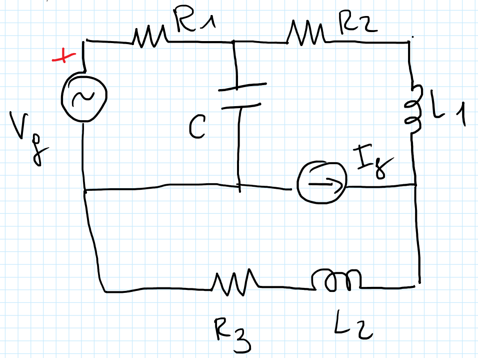

$V_g = 10\cos(\omega t + \frac{\pi}{3})$ [V]

$I_g = -5 \operatorname{sen}(\omega t)$ [A]

$R_1 = 50\,[\Omega]$ $L_1 = 1\,[mH]$

$R_2 = 10\,[\Omega]$ $L_2 = 5\,[mH]$

$R_3 = 5\,[\Omega]$ $C = 100\,[\mu F]$

$\omega = 1000$ [rad/s]

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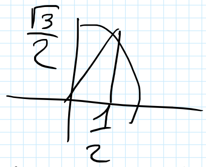
1 → DISEGNARE IL CIRCUITO SIMBOLICO NEL DOMINIO DEI FASORI



1a → FASORI DEI GENERATORI

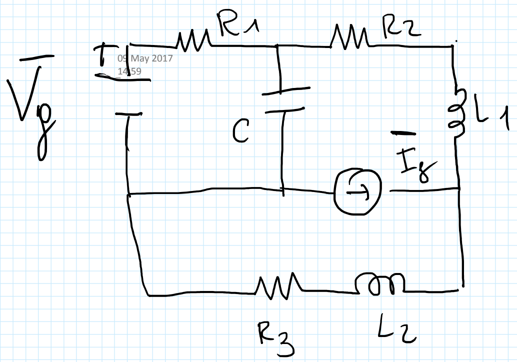
$$V_g = 10\cos(\omega t + \frac{\pi}{3})\,[V] \Rightarrow \bar{V}_g = 10 e^{j\frac{\pi}{3}} = 10\left(\frac{1}{2} + j\frac{\sqrt{3}}{2}\right)\,[V]$$

$60°$

$$I_g = -5 \operatorname{sen}(\omega t)\,[A] \Rightarrow \bar{I}_g = -5 e^{-j\frac{\pi}{2}} = -5 \cdot -j = 5j$$

$$\operatorname{sen}(\omega t) = \cos(\omega t - \frac{\pi}{2})$$

1b → sostituisco i bipoli con le rispettive IMPEDENZE



$$Z_{R_1} \stackrel{\circ}{=} R_1 = 50\,[\Omega]\;;\; Z_{R_2} \stackrel{\circ}{=} R_2 = 10\,[\Omega]$$

$$Z_{R_3} \stackrel{\circ}{=} R_3 = 5\,[\Omega]$$

$$Z_{L_1} = j\omega L_1 = j1\,[\Omega]$$

$$Z_{L_2} = j\omega L_2 = j5\,[\Omega]$$

$$Z_C = \frac{1}{j\omega C} = \frac{-j}{\omega C} = \frac{-j}{10^3 \cdot 10^{-4}} = -j10\,[\Omega]$$

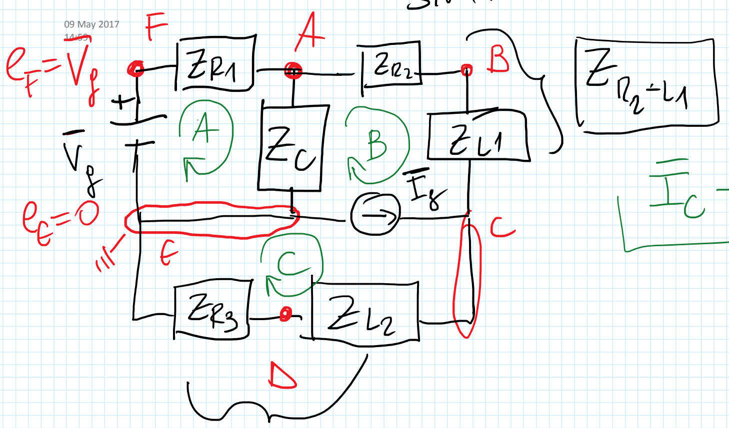
$$\tau = \frac{L}{R} \qquad L = \tau R$$

