RISULTATI PROVE SCRITTE DI ELETTROTECNICA

19 MARZO '97 A.A. 95|96 e 96|97

1) $P_{AA} \simeq 8466\ W$

$Q_{AA} \simeq 5055\ VAR$

2) $$\frac{V_o(s)}{V_g(s)} = -\frac{h_{fe} R_c (1 + s R_e C)}{(R_s + h_{ie})(1 + s R_e C) + (1 + h_{fe}) R_e}$$

3) $\bar{Z}_u = 0.05 + j0.5\ \Omega$

$P_{MAX} \simeq 2.49\ W.$

17 FEBBRAIO '97

1) $v_u(t) = \sqrt{5} \cos(2t - 63.5°) + 0.25 e^{-t}$

2) $$\frac{V_u(s)}{V_i(s)} = -\frac{2}{R^2C^2} \frac{1}{s^2 - s\frac{1}{RC} + \frac{2}{R^2C^2}}$$; instabile

3) $$\underline{\underline{Y}} = \begin{bmatrix} \frac{1}{2} + \frac{1+6s^2}{2s(5s^2+1)} & \frac{s}{5s^2+1} - \frac{1}{2} \\ \frac{s}{5s^2+1} - \frac{1}{2} & 1 + \frac{2s}{5s^2+1} \end{bmatrix}$$

16 DICEMBRE '96

1) $$v(t) = \frac{10}{\sqrt{3}} e^{-\frac{1}{2}t} \cos\left(\frac{\sqrt{3}}{2} t - 30°\right).$$

2) $v_{eq} = -\frac{5}{2} V$; $R_{eq} = 15\ \Omega.$

23 OTTOBRE '96

1) $i(t) = \frac{5}{3} + \frac{2}{3} e^{-\frac{3}{10}t}$ A ; $t \geq 0$

2) $\bar{P}_c = 35'000 + j\,24'000$ W

3) $\frac{I_o}{I_i} = -\frac{R_3}{R_1}$; $Z_{in} = R_1 \frac{s}{s - \frac{1}{R_1 C_1}}$.

2 OTTOBRE '96

1) $\bar{V}_{eq} = 2.87 + j\,0.0264$ V

$\bar{Z}_{eq} = 1.385 + j\,0.923\ \Omega$

2) $v_{oB}(t) = \frac{3}{2} e^{-\frac{3}{8}t} u(t)$ (libera)

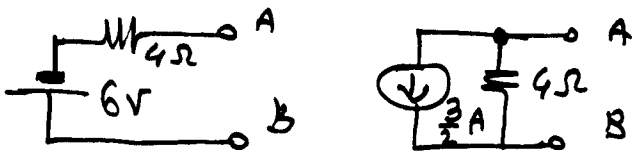
$v_{oA}(t) = \left(2 - \frac{3}{2} e^{-\frac{3}{8}t}\right) u(t)$ (forzata)

3) $\underline{\underline{Z}} = \frac{1}{s(4s-1)} \begin{bmatrix} 12s^2 - s - 1 & 2s-1 \\ 2s-1 & 2s-1 \end{bmatrix}$

È reciproca.

18 SETTEMBRE 96

1)



2) $\bar{P}_c(e(t)) \simeq 811 + j\,2201$ W

$\bar{P}_c(i_o(t)) \simeq 1390 - j\,29'500$ W

3) $\underline{\underline{Y}} = \frac{1}{2(2s+3)} \begin{bmatrix} 6s+5 & -(6s+3) \\ -(6s+3) & 8s+3 \end{bmatrix}$; $T_v(s) = \frac{5(6s+3)}{44s+21}$.

17 LUGLIO 96

1) $v_o(t) = \cos(5t - 121°) + 2.015\, e^{-\frac{t}{\beta}} \quad t \geq 0$

2) $$\frac{V_o}{V_i} = \frac{1}{R_S} \frac{g_m + \frac{1}{r_o}}{\left(g_m + \frac{1}{R_S} + \frac{1}{r_1} + \frac{1}{r_o}\right)\frac{1}{R_L} + \left(\frac{1}{R_S} + \frac{1}{r_1}\right)\frac{1}{r_o}}$$

$R_L = r_o + (1 + g_m r_o) R_S \| r_1$ (massima potenza)

3) $$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = -\begin{bmatrix} n & msL \\ msC + \frac{1}{mR} & ms^2LC + \frac{1}{m}\left(\frac{sL+R}{R}\right) \end{bmatrix}$$

È reciproca

19 GIUGNO 96

1) $\frac{V_1}{V_{im}} = -\frac{s^2}{s^2 + s\frac{2}{RC} + \frac{1}{R^2C^2}}$; passa alto

2) $$\underline{\underline{Z}} = \begin{bmatrix} 5 & 4(s+1) \\ 2 & 2(2s+1) \end{bmatrix} \frac{1}{6s+1}$$ Non reciproca.

