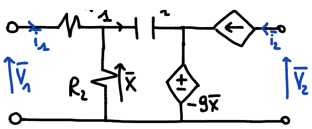


$R_1 = 1\ \Omega,\ R_2 = 1\ \Omega,\ C_1 = 0{,}1\ F$. Det mat.

$$\begin{bmatrix}\bar I_1\\ \bar I_2\end{bmatrix} = \begin{bmatrix} y_{11} & y_{12}\\ y_{21} & y_{22}\end{bmatrix}\begin{bmatrix}\bar V_1\\ \bar V_2\end{bmatrix} \qquad \bar I_2 = 4\bar I_1$$

→ prove semplici:

$\cdot\ y_{11} = \left.\dfrac{\bar I_1}{\bar V_1}\right|_{\bar V_2=0 \text{ e } \bar I_2=0} \rightarrow$ trovo $\bar I_1 = f(\bar V_1)$: $\bar V_1 - \bar I_1 \cdot 1 = 0 \rightarrow \bar I_1 = \dfrac{\bar V_1}{1}$

$\rightarrow y_{11} = \dfrac{\bar V_1}{\bar V_1} = 1$

non uso prove semplici:

$\rightarrow \bar V_1 - R_1 i_1 - \bar X = 0 \rightarrow \bar X = \bar V_1 - R_1 \bar I_1$

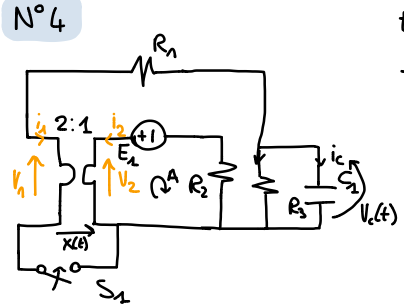
$\rightarrow V_c = \bar X + 9\bar X = 10\bar X \rightarrow \bar I_1 - \dfrac{\bar X}{R_2} - 10\bar X j\omega C = 0 \rightarrow \bar I_1 = \bar V_1 - \bar I_1 - \cancel{10}(\bar V_1 - \bar I_1) j\omega \cdot \cancel{0{,}1}$

$\rightarrow \bar I_1 = (1-j\omega)\bar V_1 - (1-j\omega)\bar I_1 \rightarrow \bar I_1 = \underbrace{\dfrac{1-j\omega}{2-j\omega}}_{y_{11}} \bar V_1$

$\rightarrow \bar I_2 = 4\bar I_1 = 4\cdot\dfrac{1-j\omega}{2-j\omega}\bar V_1$

$$\begin{bmatrix} \dfrac{1-j\omega}{2-j\omega} & 0\\ 4\,\dfrac{1-j\omega}{2-j\omega} & 0\end{bmatrix}$$

N°4



$t_0 = 0$ l'interruttore S_1 (aperto e opera a regime) viene chiuso.

$\rightarrow x(t)$ per $t < t_0$

$$\rightarrow \begin{cases} V_1 = 2V_2 \rightarrow i_1 = 0 \rightarrow i_2 = 0\\ i_1 = -\frac{1}{2} i_2 \end{cases}$$

$x(t) = V_2 - E_1 + V_{R_2} + V_c(t) - \overset{-V_1}{V_{R_1}} = V_2 - E_1 + 0 + 0 - 0$

$\rightarrow$ so che $V_2 = E_1$

$\rightarrow x(t) = -V_1 = -2E_1 = -12\,V$

$\rightarrow V_c(t)$ per $-1 < t < \infty$

tra $-1 < t < 0$: S_1 aperto e $V_c = 0$

$t > 0$: S_1 chiuso $\rightarrow$ trovo $i_c = f(V_c)$: $i_c = -i_1 - \dfrac{V_c}{R_3}$

$\rightarrow$ cerco i_1: KVL A) $V_2 - E_1 + R_2 i_2 = 0 \rightarrow V_2 = E_1 - R_2 i_2 = E_1 - R_2(-2i_1)$

