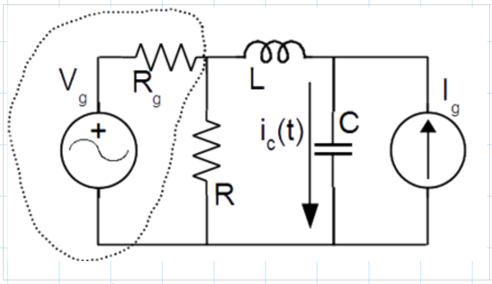
ESONERO 1 GIUGNO COMPITO A-

06 June 2017 00:30

ESERCIZIO 1



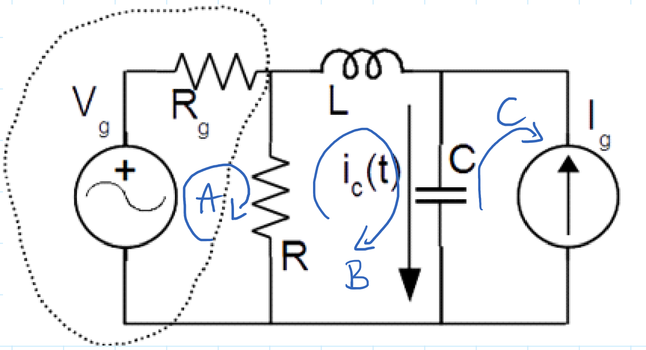

Il circuito in figura si trova a regime permanente sinusoidale, determinare (i) la potenza complessa generata ed erogata dal generatore reale di tensione racchiuso nella linea tratteggiata e costituito dal generatore ideale Vg e dalla resistenza Rg; (ii) la corrente $i_C(t)$ che scorre nel condensatore.

DATI: $V_g = +10cos(250t - \pi)$ [V], $I_g = k_N cos(250t) - 3sen(250t)$ [A], R=5 [Ω], $R_g = \boldsymbol{k_c}$ [Ω], L = 20 [mH], C = 2 [mF].

SVOLGIMENTO

1) FASORI E IMPEDENZE $\bar{V}_g = -10 [\Omega]$; $\bar{I}_g = K_N + 3J [A]$; $Z_R \triangleq R = 5 [\Omega]$

$Z_{R_g} \triangleq R_g = K_c [\Omega]$; $Z_L = J\omega L = 5J [\Omega]$; $Z_C = \frac{-J}{\omega C} = -2J [\Omega]$




$\bar{I}_C = -\bar{I}_g$; $\bar{I}_A, \bar{I}_B$ incognite

$\bar{I}_A = \bar{I}_{V_g}$; $\bar{I}_{cond} = \bar{I}_B - \bar{I}_C = \bar{I}_B + \bar{I}_g$

$S^{GEN}_{V_g} = \frac{1}{2} \bar{V}_g \cdot \bar{I}_A^*$

$S^{ERO}_{V_g} = S^{GEN}_{V_g} - \frac{1}{2} R_g |I_A|^2$

$i_C(t) = |I_C| \cos(\omega t + Arg |I_C|)$

(A) $I_A(R_g + R) - I_B R = V_g$

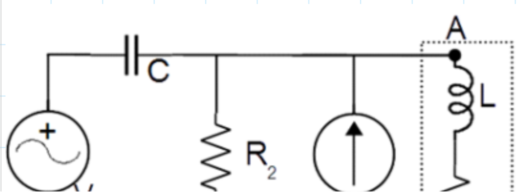
(B) $I_B(R + Z_L + Z_C) - I_A R = -I_g Z_C$

$$\begin{bmatrix} R_g + R & -R \\ -R & R + Z_L + Z_C \end{bmatrix} \begin{bmatrix} \bar{I}_A \\ \bar{I}_B \end{bmatrix} = \begin{bmatrix} \bar{V}_g \\ -\bar{I}_g Z_C \end{bmatrix}$$

$$\begin{bmatrix} 5 + K_C & -5 \\ -5 & 5 + 3J \end{bmatrix} \begin{bmatrix} \bar{I}_A \\ \bar{I}_B \end{bmatrix} = \begin{bmatrix} -10 \\ (K_N + 3J)2J \end{bmatrix}$$

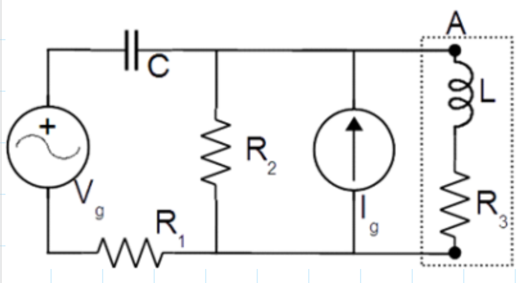
$\Delta = 5K_C + (3K_C + 15)J$

ESERCIZIO 1




Il circuito in figura si trova a regime permanente sinusoidale, determinare (i) il circuito equivalente di Thevenin visto dal bipolo L-R3; (ii) a partire dal risultato del punto precedente, calcolare la potenza istantanea del bipolo e rappresentarne graficamente l'andamento temporale.

