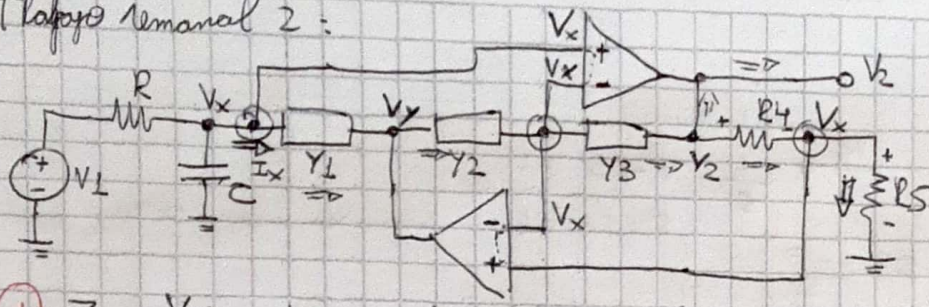
Trabajo semanal 2:



$$* \frac{\frac{\$L}{\$C}\cdot\frac{\$C}{\$^2LC+1}}{\left(\frac{\$L}{\$C}\cdot\frac{\$C}{\$^2LC+1}\right)+R} = \frac{\frac{\$L}{\$^2LC+1}}{\frac{\$L+\$^2LCR+R}{\$^2LC+1}} = \frac{\$L}{\$^2LC+1}\cdot\frac{\$^2LC+1}{\$L+\$^2LCR+R} = \frac{\$L}{LCR\left(\$^2+\$\frac{1}{CR}+\frac{1}{LC}\right)}$$

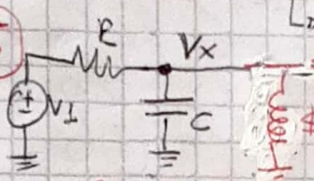
(1) $Z_x = \frac{V_x}{I_x} = \$L$ → objetivo ; ⇒ del análisis en clase: $Z_{in} = \frac{Z_1 \cdot Z_3 \cdot Z_5}{Z_2 \cdot Z_4} = \$L$

(4) $V_x = V_1 \cdot \frac{(Z_C \,//\, Z_L)}{(Z_C \,//\, Z_L)+Z_R} = V_1 \cdot \frac{(1/\$C \,//\, \$L)}{\left(\frac{1}{\$C}+R\right)} = V_1 \cdot \frac{\frac{\$L/\$C}{\$^2LC+1}}{\frac{\$L+R\$C+R}{\$C}} = V_1 \cdot \frac{\frac{\$L/\$C}{(\$^2LC+1)/\$C}}{\frac{\$L/\$C}{(\$^2LC+1)/\$C}+R} = V_1 \cdot \frac{\$L}{LCR\left(\$^2+\$\frac{1}{CR}+\frac{1}{LC}\right)}$ ⇒ $V_x = V_1 \cdot \frac{\$}{\$^2+\$\frac{1}{CR}+\frac{1}{LC}} \cdot \frac{1}{CR}$

(2) Yo quiero que $Z_{in} = \$ \cdot 1 = \frac{Z_1 \cdot Z_3 \cdot R_5}{Z_2 \cdot R_4}$ ⇒ $R_5 = R_4 = 1$; $Z_2 = \frac{1}{\$C}$ → $Y_2 = \$C$; $C = 1$; $Z_1 = 1$; $Z_3 = 1$; ⇒ $\frac{V_x}{V_1}$

(3) Y_1, Y_3 resistivas ; Y_2 → capacitor ;

(5)



$\$L$ = grader ⇒ $\frac{\frac{1}{\$C}\cdot\$L}{\$L+\frac{1}{\$C}} = \frac{\frac{\$L}{\$C}}{\$^2LC+1} = \frac{\$L}{\$^2LC+1}$; $\frac{\$L}{LC(\$^2+\$\frac{1}{CR}+\frac{1}{LC})}$

$\frac{V_2}{V_1} = \frac{V_x}{V_1}\cdot\frac{V_2}{V_x}$; ↷ $L = \frac{R_1 \cdot R_3 \cdot R_5}{\frac{1}{C}\cdot R_4}$

(6) $\frac{V_2}{V_x}$: $V_2 = V_{R4} + V_x$; $V_x = V_{R5}$; $I_{R4} = I_{R5}$; $\frac{V_{R4}}{R_4} = \frac{V_x}{R_5}$ ⇒ $V_{R4} = V_x \cdot \frac{R_4}{R_5}$

$\frac{V_2 - V_x}{R_4} = \frac{V_x}{R_5}$ ⇒ $\frac{V_2}{R_4} - \frac{V_x}{R_4} = \frac{V_x}{R_5}$ ⇒ $\frac{V_2}{R_4} = V_x\left(\frac{1}{R_5}+\frac{1}{R_4}\right)$

↳ $V_2 = V_x \cdot \frac{R_4}{R_5} + V_x = V_x\left(\frac{R_4}{R_5}+1\right)$; $\frac{V_2}{V_x} = \frac{R_4}{R_5}+1$;

$\frac{V_2}{V_x} = \frac{R_4\left(\frac{1}{R_5}+\frac{1}{R_4}\right)}{\frac{R_4+R_5}{R_5 R_4}\cdot R_4} = \frac{R_4+R_5}{R_4}$

