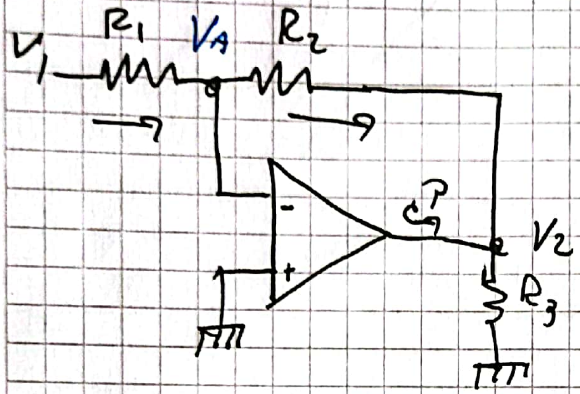
TP#1

#1

$Z_1 = 47k\Omega$ $\qquad \frac{V_2}{V_1} = -70\, db$



$Y_1 = \frac{1}{R_1}$ $\qquad Y_2 = \frac{1}{R_2}$

$Y_3 = \frac{1}{R_3}$

$\cancel{V_1 Y_1 - V_A Y_1 = 0}$ $\qquad V_A (Y_1 + Y_2) - V_1 Y_1 - V_2 Y_2 = 0$

$\cancel{V_1 Y_1 = V_A Y_1}$ ¿? $\qquad V_A (Y_1 + Y_2) - V_1 Y_1 - V_2 Y_2 = 0$

$\cancel{V_1 = V_A}$ $\qquad V_A = -V_1 \frac{Y_1}{Y_1+Y_2} - V_2$

$\frac{V_1}{R_1 + R_2 + R_3} \cdot R_3 = V_2$ $\qquad$ en la que voa ullyr.

$V_1 \cancel{Y_1} - V_A \cancel{Y_1} = (V_A - V_2) Y_2$

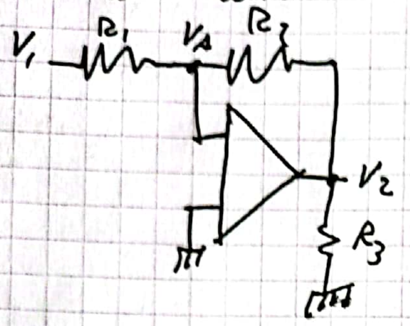
$\cancel{Y_1}(V_1 - V_A) = (V_A - V_2) Y_2$ $\qquad \cancel{V_A}$

$V_1 Y_1 - V_A Y_1 = V_A Y_2 - V_2 Y_2$

$V_1 Y_1 + V_2 Y_2 = V_A (Y_2 + Y_1)$

$$\boxed{V_1 \frac{Y_1}{Y_1+Y_2} + V_2 \frac{Y_2}{Y_2+Y_1} = V_A} \quad (1)$$

valor do nuevo:



$$V_A(Y_1+Y_2) - V_2 Y_2 - V_1 Y_1 = 0$$

$$\boxed{V_A = V_2 \frac{Y_2}{Y_2+Y_1} + V_1 \frac{Y_1}{Y_1+Y_2}} \quad 1$$

$$V_A \frac{Y_2}{Y_2+Y_3} = V_2$$

$$V_A = \frac{Y_2+Y_3}{Y_2} V_2$$

$$/\!/ \quad \frac{Y_2+Y_3}{Y_2} V_2 = V_2 \frac{Y_2}{Y_2+Y_1} + V_1 \frac{Y_1}{Y_2+Y_1}$$

$$V_2 \left(\frac{Y_2+Y_3}{Y_2} - \frac{Y_2}{Y_2+Y_1} \right) = V_1 \frac{Y_1}{Y_2+Y_1}$$

$$\frac{\cancel{Y_2^2} + Y_1Y_2 + Y_3Y_2 + Y_3Y_1 - \cancel{Y_2^2}}{Y_2(Y_2+Y_1)} V_2 = V_1 \frac{Y_1}{Y_2+Y_1}$$

$$\frac{Y_1}{\cancel{Y_1+Y_2}} \cdot \frac{Y_2\,\cancel{(Y_2+Y_1)}}{Y_1Y_2 + Y_3Y_2 + Y_3Y_1} = \frac{V_2}{V_1}$$

$$\frac{Y_1Y_2}{Y_1Y_2 + Y_3(Y_2+Y_1)} = \frac{V_2}{V_1}$$

~~$\frac{Y_1 Y_2}{Y_1 Y_2 + Y_3(Y_1+Y_2)} = \frac{V_2}{V_1}$~~

~~ze~~

AH VO SOS UN PELOTUDO

$V_1 = I_1 R_1$ $\quad ze = R_1 = 47k$

$V_1 Y_1 = -V_2 Y_2$

$\frac{V_2}{V_1} = -\frac{Y_1}{Y_2} = \left|\frac{R_2}{R_1}\right|$

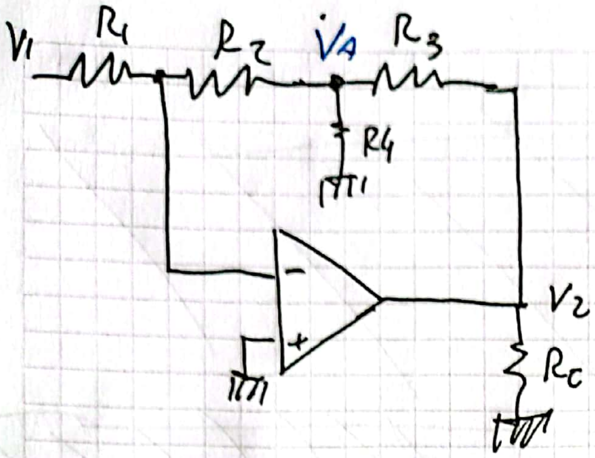
$20 \log\left(\frac{V_2}{V_1}\right) = 20 \log\left(-\frac{x}{47k}\right) = -70\,db$

$20 \log\left(\frac{R_2}{R_1}\right) = -70\,db$

$\frac{R_2}{R_1} = 0{,}316 \times 10^{-6}$ $\quad R_2 = 14{,}86\,\Omega$

$R_1 = 47k$

$R_2 = 14\,\Omega$ $\quad R_3 \to$ wever



$$\frac{V_1}{I_1} = R_1 = Z_e \qquad \boxed{47k}$$

$$V_1 Y_1 = -V_A Y_2$$

$$\boxed{-V_1 \frac{Y_1}{Y_2} = V_A}$$

$$V_A (Y_2 + Y_3 + Y_4) - V_2 Y_3 = 0$$

$$-V_1 \frac{Y_1}{Y_2} (Y_2 + Y_3 + Y_4) = V_2 Y_3$$

$$-\frac{Y_1}{Y_2} \frac{Y_2 + Y_3 + Y_4}{Y_3} = \frac{V_2}{V_1}$$

$$-\frac{R_2}{R_1} \frac{\left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}\right)}{\frac{1}{R_3}} = -\frac{R_3 R_2}{R_1} \cdot \left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}\right)$$

$$-\frac{\cancel{R_3 R_2}}{R_1} \cdot \left(\frac{R_3 R_4 + R_2 R_4 + R_2 R_3}{\cancel{R_2}\cancel{R_3} R_4}\right) = \frac{V_2}{V_1}$$

$$\frac{V_2}{V_1} = -\frac{1}{R_1} \left(\frac{R_3 R_4 + R_2 R_4 + R_2 R_3}{R_4}\right)$$

$$\frac{V_2}{V_1} = -\frac{1}{R_1}\left(\frac{R_3R_4 + R_2R_4 + R_2R_3}{R_4}\right)$$

$$\frac{V_2}{V_1} = -\frac{1}{R_1}R_3\left(\frac{\cancel{R_3}}{\cancel{R_3}} + \frac{R_2}{R_3} + \frac{R_2\cancel{R_3}}{\cancel{R_3}R_4}\right) = -\frac{R_3}{R_1}\left(1 + \frac{R_2}{R_3} + \frac{R_2}{R_4}\right)$$

$$\frac{V_2}{V_1} = -\frac{R_3}{R_1}\left(1 + R_2\left(\frac{1}{R_3} + \frac{1}{R_4}\right)\right) = -\frac{R_3}{R_1}\left(1 + R_2\left(\frac{1}{R_3} + \frac{1}{R_4}\right)\right)$$

$$\left|\frac{V_2}{V_1}\right| = 0{,}3\cancel{16}\,m = \frac{R_3}{R_1}\left(1 + R_2\left(\frac{1}{R_3} + \frac{1}{R_4}\right)\right)$$