$$[H] = [s][\Omega]$$

$$\tau = RC$$

CIRCUITO SIMBOLICO

CIRCUITO SIMBOLICO



$$\boxed{\bar I_C - \bar I_B = \bar I_g}$$

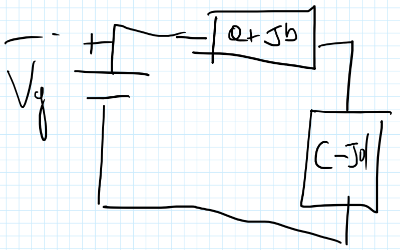
$$Z = 3 - J\,10$$

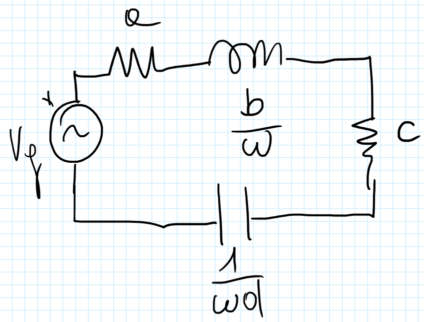
R C

$$\boxed{Z_{R_3-L_2}} = 5 + J5 \ [\Omega]$$

R L

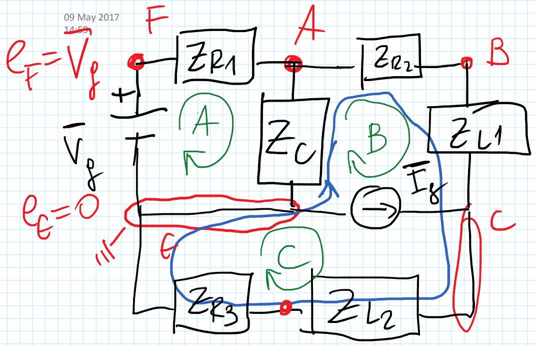
$a, b, c, d > 0$





$$d = \frac{1}{\omega C}$$

$$C = \frac{1}{\omega d}$$



(A) $\bar I_A \cdot Z_{R_1} + (\bar I_A - \bar I_B) Z_C - \bar V_g = \bar 0$

(B-C) $\bar I_B \cdot Z_{R_2} + \bar I_B \cdot Z_{L_1} + \underset{(\bar I_B + \bar I_g)}{\bar I_C} Z_{L_2} + \underset{(\bar I_B + \bar I_g)}{\bar I_C} Z_{R_3} + (\bar I_B - \bar I_A) \cdot Z_C = 0$

$$\bar I_g = \bar I_C - \bar I_B \Rightarrow \bar I_C = \bar I_g + \bar I_B$$

$$\bar I_B = \bar I_C - \bar I_g$$

(A) $\bar I_A (Z_{R_1} + Z_C) \quad - \bar I_B Z_C = \bar V_g$

(B-C) $-\bar I_A Z_C \quad + \bar I_B (Z_{R_2} + Z_{L_1} + Z_{L_2} + Z_{R_3} + Z_C) = -\bar I_g (Z_{L_2} + Z_{R_3})$

$$\begin{bmatrix} \underbrace{Z_{R_1}+Z_C} & -Z_C \\ -Z_C & \underbrace{(Z_{R_2}+Z_{R_3}+Z_{L_1}+Z_{L_2}+Z_C)} \end{bmatrix} \begin{bmatrix} \bar{I}_A \\ \bar{I}_B \end{bmatrix} = \begin{bmatrix} \bar{V}_g \\ -\bar{I}_g(Z_{L_2}+Z_{R_3}) \end{bmatrix}$$