(7) $\frac{V_2}{V_1} = \frac{V_x}{V_1}\cdot\frac{V_2}{V_x} = \frac{1}{1+\$CR}\cdot\left(\frac{R_4}{R_5}+1\right) = \frac{\left(\frac{R_4}{R_5}+1\right)}{\$CR}$ ⇒ $\frac{\$}{\$^2+\$\frac{1}{CR}+\frac{1}{LC}}$ ⇒ $\omega_p^2 = \frac{1}{LC}$ ⇒ $\omega_p = \sqrt{\frac{1}{LC}}$ ⇒ $\frac{1}{CR} = \frac{\omega_p}{Q}$ ↳ R_G

(8) $\frac{V_2}{V_1} = \frac{\left(\frac{R_4}{R_5}+1\right)}{Q}\cdot\frac{\omega_p\cdot\$}{\$^2+\$\frac{\omega_p}{Q}+\omega_p^2}$ ⇒ Normalizo $\Omega_w = \omega_p$: $\frac{V_2}{V_1} = \frac{\left(\frac{R_4}{R_5}+1\right)}{Q}\cdot\frac{\omega_p\cdot\$^*\Omega_w}{\$^{*2}\Omega_w^2+\$^*\Omega_w\omega_p+\omega_p^2} = \frac{\left(\frac{R_4}{R_5}+1\right)}{Q}\cdot\frac{\$^*}{\$^{*2}+\$^*\frac{1}{Q}+1}$

$\omega_p^* = 1 = \sqrt{\frac{1}{C_1 L}}$ ⇒ $L = \frac{1}{C}$ ⇒ $C = \frac{1}{R}$ ⇒ $\frac{R}{\Omega_2} = \left(\frac{Q}{C\omega_p}\right)$; $L = \frac{1}{LC}$ ⇒ $L = \frac{1}{C}$ ⇒ $\frac{C_2 \cdot R_1 \cdot R_3 \cdot R_5}{R_4} = \frac{1}{C}$

↳ $\omega_p = 2\pi f_p$ ⇒ $C = \frac{1}{\Omega_2 \cdot 2\pi f_p} = \frac{1}{\Omega_2 \cdot \omega_p}$ ⇒ Norma impedancia : R_G, R_5 ; Frecuencia : ω_p

$\frac{R_4}{\Omega_2}$; $\frac{R_5}{\Omega_2}$; $\frac{Z_1}{\Omega_2}$; $\frac{Z_3}{\Omega_2}$; $\frac{Z_2}{\Omega_2}$; $Z_2 = \frac{1}{\$C}$ ⇒ $Z_2 = \frac{1}{\$C\Omega_2}$; ⇒ $C_2 = Z_2 = \frac{1}{j\omega_p \cdot C_2 \cdot \Omega_2}$

Yo quiero $f_p = 10kHz$ ⇒ $\omega_p = 2\pi \cdot 10k$ ⇒ $Q = 20$ → $\frac{\omega_p}{Q} = \frac{2\pi \cdot 10k}{20} = \pi \cdot 1k = ? = \frac{1}{RC}$

C : [1nF – 100nF] ; → elijo 10nF : $1k \cdot \pi = \frac{1}{R \cdot 10nF}$ ⇒ $R_G = \frac{1}{10nF}\cdot\frac{1}{1k\pi} = 31830\,\Omega$

$R_G = 31830$ ⇒ $\omega_p^* = \frac{1}{RC} = 1$ ⇒ $Z_2 = \frac{1}{\$C}$ ⇒

$\frac{\omega_p}{Q} = \frac{1}{RC}$ ⇒ $\frac{2\pi \cdot 10k}{20} = \frac{1}{10nF}\cdot\frac{1}{R}$; $R = \frac{1}{10nF}\cdot 20 \cdot \frac{1}{2\pi 10k} = 31830$; No creo !

Rehacer $\frac{V_x}{V_1}$ → 2 polos

$\frac{R_4}{R_5}+1 = K \Rightarrow K-1 = R_4^*$; $R_1 = R_3 = R_5 = \Omega_2$; $\omega_p^2 = \frac{1}{LC} = 1 = \frac{R_4}{C_2 R_1 R_3 R_5 C}$ ⇒ $1 = \frac{R_4}{C_2 \cdot C}$ ⇒ $C_2 = C$;

$C^2 = R_4^*$; $C^* = \sqrt{R_4^*}$; $C^* = \sqrt{K-1}$; $\frac{\omega_p}{Q} = \frac{1}{RC} = \frac{1}{Q} = \frac{1}{L^*C^*}$; $L^* = \frac{Q}{\sqrt{K-1}}$; $R_1^* = R_3^* = R_5^* = 1$;

Corrigo : $Q = 20$; $K = 10$; ⇒ $L^* = \frac{20}{\sqrt{9}} = \frac{20}{3}$; $C^* = \sqrt{9} = 3$; $R_4^* = 9$; $T(\$^*) = \frac{K}{Q}\cdot\frac{\$^*}{\$^{*2}+\frac{1}{Q}+1} = \frac{10}{20}\cdot\frac{\$^*}{\$^{*2}+\frac{1}{20}+1}$