~~Si $R_3 = R_1$ $0{,}376 = 1 + R_2\left(\frac{1}{R_3} + \frac{1}{R_4}\right)$~~

$$14{,}86\,\frac{1}{R_3} = 1 + R_2\left(\frac{1}{R_3} + \frac{1}{R_4}\right)$$

$R_3 = 10$

$$1{,}48 = 1 + R_2\left(\frac{1}{10} + \frac{1}{R_4}\right)$$

$$\frac{0{,}48}{R_2} = \frac{1}{10} + \frac{1}{R_4}$$

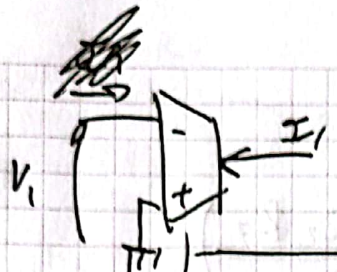
~~$R_2 = 0{,}6$~~

~~$0{,}96 - 0{,}1 = \frac{1}{R_4} \Rightarrow R_4 =$~~

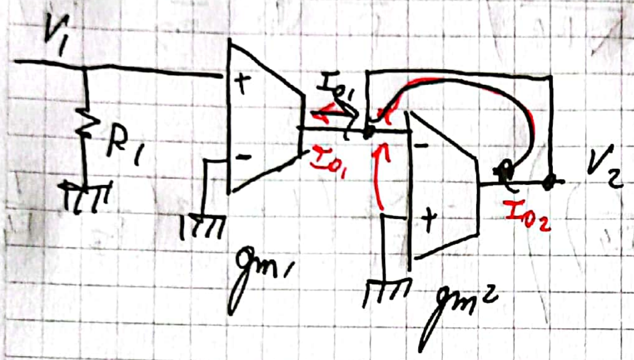
$R_2 = 1 \Rightarrow 0{,}48 - 0{,}1 = \frac{1}{R_4} \Rightarrow R_4 = 2{,}63$

[illegible]

I.



$$\boxed{I_1 = gm\,V_1}$$



$V_1\,gm_1 = I_{o1}$ $\qquad$ $V_2\,gm_2 = I_{o2}$

$$V_1\,gm_1 = V_2\,gm_2$$

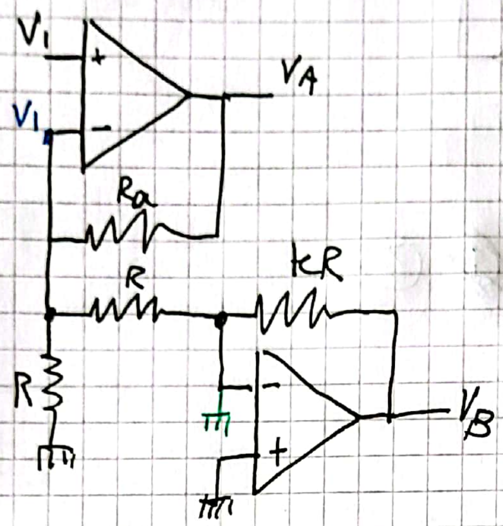
$$\frac{V_2}{V_1} = \frac{gm_1}{gm_2} \qquad gm_1 = 10\,m\mho$$

$\cancel{gm_2 = 31,62\,m}$

$$\boxed{gm_2 = 31,622}$$

ahora si tiene color.

#2



$R_a = R\frac{(k-1)}{2}$

$G = \frac{1}{R}$ ⓐ

$G_a = \frac{1}{R_a} = \frac{1}{R}\frac{2}{k-1}$ ⓑ

$G_k = \frac{1}{kR}$ ⓒ

$\frac{V_a}{V_1}$ ¿?

$V_1(G_A + 2G) - V_A G_A = 0$

$V_1(G_A + 2G) = V_A G_A \Rightarrow \boxed{V_A = V_1\left(\frac{G_A + 2G}{G_A}\right) = V_a}$ I

~~$\frac{V_A}{V_1}$~~

$V_1 G = -V_B G_K$

$\boxed{-V_1\frac{G}{G_k} = V_B}$ II

I − II $= V_{AB}$

$V_{AB} = V_1\frac{G_A + 2G}{G_A} + V_1\frac{G}{G_K} = V_1\left(\frac{G_A + 2G}{G_A} + \frac{G}{G_k}\right)$ III

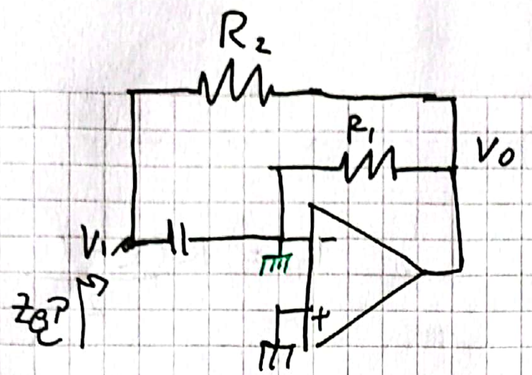
Reemplazando ⓐ ⓑ ⓒ en III

$V_{AB} = V_1\left(1 + \frac{2G}{G_A} + \frac{G}{G_k}\right) = V_1\left(1 + \frac{2}{\cancel{R}}\frac{\cancel{R}(k-1)}{\cancel{2}} + \frac{1}{\cancel{R}}k\cancel{R}\right)$

$V_{AB} = V_1(\cancel{1} + k - \cancel{1} + k) = \boxed{2K\,V_1}$

#3

A)



$$V_1(Y_C+Y_2)-V_0Y_2=I_1 \quad \text{II}$$

$$V_1Y_C=-V_0Y_1$$

$$-\frac{V_1Y_C}{Y_1}=V_0 \quad \text{I}$$

I en II

$$V_1(Y_C+Y_2)+V_1\frac{Y_C}{Y_1}Y_2=I_1=V_1\left(Y_C+Y_2+\frac{Y_CY_2}{Y_1}\right)=I_1$$

$$V_1\left(\frac{Y_CY_1+Y_2Y_1+Y_2Y_C}{Y_1}\right)=I_1$$

$$\cancel{\frac{V_1}{I_1}=Z_e=\frac{Y_1}{Y_CY_1+Y_2Y_1+Y_2Y_C}=\frac{1}{R_1}\cdot}$$

$$V_1\left(\frac{sC}{R_1}+\frac{1}{R_2R_1}+\frac{sC}{R_2}\right)R_1=I_1$$

$$V_1\left(sC\left(\frac{\cancel{R_1}}{\cancel{R_1}}+\frac{R_1}{R_2}\right)+\frac{\cancel{R_1}}{R_2\cancel{R_1}}\right)\frac{\cancel{R_1}}{\cancel{R_1}}=I_1$$

$$V_1\left(sC\left(1+\frac{R_1}{R_2}\right)+\frac{1}{R_2}\right)=I_1$$

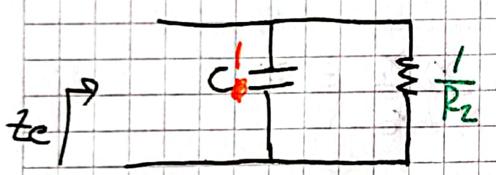
$$\frac{V_1}{I_1}=\frac{1}{sC\left(1+\frac{R_1}{R_2}\right)+\frac{1}{R_2}}=$$

$$\frac{1}{R_a} = \frac{1}{R}\,\frac{2}{k-1}$$

Jugando un poco

$$\cancel{Z_e = \frac{1}{sC\,\frac{R_2+R_1}{R_2}R_2 + \frac{1}{R_2}R_2} = \frac{1}{sC + }}$$

$$Z_e = \frac{1}{sC\,\frac{\cancel{R_2}+R_1}{\cancel{R_2}}\,\cancel{\frac{R_2}{R_2+R_1}} + \frac{1}{\cancel{R_2}}\,\frac{\cancel{R_2}}{R_2+R_1}}\;\frac{R_2}{R_2+R_1} = \frac{R_2}{R_2+R_1}\;\frac{1}{sC + \frac{1}{R_2+R_1}}$$



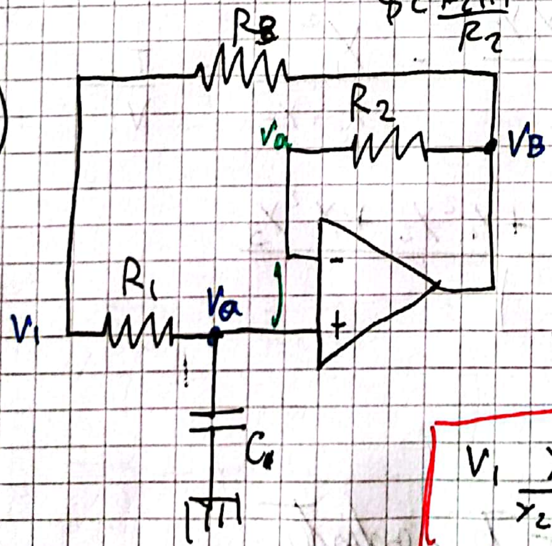
$$Z_e = \frac{1}{\underbrace{sC\,\frac{R_2+R_1}{R_2}}_{C'} + \frac{1}{R_2}}$$