$Z_{R_1}=50 \quad Z_{R_2}=10 \quad Z_{R_3}=5 \qquad Z_{L_1}=J \quad Z_{L_2}=5J \quad Z_C-10J \quad [\Omega]$

$$\begin{bmatrix} 50-J10 & 10J \\ 10J & 15-4J \end{bmatrix} \begin{bmatrix} \bar{I}_A \\ \bar{I}_B \end{bmatrix} = \begin{bmatrix} 10e^{J\frac{\pi}{3}} = 10\left(\frac{1}{2}+J\frac{\sqrt{3}}{2}\right) \\ -5J(5+5J) = 25-25J \end{bmatrix}$$

$$\Delta = (50-J10)(15-4J)+100 =$$

$$750-200J-150J-40+100 = 810-J350 =$$

$$\text{FORMA POLARE} = \sqrt{810^2+350^2}\; e^{J\,tg^{-1}\left(-\frac{350}{810}\right)}$$

$$= 882.4 \angle -0.4\,\text{rad} \;/\!-23^\circ$$

$$\begin{bmatrix} 50-J10 & 10J \\ 10J & 15-4J \end{bmatrix} \begin{bmatrix} \bar{I}_A \\ \bar{I}_B \end{bmatrix} = \begin{bmatrix} 10e^{J\frac{\pi}{3}} = 10\left(\frac{1}{2}+J\frac{\sqrt{3}}{2}\right) \\ -5J(5+5J) = 25-25J \end{bmatrix}$$

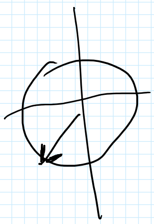
$$\bar{I}_A = \frac{\begin{vmatrix} 10\left(\frac{1}{2}+J\frac{\sqrt{3}}{2}\right) & 10J \\ 25-25J & 15-4J \end{vmatrix}}{\Delta} = \frac{10\left(\frac{1}{2}+J\frac{\sqrt{3}}{2}\right)(15-4J)-10J(25-25J)}{882.4\angle -23^\circ}$$

$$\bar{I}_A = \frac{75-20J+J\overset{1.7\cdot 75}{\sqrt{3}\,75}+\overset{\simeq 34}{\sqrt{3}\cdot 20}-J250-250}{882.4\angle -23^\circ}$$

127.5

$$882.4 \angle -23^\circ$$

$$-141 + j\left(-270 + \overset{127.5}{1.7 \cdot 75}\right)$$



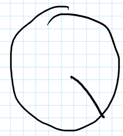
$$\frac{-141 - j\,142.5}{882.4 \angle -23^\circ} = \frac{200 \angle -135^\circ}{882.4 \angle -23^\circ}$$

$$= \left|\frac{200}{882.4}\right| \angle(-135+23)^\circ = 0.22 \angle -112^\circ$$

$$\bar{I}_B = \frac{\begin{vmatrix} 50-j10 & 5+j\sqrt{3}\,5 \\ j10 & 25-25j \end{vmatrix}}{\Delta} =$$

$$= \frac{(50-j10)(25-25j) - j10(5+j5\sqrt{3})}{\Delta} =$$

$$= \frac{1250 - 1250j - 250j - 250 - j50 + \overset{85}{\overset{\sim 1.7}{50\sqrt{3}}}}{\Delta} =$$



$$\frac{1085 - j\,1550}{882 \angle -23} = \frac{\sqrt{1085^2+1550^2} \angle \operatorname{arctg}\left(-\frac{1550}{1085}\right)}{882 \angle -23}$$

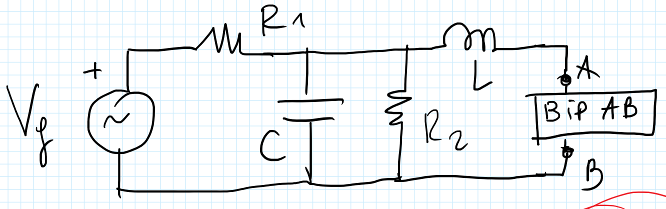
$$\bar{I}_B = \frac{1892}{882} \angle -55-(-23) = 2.14 \angle -32^\circ$$