3) $P_{AA} \simeq 9'900$ W

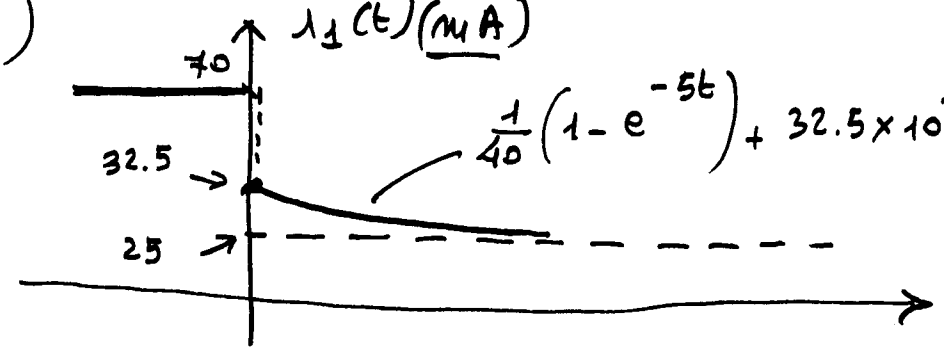
$Q_{AA} \simeq 2'370$ VAR

29 MAGGIO 96

1) $\overline{Z}_u = \frac{29 + j3}{10}\ \Omega$

2) $$\frac{V_o}{V_i} = \frac{R_2}{2R_1 + R_2} \frac{s^2 + \frac{1}{R_1 R_2 C^2}}{s^2 + 2\frac{s}{R_2 C} + \frac{1}{R_1 R_2 C^2}}$$; Elimina Banda.

3)



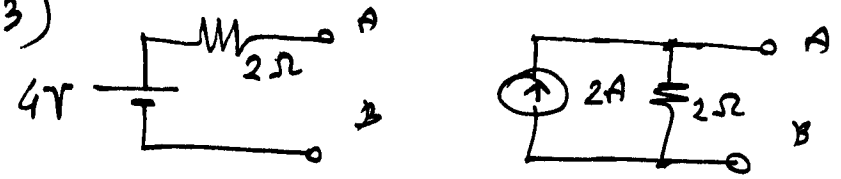
19 FEBBRAIO 96

1) $Z_{in}(s) = \dfrac{1}{s^2 R C^2}$.

2) $v_2(t) = E_0\left(1 - e^{-\frac{t}{\tau}}\right) + E_0 \dfrac{C_1}{C_1+C_2} e^{-\frac{t}{\tau}}$; $\tau = R(C_1+C_2)$

$i_{generata} = C_2 \dfrac{dv_2}{dt}$ = ...

3)



4 GENNAIO 96

1) $\dfrac{V_u}{V_i} = \dfrac{s^2 + s\left(\frac{1}{R_2C_1} + \frac{1}{R_2C_2} + \frac{1}{R_1C_2}\right) + \frac{1}{R_1R_2C_1C_2}}{s^2 + s\left(\frac{1}{R_2C_1} + \frac{1}{R_2C_2}\right) + \frac{1}{R_1R_2C_1C_2}}$;

$Z_u(s) = 0\ \Omega$.

2) $i(t) = 10e^{-\frac{t}{2}}\left(u(t) - u(t-1)\right) + \left[5 + 1.1e^{-(t-1)}\right]u(t-1)$

3) $P_g \simeq 0.155$ W $\quad Q_g \simeq 0.289$ VAR

$Q_{L1} \simeq 0.269$ VAR ; $Q_{L2} \simeq 0.020$ VAR.