DATI: $V_g = 17cos(t + 61.93°)$ [V], $I_g = -\boldsymbol{3}sin(t +$




sinusoidale, determinare (i) il circuito equivalente di Thevenin visto dal bipolo L-R3; (ii) a partire dal risultato del punto precedente, calcolare la potenza istantanea del bipolo e rappresentarne graficamente l'andamento temporale.

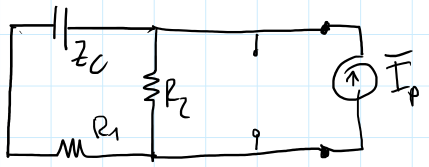
DATI: $V_g = 17\cos(t + 61.93°)$ [V], $I_g = -3\sin(t + \pi)$ [A], $R_1$=2 [Ω], $R_2$=5[Ω], $R_3 = k_C$ [Ω], $L = k_N$ [H], C = 0.2 [F].

FASORI E IMPEDENZE

$\bar{V}_g = 8+15J$ [V] ; $\bar{I}_g = -3J$ [A] ; $Z_{R_1} \doteq R_1 = 2\,[\Omega]$ ; $Z_{R_2} \doteq R_2 = 5\,[\Omega]$ ; $Z_{R_3} \doteq R_3 = K_C\,[\Omega]$

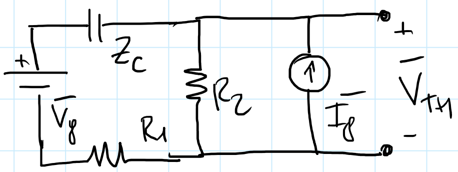
$Z_L = J\omega L = K_N J\,[\Omega]$ ; $Z_C = \frac{-J}{\omega C} = -5J\,[\Omega]$ ; $Z_{LR_3} = K_C + K_N J$

$Z_{TH}$ => DISATTIVO i GENERATORI




$$Z_{TH} = (Z_C + R_1) // R_2 = \frac{R_2 Z_C + R_1 R_2}{Z_C + R_1 + R_2}$$

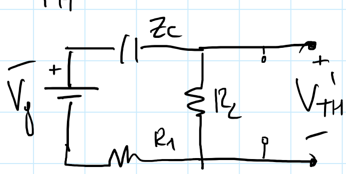
$$Z_{TH} = \frac{-25J + 10}{7-5J} = \frac{(10-25J)(7+5J)}{74} = \frac{195 - 125J}{74}\ [\Omega]$$




APPLICO PSE

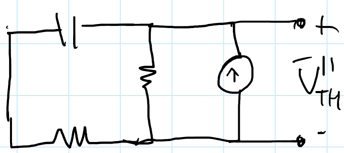
$$\bar{V}_{TH} = \bar{V}'_{TH}\Big|_{\bar{I}_g=0} + V''_{TH}\Big|_{\bar{V}_g=0}$$

$V'_{TH}$




$$V'_{TH} = \bar{V}_g \frac{R_2}{Z_C + R_1 + R_2} = (8+15J) \cdot \frac{5}{7-5J} = \frac{40+75J}{7-5J}$$

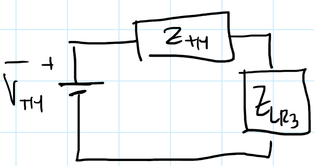
$V''_{TH}$



$$\bar{V}''_{TH} = \bar{I}_g \cdot Z_{TH} = -3J \cdot \frac{10-25J}{7-5J} = \frac{-75-30J}{7-5J}$$

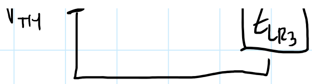
$$\bar{V}_{TH} = \bar{V}'_{TH} + \bar{V}''_{TH} = \frac{-35+45J}{7-5J} = \frac{-470+140J}{74}\ [V]$$