$$\bar{I}_C = \bar{I}_g + \bar{I}_B =$$

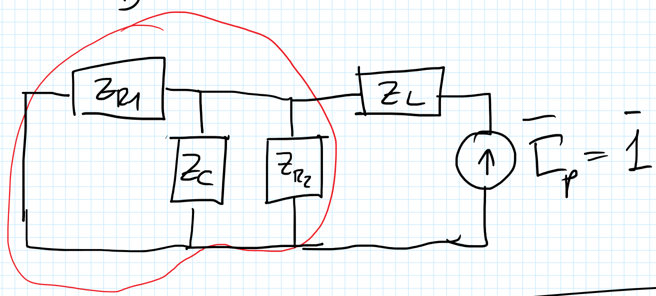
$$\bar{V}_{L1} = \bar{I}_B \cdot Z_{L1} = (2.14 \angle -32^\circ) \cdot (1 \angle 90^\circ) = 2.14 \angle 58^\circ$$

$$V_{L1}(t) = |\bar{V}_{L1}| \cos(\omega t + \angle \bar{V}_{L1}) = 2.14 \cos(1000t + 58°)\ [V]$$

$$I_A(t) = |\bar{I}_A| \cos(\omega t + \angle \bar{I}_A) = 0.22 \cos(\omega t - 112°)\ [A]$$



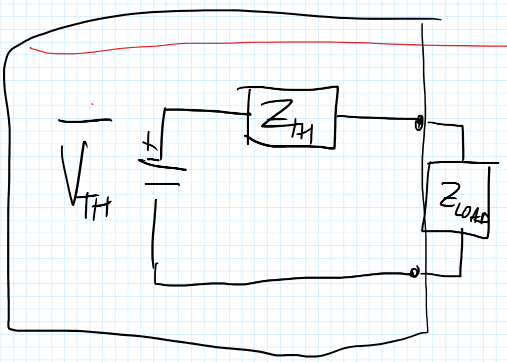
$$Z_{TH} = \frac{\bar{V}_{AB}}{\bar{I}_p} \overset{\circ}{=} \bar{V}_{AB}$$



$$Z_{eq_1} = Z_{R_1} // Z_C // Z_{R_2} \Rightarrow Y_{eq_1} = Y_{R_1} + Y_C + Y_{R_2}$$

$$Z_{eq_1} = \frac{R_1 R_2}{(R_1+R_2) + j\omega C R_1 R_2} \Leftarrow Y_{eq_1} = \frac{1}{R_1} + j\omega C + \frac{1}{R_2} = \frac{(R_1+R_2) + j\omega C R_1 R_2}{R_1 R_2}$$

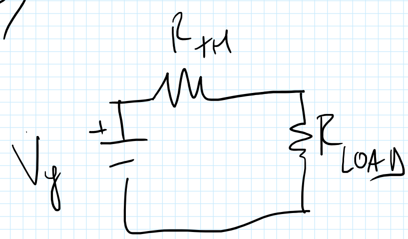
$$Z_{TH} = Z_{eq_1} + Z_L = \frac{R_1 R_2}{(R_1+R_2) + j\omega C R_1 R_2} + j\omega L$$

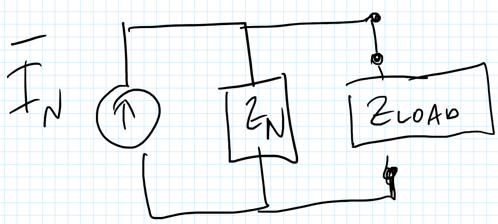


Z_{LOAD}

$R_{LOAD} + jX \quad X > 0$

$\Rightarrow$





MAX POT = $R_{LOAD} = R_{TH}$

MAX POTENZA

$Z_L = Z^* =$ IL GENERATORE VEDE UN ...

CARICO PURAMENTE
RESISTIVO

ERRATA CORRIGE

09 May 2017 14:32

$$\mathcal{L}\left\{ \int f(t) \right\} = \cancel{\frac{F(s)}{s} - f(0)} = \frac{F(s)}{s}$$

$$\mathcal{L}\left\{ \frac{df(t)}{dt} \right\} = sF(s) - f(0)$$