19 MARZO 96

1) $T_V(s) = -\dfrac{s^2 R_1R_2C_1C_2}{s^2R_1R_2C_2C_3 + sR_1(C_1+C_2+C_3) + 1}$

Passa alto.

2) $V_{eq} = \frac{3}{2}$V ; $R_{eq} = \frac{5}{2}\Omega$.

$\bar{V}_c = -0.62 + j0.27$. $P_d = \frac{9}{80}$ W. $P_c = 0.061$ W

$P_R = 0.051$ W.

3) $H(s) = I(s)/V_g(s) = \dfrac{6s}{54s^2 + 4s + 1} \Rightarrow$ circuito A.S.

$i(t) = 0.557\cos(2t + 2.16°)$ A; (a regime)

RISULTATI PROVE SCRITTE DI ELETTROTECNICA
A.A. 1997/98

29 MAGGIO 1997

1) $v_{o\,forzata} = 2 - \frac{4}{7} e^{-\frac{50}{21}t}$ $\quad v_{o\,libera} = -\frac{20}{7} e^{-\frac{50}{21}t}$

2) $\overline{Z}_{carico} = \frac{1}{2} + j\frac{1}{6}\ \Omega \qquad P_{MAX} \simeq 0.236\ W$.

3) $V_o = \left(1 + \frac{R_2}{R_1}\right)(V_{g2} - V_{g1})$; $P_{A.O.2} \simeq 1.2\ mW$.

18 GIUGNO 1997

1) $\overline{P}_c = \frac{1}{10}(3 + j4)\ W$ generatore $e(t)$

$\overline{P}_c = \frac{1}{10}(7 + j9)\ W$ generatore $i_o(t)$

2) $v_u(t) = r(t) - \rho(t-1) + \rho(t-3) + r(t-3)$

$r(t) = \frac{1}{2}(1 + e^{-t/3})$; $\rho(t) = \frac{1}{2}t - \frac{3}{2}\left[e^{-t/3} - 1\right]$

3) $g_{11} = \frac{1}{\Delta}$; $g_{21} = \frac{R_2(1+k_2)}{\Delta}$

$g_{22} = \frac{R_1 R_2}{\Delta}$; $g_{12} = -\frac{R_2(1-k_1)}{\Delta}$

$\Delta = R_1 + R_2(1-k_1)(1+k_2)$.

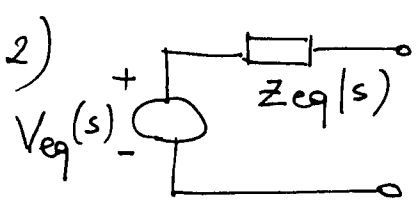
17 SETTEMBRE 1997

1) $i(t) = \frac{1}{7} e^{-\frac{15}{7}t}\, u(t)$

8 OTTOBRE 1997

1) $v_u(t) \simeq -0.129\, e^{-3.33t} \quad t \geq 0$

2)



$$Z_{eq}(s) = \frac{2s}{8s^2+1}$$

$$V_{eq}(s) = \frac{2(4-8s)}{8s^2+1}$$

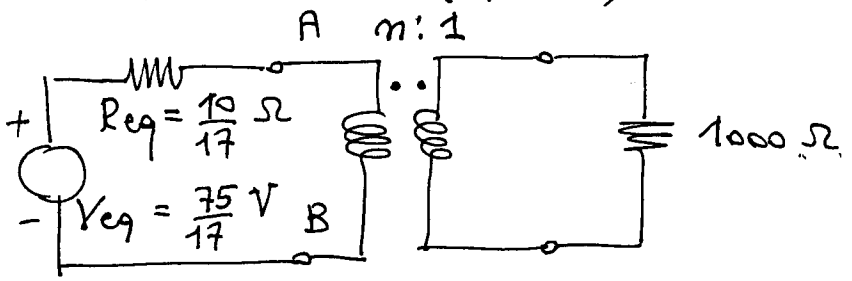
3) $\bar{P}_c \simeq 6.3 + j\,33\ W$ sul carico

$\bar{P}_c \simeq 6.3 + j\,50.1\ W$ erogata dal generatore

17 DICEMBRE 1997

1) $v(t) = 19 \cos\left(\frac{1}{\sqrt{2}} t\right) u(t)\ V$.