Tanque RC segun la w predominara la componente resistiva o la capacitiva

$W=0 \Rightarrow Z_e = R_2$

$W=\infty \Rightarrow Z_e \cong \frac{1}{sC\,\frac{R_2+R_1}{R_2}}$

(b)



$\cancel{V_A V_B}\ (V_1 - V_a)\,Y_1 = V_a Y_c$

$V_1 Y_1 = V_a (Y_c + Y_1)$

$$\boxed{V_1 \frac{Y_1}{Y_1+Y_c} = V_a} \quad \text{I}$$

$(V_1 - V_b)\,Y_3 = (V_b - V_a)\,Y_2$

$V_1 Y_3 + V_a Y_2 = V_b (Y_2 + Y_3)$

$$\boxed{V_1 \frac{Y_3}{Y_2+Y_3} + V_a \frac{Y_2}{Y_2+Y_3} = V_b} \quad a$$

$$V_1 (Y_1 + Y_3) - V_b Y_3 - V_a Y_1 = I_1 \quad \text{III}$$

I en II

$$V_1 \frac{Y_3}{Y_2+Y_3} + \frac{Y_1}{Y_1+Y_c} \frac{Y_2}{Y_2+Y_3} V_1 = V_b$$

$$V_1 \frac{1}{Y_2+Y_3}\left(Y_3 + \frac{Y_1 Y_2}{Y_1+Y_c}\right) = V_b \quad \text{IV}$$

~~IV en III~~

IV y I en III

$$V_1 (Y_1+Y_3) - V_1 \frac{Y_3}{Y_2+Y_3}\left(Y_3 + \frac{Y_1 Y_2}{Y_1+Y_c}\right) - V_1 \frac{Y_1 Y_1}{Y_1+Y_c} = I_1$$

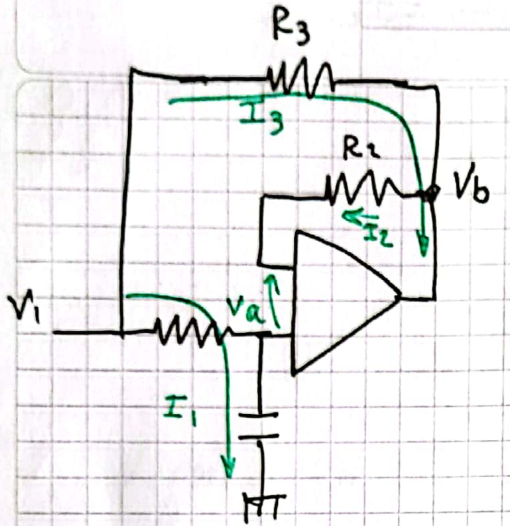
$$V_1 \left[Y_1+Y_3 - \frac{Y_3}{Y_2+Y_3}\left(Y_3 + \frac{Y_1 Y_2}{Y_1+Y_c}\right) - \frac{Y_1^2}{Y_1+Y_c}\right] = I_1$$

$$Y_1 + Y_3 - \frac{Y_3}{Y_2+Y_3} \frac{Y_3 Y_1 + Y_3 Y_c + Y_1 Y_2}{Y_1+Y_c} - \frac{Y_1^2}{Y_1+Y_c} = \frac{I_1}{V_1}$$

$$\frac{I_1}{V_1} = Y_1 + Y_3 - \frac{Y_3^2 Y_1 + Y_3^2 Y_c + Y_3 Y_1 Y_2 + Y_1^2 Y_2 + Y_1^2 Y_3}{(Y_2+Y_3)(Y_1+Y_c)}$$

$$\frac{I_1}{V_1} = Y_1 Y_2 + Y_1 Y_3$$

aca en algun lado te perdiste.



$I_2 = 0 \Rightarrow V_a = V_b$

$(V_1 - V_a)\, Y_1 = V_a Y_c$

$V_1 \dfrac{Y_1}{Y_1 + Y_c} = V_a$ (I)

$$V_1(Y_1+Y_3) - V_a(Y_1+Y_3) = I_1 = V_1(Y_1+Y_3) - \frac{Y_1}{Y_1+Y_c}(Y_1+Y_3) = I_1$$

$$V_1\left(Y_1+Y_3 - \frac{Y_1^2 + Y_1Y_3}{Y_1+Y_c}\right) = \frac{\cancel{Y_1^2} + Y_cY_1 + \cancel{Y_3Y_1} + Y_3Y_c - \cancel{Y_1^2} - \cancel{Y_1Y_3}}{Y_1+Y_c}$$

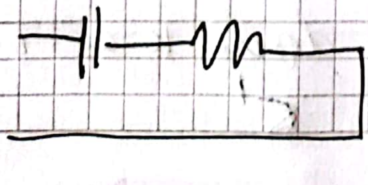
$$V_1\left(\frac{Y_cY_1 + Y_3Y_c}{Y_1+Y_c}\right) = I_1 = V_1\left(\frac{sC}{R_1} + \frac{sC}{R_3}\Big/\Big/\left(sC + \frac{1}{R_3}\right)\right)$$

$$V_1\left(\frac{sCR_3 + sCR_1}{R_3R_1} \Big/ \frac{sCR_3+1}{R_3}\right) = V_1\left(\frac{sCR_3 + sCR_1}{\cancel{R_3}R_1} \cdot \frac{\cancel{R_3}}{sCR_3+1}\right)$$

$$V_1\left(\frac{sC(R_3+R_1)}{R_1 + sR_1R_3C}\right) = I_1$$

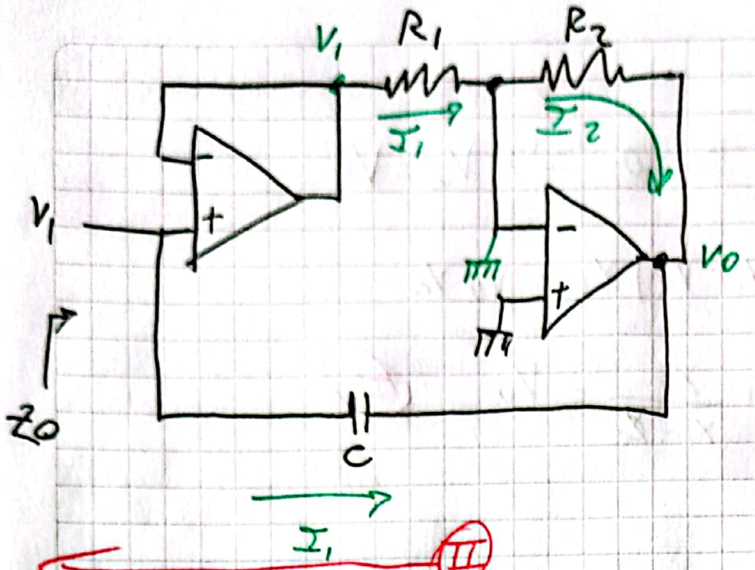
$$\frac{V_1}{I_1} = \frac{R_1 + sCR_1R_3}{sC(R_3+R_1)} = \frac{R_1}{(R_3+R_1)}\,\frac{1}{sC} + \frac{\cancel{sC}}{\cancel{sC}}\,\frac{R_1R_3}{R_3+R_1}$$

$$Z_e = \frac{1}{sC} \cdot \frac{R_1}{R_3+R_1} + \frac{R_1R_3}{R_3+R_1}$$



Capacitor con resistor en serie.

