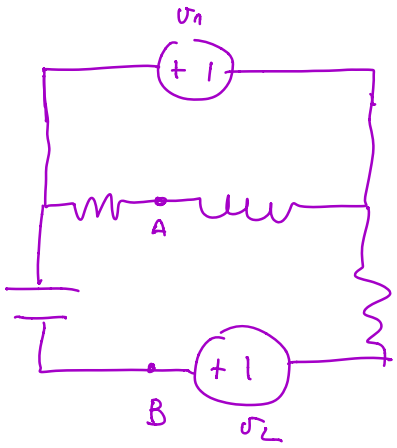
FFT2 GIADE



$v_1 = \cos\left(10^3 t + \frac{\pi}{2}\right)$

$v_2 = 2\sin\left(10^3 t + \frac{\pi}{3}\right) =$

$2\cos\left(10^3 t + \frac{4\pi}{3} - \frac{\pi}{2}\right) =$

$= 2\cos(10^3 t + 0{,}83\pi)\,V$

En fasores:

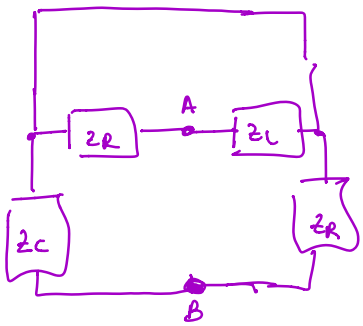
$V_1 = e^{j\pi/2}\,V \qquad V_2 = 2\,e^{j0{,}83\pi}\,V$

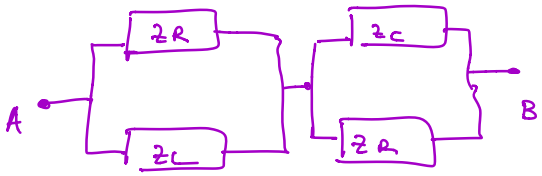
$Z_R = 100\,\Omega$

$Z_C = \frac{1}{j\omega C} = \frac{1}{j\,10^3\,10\,10^{-6}} = \frac{1}{j\,10^4\,10^{-6}} = \frac{1}{j\,10^{-2}} = -j\,100\,\Omega$

$Z_L = j\omega L = j\,10^3\,100\,10^{-3} = 100j\,\Omega$

Zth



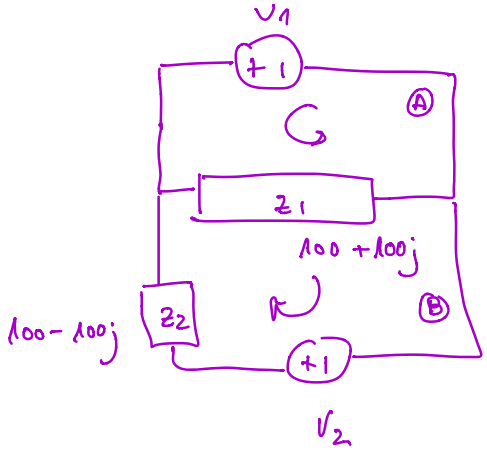


z_{p1} z_{p2}

$$z_{p1} = \frac{100 \cdot 100j}{100 + 100j} = \frac{100j}{1+j} = 50 + 50j$$

$$z_{p2} = \frac{100 \cdot -100j}{100 - 100j} = \frac{-100j}{1-j} = 50 - 50j$$

$$Z_{th} = z_{p1} + z_{p2} = 100\,\Omega$$



$1\angle 90^\circ$ $100 + 100j$ $100 + 100j$

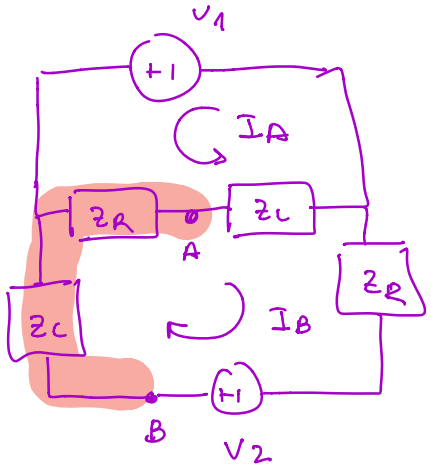
$$V_1 = I_A Z_1 + Z_1 I_B$$

$$V_2 = I_B (Z_1 + Z_2) + Z_1 I_A$$

$2\angle 0{,}83$ 200 $100 + 100j$

$I_A = 0{,}19\,\angle 0{,}79$ A

$I_B = 0{,}12\,\angle -2{,}37$ A



$$V_A - V_B = -Z_R(I_A + I_B) - Z_C I_B$$

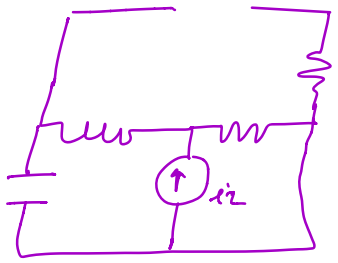
$$= -Z_R I_A - Z_C(I_A + I_B) = 2e^{-j2'71}\ V =$$