2)



$n \simeq 0.024$

$P_{MAX} \simeq 8.27\ W$

11. FEBBRAIO 1998

1) $i_c(t) \simeq -0.25\, e^{-\frac{3}{2}t} + 4.47 \cos(3t + 26.6°)\ A; t \geq 0$

2) $$V_{eq}(s) = V_i(s) \frac{1}{R_1} \frac{sC_2 - k}{s^2 C_1 C_2 + sC_2 (G_{12} + k)}$$

$$Z_{eq}(s) = \frac{G_{12} + s(C_1 + C_2)}{s^2 C_1 C_2 + sC_2 (G_{12} + k)}$$

$$G_{12} = \frac{1}{R_1} + \frac{1}{R_2}.$$

9 MARZO 1998

1) a) $H(s) = -\frac{1}{RC} \frac{s}{s^2 + \frac{2}{RC}s + \frac{1}{k^2C^2}}$

b) Filtro passa banda

c) stabilità asintotica

d) $v_o(t) = 0.4 \cos(t + 143°)$ V

2) $v_1(t) = 10\left(1 - e^{-\frac{t}{4.8}}\right) + \frac{20}{3} e^{-\frac{t}{4.8}}$

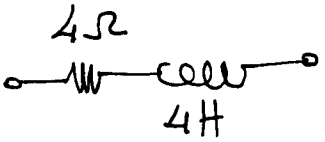
$i_{c1}(t) = -\frac{20}{3}\delta(t) + \frac{25}{18} e^{-\frac{t}{4.8}} u(t)$ A.

$E_{tot}(0^-) = 100$ joule ; $E_{tot}(0^+) = 66.7$ joule

$E_{tot}(\infty) = 150$ joule.

29 OTTOBRE 1997

1) $\bar{Z} = 4 + j8\ \Omega$;



2) $\frac{V_L}{V_g} = -\frac{\mu R_L}{R_L + R_p + (1+\mu) R_k}$

3) A-A aperti : $\varphi \simeq 6.9$

A-A in corto circuito : $\varphi \simeq 15.9$.

16 LUGLIO 1997

1) $\bar{\bar{Z}} = \begin{bmatrix} j9 & 0 \\ 0 & -j3 \end{bmatrix}$ $P_{generatore} = 0$ W

$Q_{generatore} = 4.5$ VAR

2) $i(t) \simeq 0.523\, e^{-t} \cos(3t - 18.9°)$ A

3) $v_2(t) = e^{-t} + e^{-\frac{1}{2}t}\left(-\cos\frac{\sqrt{3}}{2}t + \frac{\sqrt{3}}{3}\sin\frac{\sqrt{3}}{2}t\right)$ $t \geq 0$

RISULTATI PROVE SCRITTE DI ELETTROTECNICA DELL'A.A. 1998/99

27 MAGGIO 98 1) a) $\bar{P}_c = 484 - j242$ W

b) $\bar{P}_c = 484 + j569$ W; $\phi_M \simeq 0.01$ Wb (a) e b))

2) $i_x = -\frac{22}{7}$ A 3) $v_c(0^+) = 7$V; $i_L(0^+) = 5$A.

22 GIUGNO 98 1) $V_{eq} = 2$V; 2) $R_{eq} = -500\,\Omega$;

Non ha senso parlare di carico che assorbe la massima potenza attiva.

2) $\bar{P}_c$ (erogata da $i_0(t)$) = $1 + j2$ WATT

$\bar{P}_c$ (erogata da $e(t)$) = 1 WATT

3) Risposta forzata a $x(t)$:

$$y_1(t) = -\frac{15}{34} e^{-5t} u(t) + \frac{3}{34}\left[5\cos(3t) + 3\sin(3t)\right] u(t)$$

14 LUGLIO 98

1) Energia media contenuta in C: 0.41 joule

= = dissipata su R: 1.22 joule

2) $i_L(t) = \frac{4}{3} e^{-t} - \frac{1}{3} e^{-4t}$ A $(t \geq 0)$

3) $Z_{in}(s) = -\frac{1}{2sC}$

14 SETTEMBRE 98

1) $i(t) = -g(t) + 2g(t-1) - p(t-1) + p(t-2)$, dove

$g(t) = \frac{1}{5}\left(1 - e^{-\frac{5}{12}t}\right) u(t)$; $p(t) = \frac{1}{5} t\,u(t) + \frac{12}{25}\left(e^{-\frac{5}{12}t} - 1\right) u(t)$

