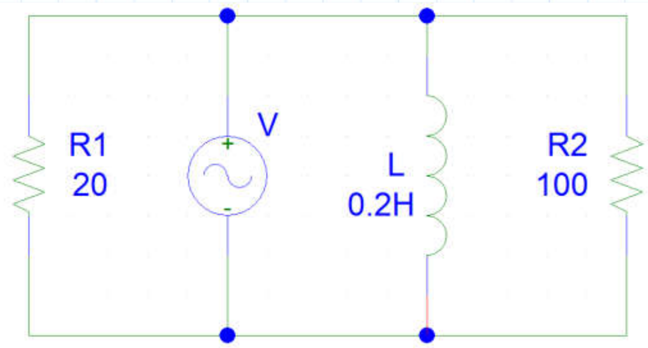
$R_1 := 20\ \Omega$ $R_2 := 100\ \Omega$

$L := 0.2\ H$

$V := (5\angle 180\ °)\ V$ $\omega := 1000\ \frac{rad}{s}$

$X_L := j\cdot\omega\cdot L = 200i\ \Omega$

Calcolare la corrente sul generatore
Verificare che la corrente sul generatore è pari alla somma delle correnti su R1, R2 ed L



$$Z_1 := \frac{R_2\cdot X_L}{R_2+X_L} = \frac{100\cdot j1000\cdot 0.2}{100+j1000\cdot 02} = \frac{j20000}{100+j200} = \frac{j200}{1+j2}\cdot\frac{1-j2}{1-j2}$$

$$= \frac{j200+400}{1-4} = \frac{400}{5} - j\,\frac{200}{5} = 80 - j\ 40\ \Omega \qquad Z_1 = (80+40i)\ \Omega$$

$$= \sqrt{80^2+40^2}\ \measuredangle atg\left(\frac{40}{80}\right) = 89.443\ \Omega\ \measuredangle 26.565$$

$$\text{polar}(Z_1) = [89.443\ \Omega\ \ 26.565]$$

$$Z_{tot} := \frac{R_1\cdot Z_1}{R_1+Z_1}$$

$$= \frac{20\cdot 89.443\ \measuredangle 26.565}{20+80+j40} = \frac{1.789\cdot 10^3\ \ \measuredangle 26.565}{100+j40} = \frac{1.789\cdot 10^3\ \ \measuredangle 26.565}{\sqrt{100^2+40^2}\ \measuredangle atg\left(\frac{40}{100}\right)}$$

$$= \frac{1.789\cdot 10^3\ \ \measuredangle 26.565}{107.703\ \measuredangle atg\left(\frac{40}{100}\right)} = \frac{1.789\cdot 10^3}{107.703}\ \measuredangle(26.565-75.964) = 16.609\ \Omega\ \measuredangle(4.764)$$

$$\text{polar}(Z_{tot}) = [16.609\ \Omega\ \ 4.764]$$

$$= 16.609\cdot\cos(4.764) + j16.609\cdot\text{sen}(4.764) = 16.552 + j\cdot 1.379\ \Omega$$

$$Z_{tot} = (16.552+1.379i)\ \Omega$$

$$I := \frac{V}{Z_{tot}} = \frac{5\ \measuredangle 180}{16.609\ \measuredangle 4.764} = \frac{5}{16.609}\ \measuredangle(180-4.764) = 0.301\ A\ \measuredangle(175.236)$$

$$\text{polar}(I) = \left[(301.04\cdot 10^{-3})\ A\ \ 175.236\right]$$

$$= 0.301\cdot\cos(175.236) + j0.301\cdot\text{sen}(175.236) = -0.3 + j\cdot 0.025\ A$$

$$I = (-300\cdot 10^{-3} + 25i\cdot 10^{-3})\ A$$

In alternativa e molto più velocemente:

$$Y := \frac{1}{Z_{tot}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{j\omega L} = \frac{1}{20} + \frac{1}{100} + \frac{1}{j200} = 0.05 + 0.01 - j\cdot 0.005$$

$$= 0.06 - j\cdot 0.005 = \sqrt{0.06^2+0.005^2}\ \measuredangle atg\left(\frac{-0.005}{0.06}\right) = 60.208\cdot 10^{-3}\angle -4.764$$

$$I := V\cdot Y = (5\angle 180\ °)\cdot(60.208\cdot 10^{-3}\angle -4.764\ °) = 0.301\ A\ \measuredangle(175.236)$$

Calcolo delle correnti sui 3 componenti passivi:

$$I_{R1} := \frac{V}{R_1} = \frac{5\angle 180}{20} = 0.25\ A\angle 180 = -0.25\ A \qquad I_{R1} = \left(-250 \cdot 10^{-3} + 30.615i \cdot 10^{-18}\right)\ A$$

$$\mathrm{polar}\left(I_{R1}\right) = \left[\left(250 \cdot 10^{-3}\right)\ A\ \ 180\right]$$

$$I_{R2} := \frac{V}{R_2} = \frac{5\angle 180}{100} = 0.05\ A\angle 180 = -0.05\ A \qquad I_{R2} = \left(-50 \cdot 10^{-3} + 6.123i \cdot 10^{-18}\right)\ A$$

$$\mathrm{polar}\left(I_{R2}\right) = \left[\left(50 \cdot 10^{-3}\right)\ A\ \ 180\right]$$

$$I_L := \frac{V}{X_L} = \frac{5\angle 180}{j \cdot 200} = \frac{5\angle 180}{200\angle 90} = 0.025\ A\angle 90\ A = j \cdot 0.025\ A$$

$$I_L = \left(3.062 \cdot 10^{-18} + 25i \cdot 10^{-3}\right)\ A$$

$$\mathrm{polar}\left(I_L\right) = \left[\left(25 \cdot 10^{-3}\right)\ A\ \ 90\right]$$

Verifica che la somma delle 3 corrrenti calcolate sia pari ad I sul generatore

$$I_{R1} + I_{R2} + I_L = -0.25 - 0.05 + j \cdot 0.025 = -0.30 + j \cdot 0.025\ A = I$$

$$I_{R1} + I_{R2} + I_L = \left(-300 \cdot 10^{-3} + 25i \cdot 10^{-3}\right)\ A$$