$S_{L-R_3} = ?$



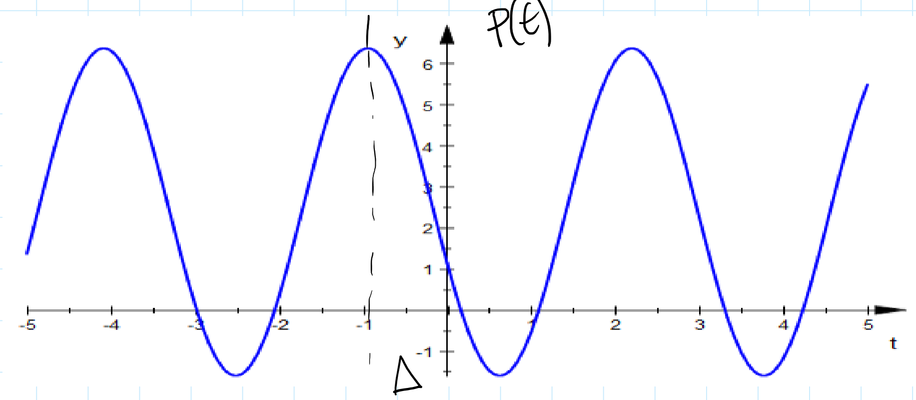

$$S_{L-R_3} = \frac{1}{2} Z_{L-R_3} \cdot \frac{|V_{TH}|^2}{|Z_{TH} + Z_{LR_3}|^2}$$

$\Phi$ = arctg $\left(\frac{K_N}{\ }\right.$




$$\phi_{S_{L-R_3}} = \operatorname{arctg}\left(\frac{K_W}{K_C}\right)$$

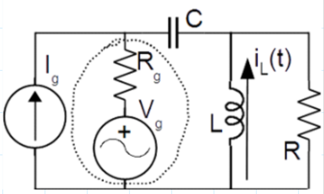
$$\theta_i = \operatorname{Arg}\left(\frac{V_{TH}}{Z_{TH} + Z_{LR_3}}\right) =$$



ESONERO 1 GIUGNO COMPITOB

06 June 2017 00:30

ESERCIZIO 1

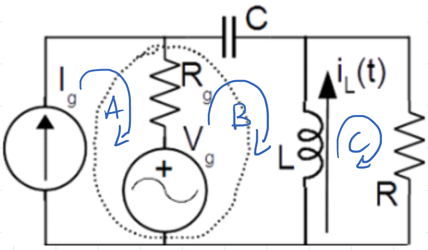



Il circuito in figura si trova a regime permanente sinusoidale, determinare (i) la potenza complessa generata ed erogata dal generatore reale di tensione racchiuso nella linea tratteggiata e costituito dal generatore ideale Vg e dalla resistenza Rg; (ii) la corrente $i_L(t)$ che scorre nell'induttore.
DATI: $V_g = +5sin(500t+\pi/2)$ [V], $I_g = \mathbf{4}cos(500t) - k_N sen(500t)$ [A] , R=2 [Ω], $R_g = \boldsymbol{k_c}$ [Ω], L = 40 [mH], C = 0.5 [mF].

SVOLGIMENTO

1) FASORI E IMPEDENZE $\bar{V}_g = 5\,[V]; \bar{I}_g = 4 + K_N j\ [A]; Z_R \triangleq R = 2\,\Omega$

$Z_{R_g} \triangleq R_g = K_c\,[\Omega];\ Z_L = j\omega L = 20j\,[\Omega];\ Z_C = \frac{-j}{\omega C} = -4j\,[\Omega]$




$\bar{I}_A = \bar{I}_g$; $\bar{I}_B, \bar{I}_C$ incognite

$\bar{I}_{V_g} = \bar{I}_B - \bar{I}_A = \bar{I}_B - \bar{I}_g$;

$\bar{I}_L = \bar{I}_C - \bar{I}_B$;

$S_{V_g}^{GEN} = \frac{1}{2}\bar{V}_g \cdot \bar{I}_{V_g}^* = \frac{1}{2}\bar{V}_g \cdot (\bar{I}_B^* - \bar{I}_g^*)$; $S_{V_g}^{ERO} = S_{V_g}^{GEN} - \frac{1}{2}R_g|\bar{I}_{V_g}|^2 \Rightarrow$

$S_{V_g}^{ERO} = \frac{1}{2}\bar{V}_g(\bar{I}_B^* - \bar{I}_g^*) - \frac{1}{2}R_g|\bar{I}_B - \bar{I}_g|^2$

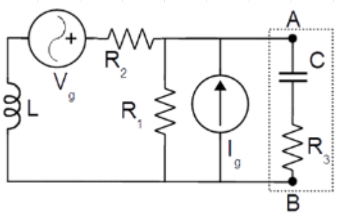
$i_L(t) = |\bar{I}_L|\cos(\omega t + Arg(\bar{I}_L))$