2) Esistono solo i parametri Y, h, T:

$$\underline{\underline{Y}} = \begin{bmatrix} \frac{1}{R} & 0 \\ -a & 0 \end{bmatrix}; \quad \underline{\underline{h}} = \begin{bmatrix} R & 0 \\ -aR & 0 \end{bmatrix}; \quad \underline{\underline{T}} = \begin{bmatrix} 0 & \frac{1}{a} \\ 0 & \frac{1}{aR} \end{bmatrix}$$

3) $R_{AB} = R \,\|\, R_g \,\|\, R'_{AB}$

$$R'_{AB} = h_{ie} + (1 - h_{re})(1 + h_{fe}) R_e$$

7 OTTOBRE 98

2) $p(t) = 15 + 25\cos(4t + 53°)$ W

3) $i_C(0^+) = 2A$; $\frac{di_L}{dt}(0^+) = -16\ A/sec$.

21 DICEMBRE 98

1) $\overline{Y}_{in} = -2(1+j)\ \Omega^{-1}$

2) $i_{COMPLETA}(t) \simeq -0.4e^{-4t} + 0.447\cos(2t - 26.6°)$ A $(t \geq 0)$

21 DICEMBRE 98 (D.U.)

1) $Req = \frac{11}{2}R$; 2) $\overline{V}eq = \frac{6-j2}{5}$ V $\quad \overline{Z}eq = \frac{3-j}{5}$

$\overline{Z}_u = \overline{Z}eq^* = \frac{3+j}{5}$; $P_{MAX} = \frac{1}{3}$ W.

13 FEBBRAIO 99

1) $P = 2.5$ W ; $Q = 2.5$ VAR.

2) $Req = 2R$; $Veq = \frac{E}{3}$.

3) $v_{u\,libera}(t) = \frac{15}{2}e^{-2t}$ $(t \geq 0)$ V

$v_{u\,forzata}(t) = \frac{15}{8} + \frac{25}{8}e^{-2t}$ V $(t \geq 0)$

$v_{u\,permanente}(t) = \frac{15}{8}$ V $(t \geq 0)$; $v_{u\,transitorio} = \frac{25}{8}e^{-2t}$ V $(t \geq 0)$.

1 MARZO 99

2) $i_{COMPLETA}(t) = 10e^{-2t}\cos(4t)$ A $(t \geq 0)$

3) $\overline{Z}_u = 3.2 + j2.4\ \Omega$; $P_{MAX} \simeq 1.056$ W.

20 MARZO 99

1) $v_1(0^+) = 2V$; $i_2'(0^+) = -1A$;

$v_2(0^+) = -1V$;

2) $Veq = -\frac{44}{3}$ V ; $Req = -\frac{4}{9}\ \Omega$

3) $v_1(t) = \frac{1}{4}\left[t - \frac{1}{2}\sin(2t)\right]u(t)$ V

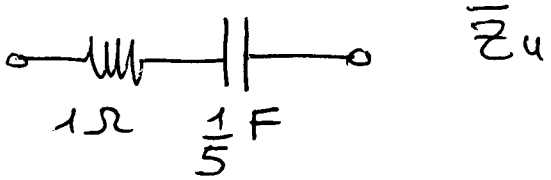
26 OTTOBRE 98

1) $N \simeq 163$ spire

2) $V_{eq} = E \dfrac{R_2+R_3}{R_1+R_2}$; $R_{eq} = R_1 \dfrac{R_2+R_3}{R_1+R_2}$.

3) $\overline{Z}_u = 1 - j\ \Omega$;

$P_{MAX} = 0.0625\ W$



RISULTATI PROVE SCRITTE DI ELETTROTECNICA

A.A. 1999/2000

1 GIUGNO 99

2) $i(t) = 4e^{-2t}\cos(t) - 6e^{-2t}\sin(t)$ A

3) $Z_{eq}(s) = sL$; $Z_T(s) = 2sL$.