$I_1 = I_2$



$$\boxed{(V_1 - V_0)\,Y_C = I_1} \quad \text{II}$$

$$V_1 Y_1 = -V_0 Y_2$$

$$\boxed{-V_1 \frac{Y_1}{Y_2} = V_0} \quad \text{I}$$

$$V_1 Y_C - V_0 Y_C = I_1$$

I en II

$$V_1 Y_C + V_1 \frac{Y_1}{Y_2} Y_C = I_1$$

$$V_1\left(Y_C + \frac{Y_1 Y_C}{Y_2}\right) = \left(\frac{Y_C Y_2 + Y_1 Y_C}{Y_2}\right) V_1 = I_1 = V_1\left(\frac{Y_2 + Y_1}{Y_2}\right) Y_C$$

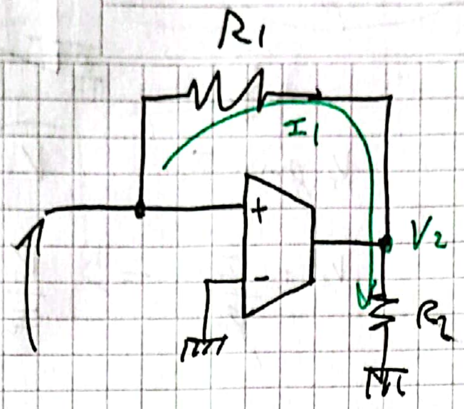
$$\frac{V_1}{I_1} = \frac{Y_2}{(Y_2 + Y_1)\,Y_C} = \frac{\frac{1}{R_2}}{\left(\frac{1}{R_1} + \frac{1}{R_2}\right) sC} = \frac{\frac{1}{R_2}}{\frac{R_1 + R_2}{R_1 R_2}\; sC}$$

$$\frac{V_1}{I_1} = \frac{1}{\cancel{R_2}} \cdot \frac{R_1 \cancel{R_2}}{sC\,(R_1 + R_2)} \frac{\frac{R_1}{R_1}}{} = \frac{1}{sC} \frac{1}{\frac{R_1 + R_2}{R_1}} = \frac{1}{sCk}$$

$$\boxed{k = 1 + \frac{R_2}{R_1}}$$

Es un capacitor de valor kC donde k es $1 + \frac{R_2}{R_1}$ sintonizando $\frac{R_2}{R_1}$ podemos ajustar k

#3 (a)



$V_1 g_m = I_{o1}$ $\qquad I_1 = (V_1 - V_2)\,Y_1 = V_1 Y_1 - V_2 Y_1$

$I_1 + I_{o1} = V_2 Y_2$

$I_1 + g_m V_1 = V_2 Y_2 \rightarrow I_1 \frac{1}{Y_2} + g_m \frac{V_1}{Y_2} = V_2$

$I_1 = V_1 Y_1 - \left(\frac{I_1}{Y_2} + g_m \frac{V_1}{Y_2}\right) Y_1 = V_1 Y_1 - I_1 \frac{Y_1}{Y_2} - g_m V_1 \frac{Y_1}{Y_2}$

$I_1\left(1 + \frac{Y_1}{Y_2}\right) = V_1\left(Y_1 - g_m \frac{Y_1}{Y_2}\right)$

$\cancel{\frac{V_1}{I_1} = \frac{Y_1 - g_m\frac{Y_1}{Y_2}}{1 + }}$ $\qquad \frac{V_1}{I_1} = \frac{\frac{Y_2 + Y_1}{Y_2}}{\frac{Y_1 Y_2 - g_m Y_1}{Y_2}} = \frac{Y_2 + Y_1}{\cancel{Y_2}} \cdot \frac{\cancel{Y_2}}{Y_1 Y_2 - g_m Y_1}$

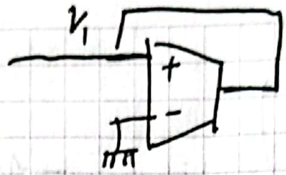
$$\frac{V_1}{I_1} = \frac{Y_2 + Y_1}{Y_1 (Y_2 - g_m)} = \frac{\frac{1}{R_2} + \frac{1}{R_1}}{\frac{1}{R_1}\left(\frac{1}{R_2} - g_m\right)} = \frac{\frac{R_2 + R_1}{R_2 R_1}}{\frac{1}{R_1}\left(\frac{1}{R_2} - g_m\right)}$$

$$\frac{V_1}{I_1} = R_1 // R_2 \cdot \frac{1}{\frac{1}{R_1}\left(\frac{1}{R_2} - g_m\right)}$$

Resistor variable que puede ser negativo si $|g_m| > \left|\frac{1}{R_2}\right|$

OTA AS RESISTOR

$$I = V g_m$$



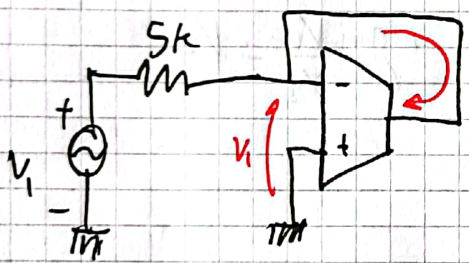
Z_e

$V_i\, g_m = I_o$ $\qquad V = I \cdot R$

$$V_i = \frac{I_o}{g_m} \Rightarrow \frac{V_1}{I_o} = \frac{1}{g_m} = Z_{e\Omega}$$

a)

$$5k = \frac{V_i}{g_m}$$



$V_i\, g_m = I_{01}$

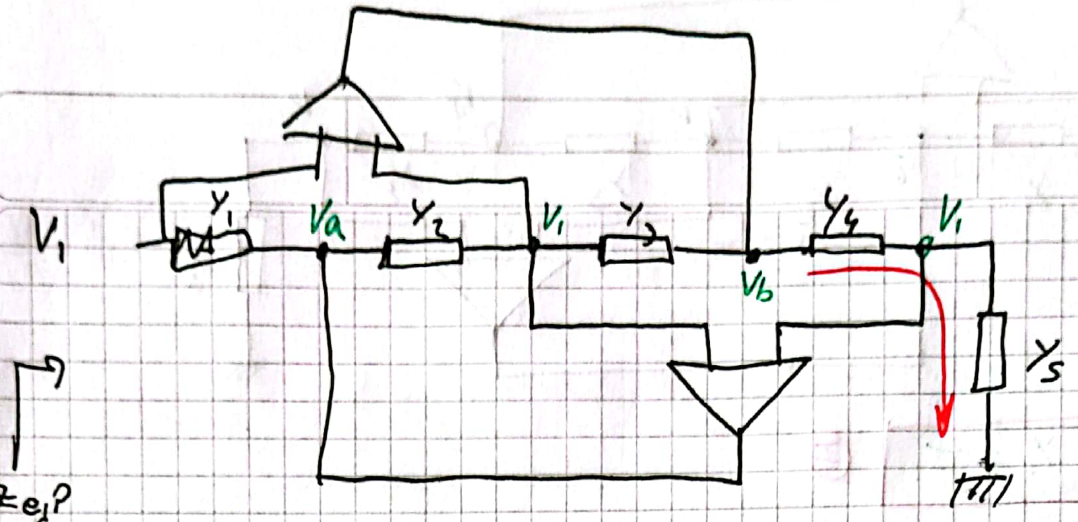
$$\frac{V_i}{I_{01}} = \frac{1}{g_m} = 5k$$

$$5k = \frac{1}{g_m} \Rightarrow g_m = 200\mu$$

Seteando la $I_{ABC} \cong 200\mu A$ obtenemos $g_m = 200\mu$

Circuito de ditación ¿?

Duda



Z_{eq}?

a)

$$\boxed{V_1(Y_2+Y_3) - V_a Y_2 - V_b Y_3 = 0} \quad \text{II}$$

$(V_1 - V_a)\, Y_1 = I_1$ $\qquad \boxed{I_1 = V_1 Y_1 - V_a Y_1}$ III

$V_b \dfrac{Y_4}{Y_4+Y_5} = V_1 \quad \Rightarrow \quad \boxed{V_1 \dfrac{Y_4+Y_5}{Y_4} = V_b}$ I

I en II

$$V_1 (Y_2+Y_3) - V_1 \frac{Y_4+Y_5}{Y_4} = V_a Y_2$$

$$V_1\left[\frac{Y_2+Y_3}{Y_2} - \frac{Y_4+Y_5}{Y_4 Y_2}\right] = \boxed{V_a = V_1\left[\frac{Y_2Y_4+Y_3Y_4-Y_4-Y_5}{Y_2Y_4}\right]} \quad \text{IV}$$

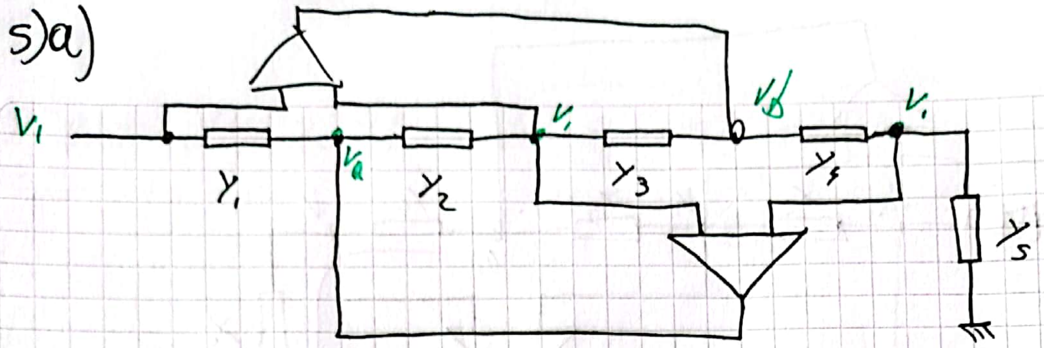
IV en III

$$I = V_1\left[Y_1 - \frac{(Y_2Y_4+Y_3Y_4-Y_4-Y_5)\,Y_1}{Y_2Y_4}\right]$$

$$I = V_1\left[\frac{\cancel{Y_1Y_2Y_4} - \cancel{Y_1Y_2Y_4} - Y_3Y_4Y_1 + Y_4Y_1 + Y_5Y_1}{Y_2Y_4}\right] = \frac{Y_4Y_1 + Y_5Y_1 - Y_3Y_4Y_1}{Y_2Y_4} \cdot V_1$$

donde la cagaste ¿P?