$$= (-1'87 - 0'85j)\ V$$

$$I_N = \frac{V_{th}}{Z_{th}} = (-0'0093 - j0'0043)\ A = 0'010\, e^{-j2'71}\ A$$

FFT1 GIADE

Uso superposición **Circuito 1** anulo i_1



$\omega_2 = 2\cdot10^3$

$I_2 = 2\angle j^{0'83\pi}$ A

$Z_R = 100$

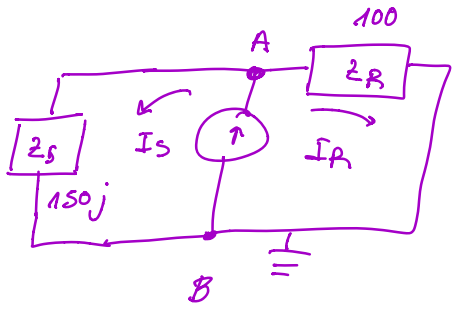
$Z_L = j\omega_2 L =$

$= j\ 2\cdot10^3\ 10^2 10^{-3} = 200j$

$Z_C = \dfrac{1}{j\ 2\cdot10^3\ 10\ 10^{-6}} = \dfrac{1}{j\ 2\ 10^{-2}} = -50j$

$Z_S = Z_L + Z_C = (200-50)j$

$= 150j$



$I_2 = I_S + I_R = 2\angle^{j0'83\pi} = \dfrac{V_A}{Z_S} + \dfrac{V_A}{Z_R} =$

$= V_A\left(\dfrac{1}{Z_S} + \dfrac{1}{Z_R}\right) = V_A\dfrac{(Z_S+Z_R)}{Z_R Z_S}$

$V_A = \alpha\, e^{j0'83\pi}_{mA}\dfrac{Z_S Z_R}{Z_S + Z_R} = 2e^{j0'83\pi}\dfrac{150j\ 100}{100+150j}$

$= (-166'17 - 8'97i)_{mV}$

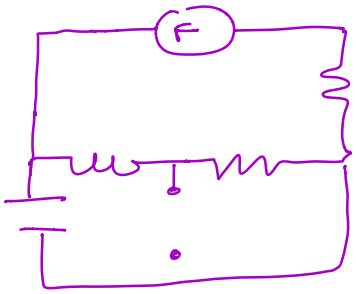
$= 166'41\ e^{-j\,3'09}\ mV$

Circuito 2 anulo i_2

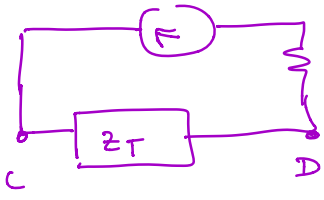
$Z_R = 100$

$Z_C = -100j$

$Z_L = 100j$



$I_A = e^{j\pi/2}\ A$

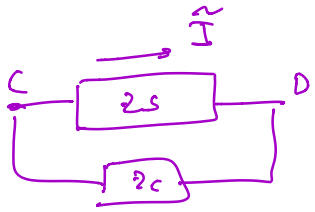


$$Z_T = \frac{Z_S \cdot Z_C}{Z_C + Z_S}$$

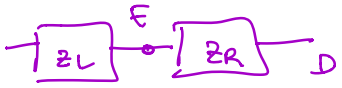
Con $Z_S = Z_R + Z_L = 100 + 100j$

$$Z_T = \frac{(100+100j)\ -100j}{100+100j-100j} = (1+j)(-100j) = -100j + 100$$

$$V_C - V_D = I_1 Z_T = \underbrace{e^{j\pi/2}}_{j} \cdot (-100j+100) = 100+100j$$



$$\tilde{I} = \frac{U_C - U_D}{Z_S} = \frac{100 + 100j}{100 + 100j} = 1\,mA$$



$$V_E - V_D = Z_R \cdot \tilde{I} = 100\,mV$$

Circuito 1

$$166'41\ \angle\ -3'09\ mV = ddp \Rightarrow v_{R1}(t) = 0'17\cos(2\cdot10^3 t - 3'09)\,V$$

$$i_{R1}(t) = 0'017\cos(2\cdot10^3 t - 3'09)\,mA = \frac{v_{R1}(t)}{100\,\Omega}$$

Circuito 2

$$v_{R2}(t) = 0'1\cos(10^3 t)\,V$$

$$i_{R2}(t) = 0'17\cos(2\cdot10^3 t - 3'09)\,mA$$

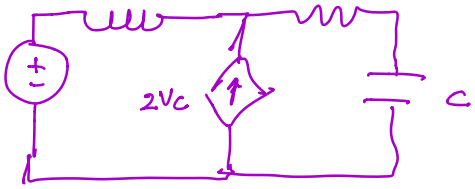
$$v_R(t) = \left(0'17\cos(2\cdot10^3 t - 3'09) + 0'1\cos(10^3 t)\right)V$$