23 GIUGNO 99

1) $P_{AA} \simeq 57900$ W ; $Q_{AA} \simeq -42000$ VAR

$\cos\phi_{AA} \simeq 0.81$ capacitivo

2) $v_u(t) = -\frac{I_0}{C}\cos\left(\frac{1}{\sqrt{LC}}t\right)u(t)$

14 LUGLIO 99 (C.d.L.)

1) $v_c(t) = 5 - \frac{5}{3}e^{-t}\sin(3t)$ V ; $t \geq 0$

2) $T_v(s) = -\frac{G_1}{C_2}\cdot\frac{s}{s^2 + sG_2\frac{C_1+C_2}{C_1C_2} + \frac{G_1G_2}{C_1C_2}}$

3) $\bar{Z}_u = 50(2-j)\ \Omega$;

$P_{MAX} \simeq 3.125$ W

14 LUGLIO 99 (D.U.)

2) $v_u(t) \simeq 3.6e^{-1.5t} + 4.47\cos(2t + 10.3°)$ V

16 SETTEMBRE 99

1) $v_c(t) = 2.24e^{-t} - 2.4te^{-t} + \frac{2}{5}\cos(2t + 233°)$ V

2) $R_{eq} = \frac{3}{5}\ \Omega$; $V_{AB\,eq} = -\frac{11}{2}$ V

$R_u = \frac{3}{5}\ \Omega$; $P_{MAX} \simeq 12.6$ W

6 OTTOBRE 99

2) $i_L(0^+) = 5\,A$; $v_2(0^+) = 5\,V$; $v_1(0^+) = -4\,V$

$\frac{dv_2}{dt}(0^+) = \frac{5}{2}\ V/sec$

3) $\bar{P}_{\substack{\text{erogata da gen.re} \\ \text{ind.te}}} = \frac{1}{4}(1+j)$

$\bar{P}_{\substack{\text{erogata da gen.re} \\ \text{controllato}}} = -\frac{1}{2}j$

$Q_L = \frac{1}{4}\ VAR$; $Q_C = -\frac{1}{2}\ VAR$; $P_R = \frac{1}{4}\ W$.

25 OTTOBRE 99

2) $i_{AB\,eq} = \frac{17}{6}\ A$; $R_{eq} = \frac{6}{5}\ \Omega$.

21 DICEMBRE 99

1) $R_{in} = \dfrac{h_{ie} - h_{re}\,h_{fe}\,R}{(1+h_{fe})(1-h_{re})}$.

2) $v(t) \simeq 1.02\cos(3t - 71°) - 0.33\,e^{-2t}\cos(3t) - 1.18\,e^{-2t}\sin(3t)\ V$

12 FEBBRAIO 2000

1) $v_{AB}(t) = 10 + 4e^{-3t}\cos(4t) + \frac{11}{2}e^{-3t}\sin(4t)\ V$

2) $v_{eq} = \frac{35}{13}\ V$; $R_{eq} = \frac{60}{13}\ \Omega$.

4 MARZO 2000

1) $i_c(0^+) = -\frac{10}{7}$ A

2) $E_{MEDIA} \simeq 0.174$ joule

3) $f_h(t) = \delta(t) + \frac{22}{3}u(t) - \frac{13}{3}e^{-3t}u(t)$.

25 MARZO 2000

1) $R_{eq} = \frac{RR_L}{R - ABR_L}$

2) $i(t) = \frac{5}{4}\delta(t) + 20u(t)$
$- 15e^{-2t}\cos(2t)u(t) + 20e^{-2t}\sin(2t)u(t)$

RISULTATI SCRITTI ELETTROTECNICA
A.A 2000/2001

03|06|00

1) $C = 568\ \mu F$ (Condensatore da rifasamento)

2) $v_{eq} = 0\ V \quad R_{eq} = 2R$

3) $v_{libera}(t) = \frac{5}{2} e^{-\frac{t}{\tau}}$; $v_{forzata} = -\frac{25}{12} e^{-\frac{t}{\tau}}$

$v_{trans.}(t) = -\frac{25}{12} e^{-\frac{t}{\tau}}$; $v_{perm.}(t) = 0.$

$\tau = \frac{12}{5}$ sec.

26|06|00

2) $i_C(0+) = -\frac{13}{16}\ A$; $i_R(0+) = -\frac{13}{32}\ A$

Energia dissipata $\simeq 15.8$ joule.

3) Potenza complessa erogata da generatore tensione: $\frac{7}{40} + j\frac{1}{40}$

Potenza complessa erogata da generatore controllato: $-\frac{1}{20} + j\frac{1}{20}$.