5)a)



$$\boxed{V_1 Y_1 - V_a Y_1 = I_1} \quad \text{I}$$

$$V_b \frac{Y_4}{Y_4 + Y_5} = V_1 \quad \Rightarrow \quad V_b = \left(\frac{Y_4}{Y_4} + \frac{Y_5}{Y_4}\right) V_1 = V_1\left(1 + \frac{Y_5}{Y_4}\right)$$

$$\boxed{V_b = V_1\left(1 + \frac{Y_5}{Y_4}\right)} \quad \text{II}$$

$$V_1(Y_2 + Y_3) - V_a Y_2 - V_b Y_3 = 0$$

$$V_1(Y_2 + Y_3) - V_1\left(1 + \frac{Y_5}{Y_4}\right) Y_3 = V_a Y_2$$

$$V_1\left(\frac{Y_2}{Y_2} + \frac{Y_3}{Y_2}\right) - V_1\left(1 + \frac{Y_5}{Y_4}\right)\frac{Y_3}{Y_2} = V_a$$

$$V_1\left[1 + \cancel{\frac{Y_3}{Y_2}} - \cancel{\frac{Y_3}{Y_2}} - \frac{Y_5 Y_3}{Y_4 Y_2}\right] = V_a$$

$$V_1\left[1 - \frac{Y_5 Y_3}{Y_4 Y_2}\right] = V_1\left(\frac{Y_4 Y_2 - Y_5 Y_3}{Y_4 Y_2}\right) = V_a \quad \text{III}$$

$$V_1 Y_1 - V_1 \left(1 - \frac{Y_5 Y_3}{Y_4 Y_2}\right) Y_1 = I_1$$

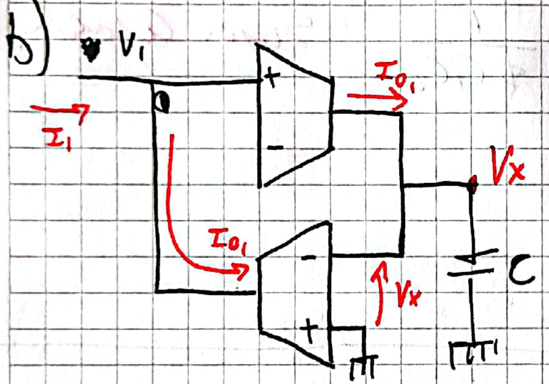
$$V_1 \left(Y_1 - Y_1 + \frac{Y_5 Y_3 Y_1}{Y_4 Y_2}\right) = I_1$$

$$\boxed{Z_e = \frac{Y_4 Y_2}{Y_5 Y_3 Y_1}}$$

$\cancel{Z_{ea} = sC \cdot \frac{R_3}{R_1 R_2 R_4}}$

$Z_{eb} =$ Ver al dorso

b)



$V_1 g_{m_1} = I_{o_1}$ $\qquad I_{o_1} \frac{1}{sC} = V_x$ $\qquad V_x g_{m_2} = I_{o_2} = I_1$

$$I_1 = V_x g_{m_2} = g_{m_2} I_o \frac{1}{sC} = g_{m_1} g_{m_2} \frac{1}{sC} V_1$$

$$I_1 = V_1 g_{m_1} g_{m_2} \frac{1}{sC}$$

$$\frac{V_1}{I_1} = sC \frac{1}{g_{m_1} g_{m_2}}$$

$$Z_{ea} = \frac{Y_2 Y_4}{Y_1 Y_3 Y_5}$$

$Y_1 = \frac{1}{R_1}$ $\quad Y_2 = sC$

$Y_3 = \frac{1}{R_2}$ $\quad Y_4 = \frac{1}{R_3}$; $Y_5 = \frac{2}{R_4}$

$$Z_{ea} = sC \frac{1}{R_3} \cdot R_1 R_2 R_4$$

INDUCTOR.

$$Z_{eb} = \frac{Y_2 Y_4}{Y_1 Y_3 Y_5}$$

$Y_1 = sC_1$ $\quad Y_3 = sC_2$ $\quad Y_5 = \frac{1}{R_4}$

$Y_2 = \frac{1}{R_1}$ $\quad Y_4 = \frac{1}{R_3}$

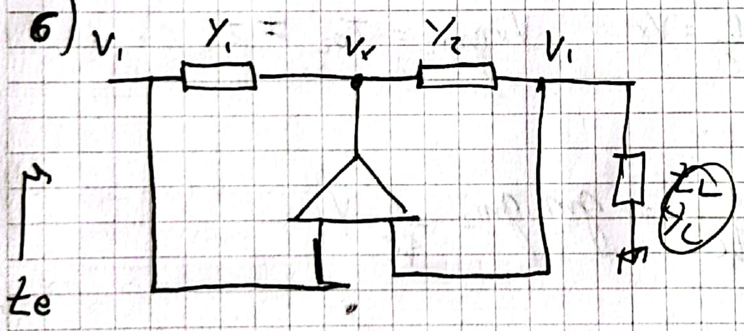
$$Z_{eb} = \frac{1}{R_1} \frac{1}{R_3} \frac{R_4}{sC_1 sC_2} = \frac{R_4}{R_1 R_3} \frac{1}{sC_1 C_2}$$

Super Capacitor.

Ver esto si de super cap.

Ver sin s-a/b/c

6)



$(V_1 - V_x) Y_1 = I_1$ (II)

$$V_x \frac{Y_2}{Y_2 + Y_L} = V_1$$

$$V_1 \frac{Y_2 + Y_L}{Y_2} = V_1 = V_1 \left(1 + \frac{Y_L}{Y_2}\right) \quad \text{(I)}$$

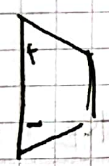
(I) en (II) $\quad V_1 \left(1 - 1 - \frac{Y_L}{Y_2}\right) Y_1 = I_1$

$$V_1 = -Y_L \frac{Y_1}{Y_2} = I_1 \Rightarrow \frac{V_1}{I_1} = -\frac{Y_2}{Y_1}\frac{1}{Y_L} = -\frac{Y_2}{Y_1} Z_L$$

$$Ze = -\frac{R_1}{R_2} Z_L$$

Esta red sirve pro obtener una Resistencia negativa

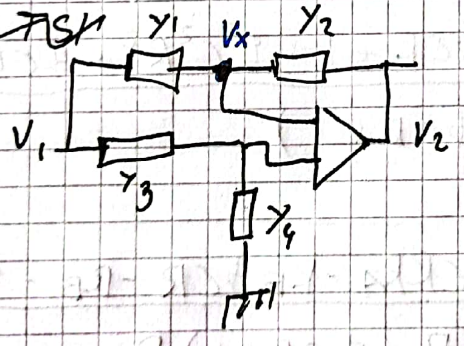
Projeto de Schauman



(7) → TS #1

(8) → TS #2 → SIM SPICE

(7a) TSH



$$V_1 \frac{Y_3}{Y_3+Y_4} = V_x$$

$$V_x (Y_1 + Y_2) - V_2 Y_2 - V_1 Y_1 = 0$$

$$V_1 \frac{Y_3}{Y_3+Y_4}(Y_1+Y_2) - V_1 Y_1 = V_2 Y_2$$

$$V_1 \left(\frac{Y_3 Y_1 + Y_2 Y_3}{Y_3 + Y_4} - Y_1 \right) : \frac{\cancel{Y_3 Y_1} + Y_3 Y_2 - \cancel{Y_1 Y_3} - Y_4 Y_1}{Y_3 + Y_4} = \frac{V_2 Y_2}{V_1}$$

$$\frac{Y_3 Y_2 - Y_4 Y_1}{Y_2 (Y_3 + Y_4)} = A_v$$

b) $Y_1 = \frac{1}{R_A}$ $\quad Y_2 = \frac{1}{R_B}$

$$Z_3 = R + \frac{1}{\$C} = \frac{\$CR+1}{\$C} \Rightarrow Y_3 = \frac{\$C}{\$CR+1}$$