B $\quad \bar{I}_B(R_g + Z_C + Z_L) - \bar{I}_C Z_L = \bar{I}_g R_g + V_g$

C $\quad -\bar{I}_B Z_L + \bar{I}_C(Z_L + R) = 0$

$$\begin{bmatrix} R_g + Z_C + Z_L & -Z_L \\ -Z_L & Z_L + R \end{bmatrix}\begin{bmatrix} \bar{I}_B \\ \bar{I}_C \end{bmatrix} = \begin{bmatrix} I_g R_g + V_g \\ 0 \end{bmatrix}$$

ESERCIZIO 2




Il circuito in figura si trova a regime permanente sinusoidale, determinare (i) il circuito equivalente di Thevenin visto dal bipolo C-R3; (ii) a partire dal risultato del punto precedente, calcolare la potenza istantanea del bipolo e rappresentarne graficamente l'andamento temporale.

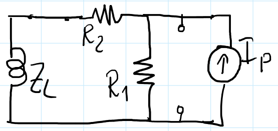
DATI: $V_g = 17cos(t + 28.07°)$ [V], $I_g = \mathbf{4}sin\left(t + \frac{\pi}{2}\right)$ [A], $R_1$=2 [Ω], $R_2$=5 [Ω], $R_3 = k_C$ [Ω], L = 5 [H], $C = \frac{1}{kN}$ [F].

FASORI E IMPEDENZE $\bar{V}_g = 15 + 8j\,[V];\ \bar{I}_g = 4\,[A];\ Z_{R_1} \triangleq R_1 = 2\,[\Omega]$

$Z_{R_2} \triangleq R_2 = 5\,[\Omega];\ Z_{R_3} \triangleq R_3 = K_c\,[\Omega];\ Z_L = j\omega L = 5j\,[\Omega];\ Z_C = -K_N j\,[\Omega]$

$Z_{R_2} \triangleq R_2 = 5\,[\Omega]$ ; $Z_{R_3} \triangleq R_3 = K_C\,[\Omega]$ ; $Z_L = j\omega L = 5j\,[\Omega]$ ; $Z_C = -K_N j\,[\Omega]$

$Z_{TH}$

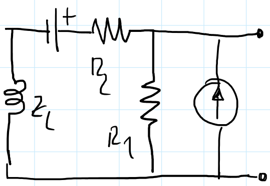



$$Z_{TH} = (R_2 + Z_L) // R_1 =$$

$$Z_{TH} = \frac{R_1 R_2 + R_1 Z_L}{R_1 + R_2 + Z_L}$$

$$Z_{TH} = \frac{10 + 10j}{7 + 5j} = \frac{120 + 20j}{74}\ [\Omega]$$

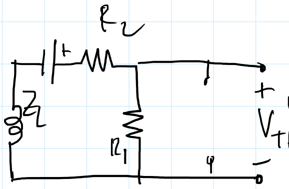
$V_{TH}$




APPLICO PSE

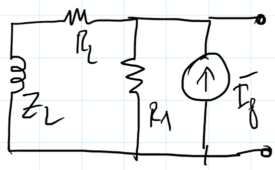
$$\bar{V}_{TH} = \bar{V}'_{TH}\Big|_{\bar{I}_g = 0} + V''_{TH}\Big|_{\bar{V}_g = 0}$$

$V'_{TH}$




$$V'_{TH} = \frac{\bar{V}_g \cdot R_1}{R_1 + R_2 + Z_L} = \frac{30 + 16j}{7 + 5j} = \frac{290 - 38j}{74}\ [V]$$

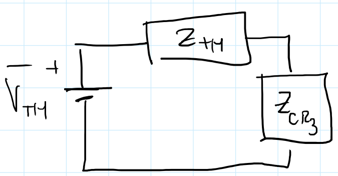
$V''_{TH}$ :




$$\bar{V}''_{TH} = \bar{I}_g \cdot Z_{TH} = \frac{480 + 80j}{74}$$

$$\bar{V}_{TH} = \bar{V}'_{TH} + \bar{V}''_{TH} = \frac{770 + 42j}{74} = \frac{385 + 21j}{37}\ [V]$$

$S_{C-R_3} = ?$




$$S_{C-R_3} = \frac{1}{2} Z_{C-R_3} \cdot \frac{|V_{TH}|^2}{|Z_{TH} + Z_{CR_3}|^2}$$

$$\phi_{Z_{C-R_3}} = \arctan\left(\frac{-K_N}{K_C}\right)$$

$$\theta_i = \operatorname{Arg}\left(\frac{V_{TH}}{Z_{TH} + Z_{CR_3}}\right) =$$