1}{C_2 L_2}}{\$^2 + \$\frac{R_1}{L_1} + \frac{1}{C_1 L_1}}$$

- $C_1 = C_2 = L_1 = L_2 = 1$

$$\frac{V_o}{V_i} = \frac{\$^2 + \$ R_2 + 1}{\$^2 + \$ R_1 + 1}$$

$R_2 = 1/\sqrt{2} = 0{,}707$

$R_1 = \sqrt{2} = 1{,}41$

c.2) $\Omega_0 = 2\pi \cdot 1\,kHz \qquad R_2 = 1k\Omega$

$$C_1 = C_2 = \frac{1}{2\pi \cdot 1\,kHz \cdot 1k\Omega} = 160\,nF.$$

$$L_1 = L_2 = \frac{1k\Omega}{2\pi\ 1\,kHz} = 160\,mHy$$

$R_2 = 707\,\Omega$; $R_1 = 1{,}41\,k.$

NOTA

Ejercicio 3.

a) CERO EN EL ORIGEN ← NUMERADOR

$$\varphi(\omega) = \frac{\pi}{2} - \operatorname{arctg}\left[\frac{6\omega}{-\omega^2+4}\right]$$

$$\cdot j\,tg\,\varphi(j\omega) = \frac{F(j\omega) - F(j\omega)}{F(j\omega) + F(j\omega)}$$

$$\frac{F(j\omega)}{F(-j\omega)} = \frac{1 + j\,tg\,\varphi(j\omega)}{1 - j\,tg\,\varphi(j\omega)}$$

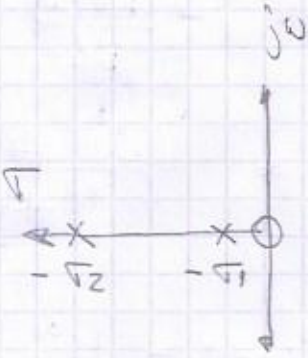
$$\frac{F(j\omega)}{F(-j\omega)} = \frac{1 + j\frac{6\omega}{-\omega^2+4}}{1 - j\frac{6\omega}{-\omega^2+4}} = \frac{-\omega^2+4 + 6j\omega}{-\omega^2+4 - 6j\omega}$$

← DENOMINADOR

$$j\omega = \$ \qquad \omega = \frac{\$}{j}$$

$$\frac{F(\$)}{F(-\$)} = \frac{\$^2 + \$\cdot 6 + 4}{\$^2 - \$\cdot 6 + 4}$$

$$\boxed{F(\$) = \frac{a\,\$}{\$^2 + \$\cdot 6 + 4}}$$

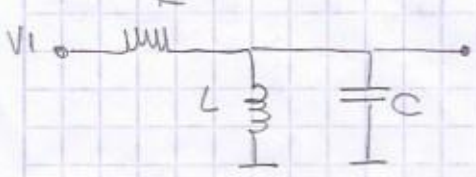


b) $$F(\$) = \frac{a\,\$}{(\$ + 0{,}764)(\$ + 5{,}236)}$$

τ_1 τ_2

c) Si $a = \frac{\omega_0}{Q} = 6 \rightarrow$ PASABANDA DE $n=2$ $\quad \omega_0 = 1$, $C = 1$, $L = 1$

PASIVO



$$\frac{V_2}{V_1} = \frac{\frac{1}{RC}\,\$}{\$^2 + \$\frac{1}{RC} + \frac{1}{LC}}$$

$$\frac{1}{R} = 6 \rightarrow R = 0{,}167$$

$$\boxed{\begin{array}{l} R = 0{,}167 \\ C = 1 \\ L = 1 \end{array}}$$