$$Y_4 = \frac{1}{R} + \$C = \frac{1+\$CR}{R}$$

$$A_v = \frac{\frac{\$C}{\$CR+1}\frac{\cancel{R_B}}{R_B} - \frac{1+\$CR}{R}\frac{R_B}{R_A}}{\cancel{R_B}\frac{1}{\cancel{R_B}}\left(\frac{\$C}{\$CR+1} + \frac{1+\$CR}{R}\right)} = \frac{\frac{\$C}{\$CR+1} - \frac{R_B + \$CRR_B}{R\ R_A}}{\cancel{\$CR + \$CR + 1 + \$^2C^2R^2 + \$C}}$$

$$\frac{\$C}{\$CR+1} + \frac{1+\$CR}{R} = \frac{\$CR + \$CR + 1 + \$^2C^2R^2 + \$CR}{R(\$CR+1)} \quad \text{B}$$

$$\frac{\$C}{\$CR+1} - \frac{R_B + \$CRR_B}{R\ R_A} = \frac{\$CRR_A - R_B\$CR - R_B - \$^2C^2R^2R_B - \$CRR_B}{R(\$CR+1)R_A}$$

$$\frac{\$CRR_A - \$CRR_B - R_B - \$^2C^2R^2R_B - \$CRR_B}{R(\$CR+1)R_A} \quad \text{A}$$

$$-\$^2(C^2R^2R_B) + \$(CRR_A - CRR_B - CRR_B) - R_B$$

$$-\$^2(C^2R^2R_B) + \$CR(R_A - 2R_B) - R_B$$

$$\frac{1}{C^2R^2} = \omega_0^2 \qquad \omega_0 = \frac{1}{CR}$$

$\cancel{A}\,\cancel{CR}$

$$\frac{\left(-s^2C^2R^2R_B + sCR(R_A - 2R_B) - R_B\right)\frac{1}{R_A}}{s^2C^2R^2 + s3CR + 1} \qquad \frac{\frac{1}{C^2R^2}}{\frac{1}{C^2R^2}}$$

$$\frac{\left(-s^2R_B\frac{\cancel{C^2R^2}}{\cancel{C^2R^2}} + s\frac{\cancel{CR}}{C^{\cancel{2}}R^{\cancel{2}}}(R_A - 2R_B) - \frac{R_B}{C^2R^2}\right)\frac{1}{R_A}}{s^2\frac{\cancel{C^2R^2}}{\cancel{C^2R^2}} + s3\frac{\cancel{CR}}{C^{\cancel{2}}R^{\cancel{2}}} + \frac{1}{C^2R^2}}$$

$$\frac{-s^2\frac{R_B}{R_A} + s\frac{1}{CR}\left(\frac{R_A}{R_A} - \frac{2R_B}{R_A}\right) - \frac{R_B}{C^2R^2}}{s^2 + s3\frac{1}{RC} + \frac{1}{C^2R^2}} = A_v$$

$$\frac{-s^2\frac{1}{5} + s\,\omega_0\left(1 - 2\frac{1}{5}\right) - \omega_0^2\frac{1}{5}}{s^2 + s3\omega_0 + \omega_0^2} \qquad \frac{R_B}{R_A} = \frac{1}{5}$$

$$A_v = \frac{-s^2\frac{1}{5} + s\,\omega_0\frac{3}{5} - \omega_0^2\frac{1}{5}}{s^2 + s3\omega_0 + \omega_0^2} = \frac{1}{5}\,\frac{\left(-s^2 + s3\omega_0 - \omega_0^2\right)}{s^2 + s3\omega_0 + \omega_0^2}$$

$\cancel{Si}\ \cancel{\omega_0}\ \Omega_W = \omega_0$

$$\cancel{A_v = \frac{1}{5}\left(-s^2 + 3s - 1\right)}$$

$$A_v = \frac{1}{5}\,\frac{\left(-s^2 + 3s - \cancel{\omega_0}\right)}{\left(s^2 + 3s + (\ )\right)} \qquad |A_v(0)|_{dB} = \cancel{A_0}\ 20\log(1/5) \cong -13{,}97$$

Ver ~~SIM~~ ~~T2 SIM~~

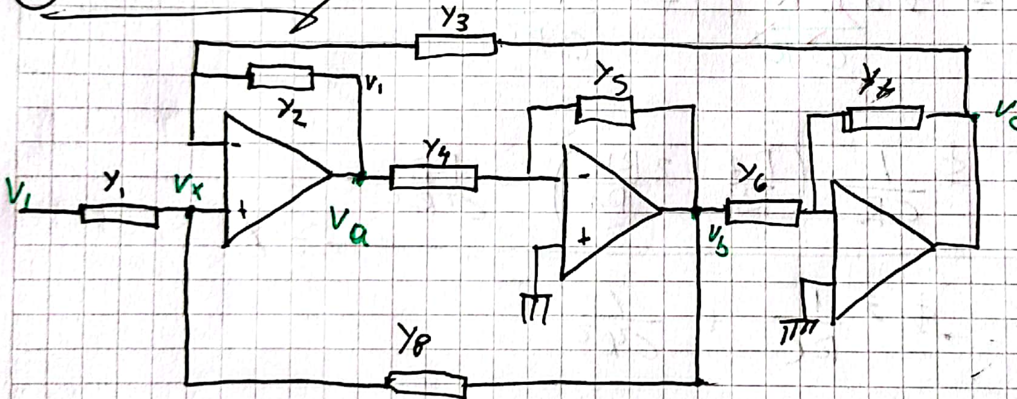
"tp_1_7_b_SIM" y "tp-1_7-b-ac"

1) En un filtro AP con ganancia $k = \frac{R_B}{R_A}$

que para estos valores obtenemos 14dB.

Al ser de orden 2 la fase tiene mayor excursión va de 180 a $-180°$ (π a $-\pi$)

8) ZDTMAB!!!

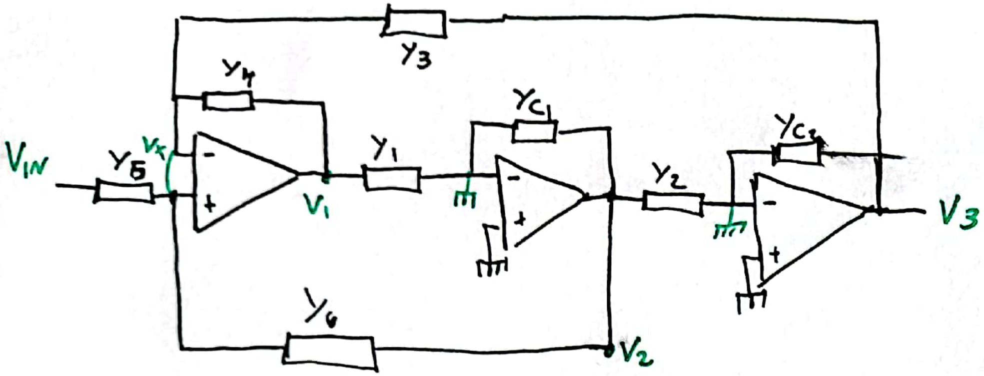


$V_x(Y_1 + Y_8) - V_1 Y_1 - V_b Y_8 = 0$ I

$V_x(Y_2 + Y_3) - V_A Y_2 - V_c Y_3 = 0$ II

$V_a Y_4 = -V_b Y_5$ III

$V_b Y_6 = -V_c Y_7$ IV



Ode

$$V_x(Y_5+Y_6) - V_{IN}Y_5 - V_2 Y_6 = 0 \quad \text{(I)}$$

$$V_x(Y_4+Y_3) - V_3 Y_3 - V_1 Y_4 = 0 \quad \text{(II)}$$

$$V_1(\cancel{Y_4}\, Y_1) = -V_2 Y_{c_1} \quad \text{(III)}$$

$$V_2 Y_2 = -V_3 Y_{c_2} \quad \text{(IV)}$$

$$V_x(Y_3+Y_3) = V_3 Y_3 + V_1 Y_4 \Rightarrow \boxed{V_x = V_3 \frac{Y_3}{Y_3+Y_4} + V_1 \frac{Y_4}{Y_3+Y_4}} \quad \text{(V)}$$

(V) en (I)

$$\boxed{\left(V_3 \frac{Y_3}{Y_3+Y_4} + V_1 \frac{Y_4}{Y_3+Y_4}\right)(Y_5+Y_6) - V_2 Y_6 = V_{IN} Y_5} \quad \text{(VI)}$$

②

$V_1 Y_1 = -V_2 Y_{C_1}$ ∧ $V_2 Y_2 = -V_3 Y_{C_2}$

Expresamos V_1 ∧ V_3 en función de V_2 $\cancel{\boxed{-\dfrac{V_2 Y_{C_1}}{Y_1} = V_1}}$ $\boxed{V_1 = -\dfrac{V_2 Y_{C_1}}{Y_1}}$ (i) $\boxed{V_3 = -\dfrac{V_2 Y_2}{Y_{C_2}}}$ (ii)