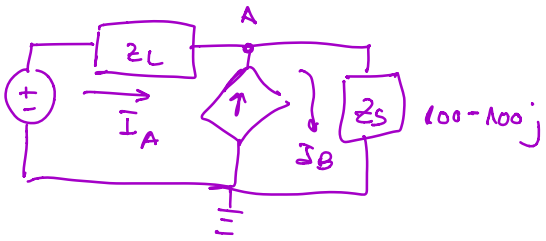
FFTZ GIM

$Z_R = 100\,\Omega$

$Z_C = -100j$

$Z_L = 100j$





$$I_A + 2V_C = I_B$$

$$\frac{V_1 - V_A}{Z_L} + 2V_C = \frac{V_A}{Z_S} \qquad V_C = I_B Z_C = \frac{V_A}{Z_S} Z_C$$

$$\frac{V_1 - V_A}{Z_L} + 0'0\,2\,\frac{V_A}{Z_S} Z_C = \frac{V_A}{Z_S}$$

$$\frac{V_1}{Z_L} = \frac{V_A}{Z_S} - 0'02\,\frac{V_A}{Z_S} Z_C + \frac{V_A}{Z_L}$$

$$V_1 = Z_L V_A \left(\frac{1}{Z_S} - 0'02\,\frac{Z_C}{Z_S} + \frac{1}{Z_L} \right) = (-0'5 - 0'5i) V_A$$

$$V_A = (-1 - i)\,V = \sqrt{2}\, e^{-j\,2'36}\, V$$

$$I_B = \frac{V_A}{Z_5} = -0{,}01j = 0{,}01\, e^{-j\pi/2}$$

$$i_B(t) = 0{,}01 \cos(10^3 t - \pi/2)$$

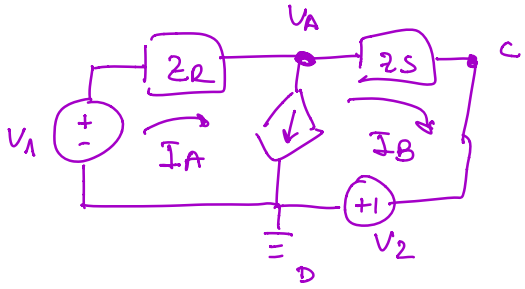
$$p(t)_R = v_R(t)\, i_R(t) = i_R^2(t)\, R$$

$$V_C = -1 = 1\, e^{j\pi}$$

$$v_C(t) = \cos(10^3 t + \pi)\, V$$

$$p_C(t) = \cos(10^3 t + \pi)\; 0{,}01 \cos(10^3 t - \pi/2)$$

$I_A = 0'03\, V_L + I_B$



$$\frac{V_1 - V_A}{Z_R} = I_A$$

$$I_B = \frac{V_A + V_2}{Z_S}$$

$$V_L = I_B Z_L = \frac{V_A + V_2}{Z_S} Z_L$$

$V_D - V_C = V_2 \Rightarrow V_C = -V_2$ ($V_D = 0$)

$V_A - V_C = I_B Z_S$

$V_A - (-V_2) = I_B Z_S$

$$\frac{V_A + V_2}{Z_S} = I_B$$

$$\frac{V_1 - V_A}{Z_R} = 0'03 \left(\frac{V_A + V_2}{Z_S}\right) Z_L + \frac{V_A + V_2}{(Z_S)}$$

$$= \left(0'03\, Z_L + 1\right)\left(\frac{V_A + V_2}{Z_S}\right) = \frac{V_1 - V_A}{Z_R}$$

$$\frac{\left(0'03\, Z_L + 1\right) Z_R}{Z_S}\left(V_A + V_2\right) = \left(V_1 - V_A\right)$$

$\rightarrow (6 - j)$

$Z_L = 200j$ $\qquad Z_S = 100j$

$Z_R = 100$

$Z_C = -100j$

$F V_A + F V_2 = V_1 - V_A$

$\left(V_A + F V_A\right) = V_1 - F V_2$

$$V_A = \frac{V_1 - F V_2}{(1+F)}$$

$$V_A = (1'44 - 0'77\,i)\ V$$

$$\boxed{V_A = 1'63\, e^{-j0'49}\ V}$$

$$V_1 = 1\, e^{j\pi/2} = j$$

$$V_2 = 2\, e^{j0'78\pi}$$

$$I_B = \frac{V_A + V_2}{Z_S} = 0'0038\, e^{j0'85}\ A$$

$$V_L = I_B Z_L = 0'75\, e^{j2'42}\ V$$

$$i_c(t) = 0'003 \cos(10^3 t + 0'85)\ A$$

$$v_L(t) = 0'75 \cos(10^3 t + 2'42)\ V$$

$$\boxed{p(t) = 0'00225 \cos(10^3 t + 0'85) \cos(10^3 t + 2'42)\ W}$$