Potenza attiva assorbita da R: $\frac{1}{8}\ W$

Potenza reattiva assorbita da C: $-\frac{1}{40}$ VAR

Potenza reattiva assorbita da L: $\frac{1}{10}$ VAR.

19|07|00

1) $v_c(t) = -35 e^{-2t}\cos(t) - 70 e^{-2t}\sin(t) + 40\ V \quad (t \geq 0)$

2) $R_{eq} = \frac{R}{1+k}$; $v_{eq} = E\frac{2-k}{1+k}$; $k = 2.$

3) $\bar{I} = 0.48\, e^{-j17^\circ}$

$\bar{I}_1 = 0.2875\, e^{-j17^\circ}$

$\bar{V} = 0.29\, e^{j73^\circ}$

16|09|00

1) $v(t) = 0 \qquad t \geq 0.$

2) $\overline{P}_{(e(t))} = -0.396 - j\,0.073$

$\overline{P}_{(i_0(t))} = 1.046 - j\,0.77.$

3) $R_{eq} = R\,\dfrac{3+k-2GR}{1+k-2GR}$

7|10|00

1) $i_L(t) = \frac{5}{2}\left(e^{-5t} - e^{-t}\right) + 15 \quad A \qquad t \geq 0$

3) $\overline{Z}_u = 1.585 + j\,0.453 \ \Omega$

$P_{MAX} \simeq 6.695 \ \text{Watt}$

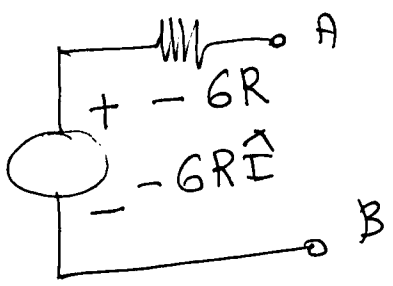
28|10|00

1) $i_L(t) = A e^{-\frac{1}{2}t} \cos(t+\varphi) + 0.97 \cos(t+14°) \ A$

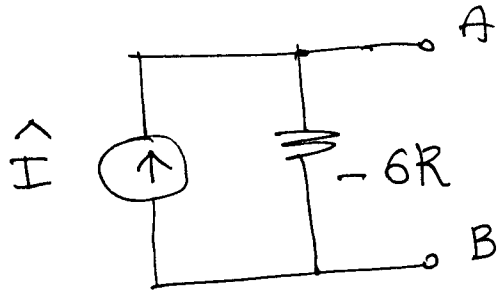
$i_L(0+) = \frac{1}{2} A$

$\dfrac{di_L}{dt}(0+) = \frac{1}{2} \ A/\text{sec}$

3)



Thevenin



16|12|00

1) $R_{eq} = R\,\dfrac{3 - 2A - 2RB}{1 - 2RAB}$

2) $v_{libera}(t) = \dfrac{8}{5} e^{-\frac{2}{5}t}$ V

$v_{forzata}(t) = 0.031\, e^{-\frac{2}{5}t} + 0.784 \cos(2t + 11.3°)$ V

3) $E_{trafeno\,1} \simeq 1.125 \times 10^{-2}$ joule

$E_{trafeno\,2} \simeq 0.375 \times 10^{-2}$ joule

$E_{foro} = 0$.

03|02|01

1) $P_{MAX} \simeq 0.716$ Watt

28|02|01

1) $v(t) = -\dfrac{2}{9} - \dfrac{1}{9} e^{-\frac{t}{\tau}}$ $t \geq 0$; $\tau = \dfrac{5}{18}$ sec.

2) $R_{eq} = \dfrac{5}{2} R$

17|03|01

1) $v_c(t) = k_1 e^{-2t} + k_2 e^{-4t}$

$v_c(0^+) = \dfrac{27}{82}$ V ; $\dfrac{dv_c}{dt}(0^+) = -\dfrac{77}{41}$ V/sec.

2) $R_{eq} = \dfrac{6}{5}\,\Omega$; $v_{eq} = -\dfrac{6}{5}$ V.

3) Risposta forzata a $x(t)$:

$2\cos(2t)\,u(t) + \dfrac{2}{3}\sin(4t)\,u(t) - \dfrac{1}{3}\sin(2t)\,u(t)$.