(i) ∧ (ii) en (VI)

$$\left[-V_2 \frac{Y_2}{Y_{C_2}} \frac{Y_3}{Y_3+Y_4} - V_2 \frac{Y_{C_1}}{Y_1} \frac{Y_4}{Y_3+Y_4}\right](Y_5+Y_6) - V_2 Y_6 = V_{IN} Y_5 = \left[\frac{(-Y_2 Y_3 \cancel{Y_{C_2}} - Y_{C_1} Y_4 Y_{C_2})(Y_5+Y_6)}{Y_{C_2}(Y_3+Y_4) Y_1} - Y_6\right] V_2$$

$$\cancel{-Y_2 \frac{(Y_3 Y_1 + Y_4 Y_{C_2})(Y_5+Y_6)}{Y_{C_2}(Y_3+Y_4) Y_1} - V_2 Y_6 =}$$

$$V_{IN} Y_5 = -V_2 \frac{Y_1 Y_2 Y_3 Y_5 + Y_1 Y_2 Y_3 Y_6 + Y_{C_1} Y_{C_2} Y_4 Y_5 + Y_{C_1} Y_{C_2} Y_4 Y_6}{Y_{C_2}(Y_3+Y_4) Y_1} - Y_6 V_2$$

$$V_{IN} Y_5 = -V_2 \frac{Y_1 Y_2 Y_3 Y_5 + Y_1 Y_2 Y_3 Y_6 + Y_{C_1} Y_{C_2} Y_4 Y_5 + Y_{C_1} Y_{C_2} Y_4 Y_6 + Y_6 Y_{C_2} Y_3 Y_1 + Y_6 Y_{C_2} Y_4 Y_1}{Y_{C_2} Y_3 Y_1 + Y_{C_2} Y_4 Y_1}$$

Agruyamor. ||||

③

$$\frac{V_{IN}}{V_2} Y_5 = \frac{Y_{C_1}Y_{C_2}(Y_4Y_5 + Y_4Y_6) + Y_{C_2}(Y_1Y_3Y_6 + Y_1Y_4Y_6) + Y_1Y_2Y_3(Y_5+Y_6)}{Y_{C_2}(Y_3+Y_4)Y_1} (-1)$$

$$\frac{V_2}{V_{IN}} = -1 \frac{Y_{C_2}Y_1Y_5(Y_3+Y_4)}{Y_{C_1}Y_{C_2}(Y_4Y_5+Y_4Y_6) + Y_{C_2}Y_1Y_6(Y_3+Y_4) + Y_1Y_2Y_3(Y_5+Y_6)} = \frac{-Y_{C_2}Y_1Y_5(Y_3+Y_4)}{Y_{C_1}Y_{C_2}Y_4(Y_5+Y_6) + Y_{C_2}Y_1Y_6(Y_3+Y_4) + Y_1Y_2Y_3(Y_5+Y_6)}$$

$$\frac{V_2}{V_{IN}} = \frac{-\$C_2 \frac{1}{R_1R_5}\left(\frac{1}{R_3}+\frac{1}{R_4}\right)}{\$^2\frac{C_1C_2}{R_4}\cdot\left(\frac{1}{R_5}+\frac{1}{R_6}\right) + \$\frac{C_2}{R_1R_6}\left(\frac{1}{R_3}+\frac{1}{R_4}\right) + \frac{1}{R_1R_2R_3}\left(\frac{1}{R_5}+\frac{1}{R_6}\right)}$$

$$\frac{V_2}{V_{IN}} = \frac{-\$\frac{\cancel{C_2}}{C_1\cancel{C_2}} R_4 \frac{\left(\frac{1}{R_3}+\frac{1}{R_4}\right)}{\frac{1}{R_5}+1/R_6}\frac{1}{R_1R_5}}{\$^2 + \$\frac{\cancel{C_2}}{R_1R_6}\frac{\left(\frac{1}{R_3}+\frac{1}{R_4}\right)}{\cancel{\frac{1}{R_5}+\frac{1}{R_6}}}\frac{R_4}{C_1\cancel{C_2}} + \frac{1}{R_1R_2R_3}\frac{\cancel{\left(\frac{1}{R_5}+\frac{1}{R_6}\right)}}{\cancel{\left(\frac{1}{R_5}+\frac{1}{R_6}\right)}}\frac{R_4}{C_1C_2}}$$

$$\frac{V_2}{V_{IN}} = \frac{-\$\frac{R_4}{C_1R_1R_5}\frac{\frac{1}{R_3}+1/R_4}{1/R_5+1/R_6}}{\$^2 + \$\frac{R_4}{R_1R_6C_1}\frac{\frac{1}{R_3}+\frac{1}{R_4}}{\frac{1}{R_5}+\frac{1}{R_6}} + \omega_0^2}$$

$$\omega_0^2 = \frac{1}{\frac{R_1R_2R_3}{R_4}C_1C_2}$$

Si $R_1 = R_2 = R \wedge \frac{R_3}{R_4} = 1 \quad C_1 = C_2 = C \Rightarrow \omega_0^2 = \frac{1}{R^2C^2} \Rightarrow \omega_0 = \frac{1}{RC}$

$$\frac{\omega_0}{Q} = \frac{1}{RC} \cdot \frac{R_4}{R_6} \frac{\left(\frac{1}{R_3} + \frac{1}{R_4}\right)}{\left(\frac{1}{R_5} + \frac{1}{R_6}\right)} = \omega_0 \frac{R_4}{R_6} \frac{\frac{R_3 + R_4}{R_3 \cdot R_4}}{\frac{R_5 + R_6}{R_5 R_6}} = \omega_0 \cancel{\frac{R_4}{R_6}} \cdot \frac{R_3 + R_4}{R_3 \cancel{R_4}} \cdot \frac{R_5 \cancel{R_6}}{R_5 + R_6}$$

$$\frac{\cancel{\omega_0}}{Q} = \cancel{\omega_0} \frac{(R_3 + R_4)\ R_5}{(R_5 + R_6)\ R_3} \Rightarrow \boxed{Q = \frac{R_5 + R_6}{R_3 + R_4} \frac{R_3}{R_5}}$$

Si $R_4 = R_3 \wedge R_5 = R_6 \Rightarrow \boxed{Q = 1}$

Filtro pasa banda.

(9)

Volvedo a (II) $\wedge$ (III) $\quad V_1 Y_1 = -V_2 Y_{C_1} \quad \wedge \quad V_2 Y_2 = -V_3 Y_{C_2}$

Buscamos $V_2(V_3)$ $\quad \boxed{V_2 = -V_3 \dfrac{Y_{C_2}}{Y_2}}$ (iii) $\qquad V_1(V_3) \Rightarrow V_1 = -\dfrac{V_2 Y_{C_1}}{Y_1} = (-)(-V_3)\dfrac{X_{C_2}}{Y_2}\dfrac{Y_{C_1}}{Y_1} = \boxed{\dfrac{V_3 Y_{C_1} Y_{C_2}}{Y_2 Y_1}}$ (iv)

(iv)
(iii) en (VI)

$$V_3\left(\frac{Y_3}{Y_3+Y_4} + \frac{Y_{C_1}Y_{C_2}}{Y_2 Y_1}\frac{Y_4}{Y_3+Y_4}\right)(Y_5+Y_6) + V_3\frac{Y_{C_2}}{Y_2}Y_6 = V_{IN} Y_5$$

$$\frac{V_{IN}Y_5}{V_3} = \frac{(Y_3Y_2Y_1 + Y_{C_1}Y_{C_2}Y_4)(Y_5+Y_6)}{(Y_3+Y_4)Y_2Y_1} + \frac{Y_{C_2}Y_6}{Y_2} = \frac{Y_1Y_2Y_3Y_5 + Y_{C_1}Y_{C_2}Y_4Y_5 + Y_1Y_2Y_3Y_6 + \cancel{\cdots} + Y_{C_1}Y_{C_2}Y_4Y_6}{Y_1(Y_3+Y_4)Y_2}$$

$$+\frac{Y_{C_2}Y_6Y_3Y_1 + Y_{C_2}Y_6Y_1Y_4}{}$$

$$\frac{V_{IN}}{V_3}Y_5 = \frac{Y_{C_1}Y_{C_2}(Y_4Y_5+Y_4Y_6) + Y_{C_2}(Y_3+Y_4)Y_1Y_6 + Y_1Y_2Y_3(Y_5+Y_6)}{Y_1Y_2(Y_3+Y_4)}$$

$$\frac{V_3}{V_{IN}} = \frac{Y_1Y_2(Y_3+Y_4)}{Y_{C_1}Y_{C_2}Y_4(Y_5+Y_6) + Y_{C_2}Y_1Y_6(Y_3+Y_4) + Y_1Y_2Y_3(Y_5+Y_6)}\frac{1}{Y_5} = \frac{\dfrac{Y_3+Y_4}{R_1R_2}\quad\dfrac{R_5}{C_1C_2(Y_5+Y_6)}}{\dfrac{s^2C_1C_2(Y_5+Y_6)Y_4}{C_1C_2(Y_5+Y_6)Y_4} + \dfrac{sC_2}{R_1R_6}\dfrac{(Y_3+Y_4)}{Y_4C_1C_2(Y_5+Y_6)} + \dfrac{Y_5+Y_6}{R_1R_2R_3}\dfrac{1}{(Y_5+\cdots}}$$

⑥

$$\frac{V_3}{V_1} = \frac{\quad}{s^2 + s\,\frac{1}{R_1C_1}\,\frac{Y_3+Y_4}{Y_5+Y_6}\,\frac{1}{R_6} + \frac{1}{R_1R_2R_3C_1C_2}}$$

OJO ACA no da el ω_0^2 fácilmente → Te morfaste el Y_4 de $Y_{C_1}Y_{C_2}Y_4(Y_5\,Y_6)$

Corrigiendo el moco

$$\frac{V_3}{V_1} = \frac{R_5\,\frac{Y_3+Y_4}{Y_5+Y_6}\,\frac{1}{R_1R_2C_1C_2}}{s^2 + s\,\frac{1}{R_1C_1}\,\frac{Y_3+Y_4}{Y_5+Y_6}\,\frac{Y_6}{Y_4} + \frac{1}{C_1C_2R_1R_2\frac{R_3}{R_4}}}$$

Si $\frac{R_3}{R_4} = 1 \Rightarrow \omega_0^2 = \frac{1}{C_1C_2R_1R_2}$ $\wedge$ $R_1 = R_2 = R$, $C_1 = C_2 = R$ $\qquad \omega_0^2 = \frac{1}{R^2C^2} \Rightarrow \omega_0 = \frac{1}{RC}$

Filtro pasabajos.

Volvemos a (II) (III), (VI) para buscar $\frac{V_1}{V_{in}}$ $\qquad V_2 = -\frac{V_1 Y_1}{Y_{C_1}}$ (4)

$$V_3 = -V_2 \frac{Y_2}{Y_{C_2}} = (-)(-V_1)\frac{Y_2}{Y_{C_2}}\frac{Y_1}{Y_{C_1}}$$

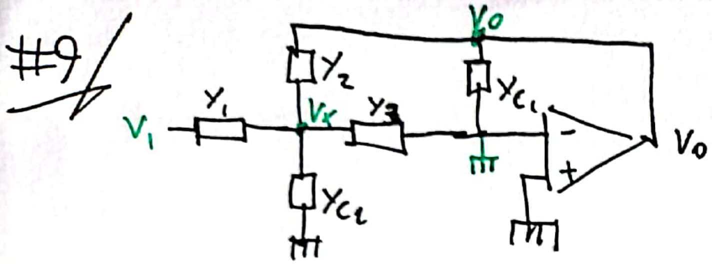
$$\left(V_1 \frac{Y_2 Y_1}{Y_{C_2} Y_{C_1}} \frac{Y_3}{Y_3+Y_4} + \frac{V_1 Y_4}{\cancel{Y_3+Y_4}}\right)(Y_5+Y_6) + V_1 \frac{Y_1}{Y_{C_1}} Y_6 = V_{in} Y_5 = V_1 \frac{Y_1 Y_6}{Y_{C_1}} + V_1 \frac{(Y_1 Y_2 Y_3 + Y_{C_1} Y_{C_2} Y_4)(Y_5+Y_6)}{Y_{C_2} Y_{C_1} (Y_3+Y_4)}$$

$$\frac{V_{in}}{V_1} = \frac{Y_1 Y_2 Y_3 (Y_5+Y_6) + Y_{C_1} Y_{C_2} Y_4 (Y_5+Y_6) + Y_1 Y_6 Y_{C_2} (Y_3+Y_4)}{Y_{C_2} Y_{C_1} (Y_3+Y_4) Y_5}$$

$$\frac{V_1}{V_{in}} = \frac{s^2 C_2 C_1 (Y_3+\cancel{Y_4}) Y_5}{s^2 \frac{C_1 C_2}{R_4}(Y_5+Y_6) + s \frac{C_2}{R_1 R_6}(Y_3+Y_4) + \frac{(Y_5+Y_6)}{R_1 R_2 R_3}} = \frac{s^2 \frac{\cancel{C_2 C_1} (Y_3+Y_4) Y_5}{\cancel{C_1 C_2} Y_4 (Y_5+Y_6)}}{s^2 + s \frac{1}{C_1 R_1} \frac{(Y_3+\cancel{Y_4})}{(Y_5+Y_6)} \frac{R_4}{R_6} + \frac{1}{C_1 C_2 R_1 R_2 \frac{R_3}{R_4}}}$$

Filtro pasa altos.

#9



$V_x(Y_1+Y_2+Y_3+Y_{C_2}) - V_oY_2 - V_1Y_1 = 0$

$V_xY_3 = -V_oY_{C_1} \Rightarrow V_x = -V_o\dfrac{Y_{C_1}}{Y_3}$

$-V_o\dfrac{Y_{C_1}}{Y_3}(Y_1+Y_2+Y_3+Y_{C_2}) - V_oY_2 = V_1Y_1 = \cancel{-V_o(Y_1+Y_2+Y_3+Y_{C_2})}$

$-V_o\left(\dfrac{Y_{C_2}Y_{C_1}+Y_{C_1}(Y_1+Y_2+Y_3)+Y_2Y_3}{Y_3}\right) = V_1Y_1 \Rightarrow \dfrac{V_o}{V_1} = \dfrac{-Y_3Y_1}{Y_{C_2}Y_{C_1}+Y_{C_1}(Y_1+Y_2+Y_3)+Y_2Y_3}$

$$\frac{V_o}{V_1} = \frac{-\frac{1}{R_3R_1}\frac{1}{C_2C_1}}{\frac{s^2C_2C_1}{C_2C_1}+\frac{sC_1}{C_2C_1}\left(\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}\right)+\frac{1}{R_2R_3C_2C_1}} = \frac{\frac{1}{R_3R_1C_2C_1}}{s^2+s\frac{1}{C_2}\frac{R_2R_3+R_1R_3+R_1R_2}{R_1R_2R_3}+\frac{1}{R_2R_3C_1C_2}}$$

$\omega_0^2 = \dfrac{}{R_2R_3C_1C_2}$ $\quad R_1=R_2=R_3=1 \quad \omega_0^2 = \dfrac{1}{C_1C_2} \quad \left.\begin{matrix}C_1 = 1\\ C_2\ 0.01\end{matrix}\right\} \Rightarrow \omega_0 = 10$

$\dfrac{\omega_0}{Q} = \dfrac{R_2R_3+R_1R_3+R_1R_2}{C_2R_1R_2R_3} \qquad \dfrac{\omega_0}{Q} = \dfrac{1+1+1}{C_2\,1} = \dfrac{3}{C_2} \qquad \dfrac{10}{3}\cdot 1 = Q = 3.3\hat{3}$

L9

$$\omega_0^2 = 1000^2 = \frac{1}{C_1 C_2 R^2} = \frac{1}{C^2 R^2} \qquad 1000 = \frac{1}{RC} \qquad C = 4700\times10^{-12} \qquad R = 212k$$

$R_1 = R_2 = R_3 = 212\,k\Omega$

$$\frac{\omega_0}{Q} = \frac{1000}{Q} = \frac{3.(211k)^2}{2\,(212k)^3}$$

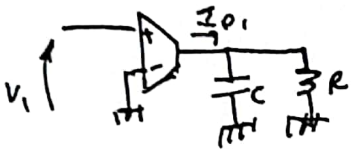
$Q = 0{,}33$ lo pegue al ao pero dice vago el Q

Simular.

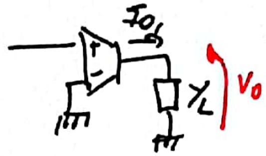
con estos valores mantengo la ganancia (odb) a la banda de paso pero el Q del filtro a menor.

10

10/



$Y_L = Y_C + Y_R$ $\Longrightarrow$



$V_1 \, g_m Y_L = V_o$ $\qquad \dfrac{V_o}{V_1} = g_m Y_L$

$$\frac{V_o}{V_1} = g_m(Y_C + Y_R) = g_m\left(sC + \frac{1}{R}\right) = g_m \, \frac{sCR + 1}{R} = \boxed{g_m\left(sC + \frac{1}{R}\right)}$$