$\rightarrow 2V_2 + R_1 i_1 - R_3(i_c - i_1) = 0 \rightarrow 2E_1 + 4R_3 i_1 + R_3 i_c + R_3 i_1 = 0$

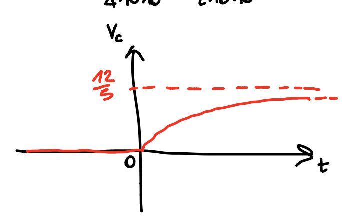
$\rightarrow i_1 = \dfrac{-2E_1 - R_3 i_c}{5R_3}$

$\rightarrow i_c = -\dfrac{V_c}{R_3} + \dfrac{2E_1}{5R_3} + \dfrac{i_c}{5} \rightarrow \left(1 - \dfrac{1}{5}\right) i_c = -\dfrac{V_c}{R_3} + \dfrac{2E_1}{5R_3} \rightarrow i_c = -\dfrac{5V_c}{4R_3} + \dfrac{E_1}{2R_3} \rightarrow \dot V_c = -\dfrac{5V_c}{4\cdot 10\cdot 10^{-3}} + \dfrac{6}{2\cdot 10\cdot 10^{-3}}$

$\rightarrow \dot V_c = -125 V_c + 300$

trovo $V_c(\infty)$: $0 = -125 V_c(\infty) + 300 \rightarrow V_c(\infty) = \dfrac{\overset{60}{\cancel{300}}}{\underset{25}{\cancel{125}}} = \dfrac{12}{5}$

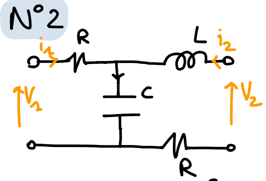
trovo K: $\underbrace{0}_{V_c(0)} = K + \dfrac{12}{5} \rightarrow K = -\dfrac{12}{5} \quad \rightarrow V_c(t) = -\dfrac{12}{5}^{\,-125t} + \dfrac{12}{5}$



APPELLO SETT-2015

N°1

N°2



matrice di impedenze z.

$$\rightarrow \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix}$$

→ prove semplici:

$$z_{11} = \frac{\bar{V}_1}{\bar{i}_1}\Big|_{i_2=0, V_2=0} \longrightarrow z_{11} = R + \frac{1}{j\omega C}$$

$$z_{12} = \frac{\bar{V}_1}{\bar{i}_2}\Big|_{i_1=0, V_2=0} \longrightarrow V_1 = V_c \longrightarrow \overbrace{\frac{1}{j\omega C}\bar{i}_2}^{V_c} + j\omega L\,\bar{i}_2 + R\,\bar{i}_2 = 0$$

$$V_1 = V_c = (j\omega L + R)i_2 \longrightarrow z_{12} = -(j\omega L + R)$$

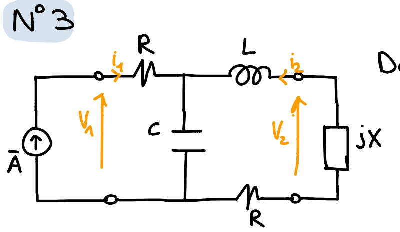
$$z_{21} = \frac{\bar{V}_2}{\bar{i}_1}\Big|_{\bar{V}_1=0, \bar{i}_2=0} \longrightarrow V_2 = V_c \longrightarrow V_c + R\bar{i}_1 = 0$$

$$V_2 = -R\bar{i}_1 \longrightarrow z_{21} = -R$$

$$z_{22} = \frac{\bar{V}_2}{\bar{i}_2}\Big|_{\bar{V}_1=0, \bar{i}_1=0} \longrightarrow z_{22} = j\omega L + \frac{1}{j\omega C} + R$$

$$Z \begin{bmatrix} R + \frac{1}{j\omega C} & -(j\omega L + R) \\ -R & j\omega L + \frac{1}{j\omega C} + R \end{bmatrix}$$

N°3



Det $\bar{X}$, affinché $\bar{V}_2 = k\bar{A}$, con $k \in R$ e $k \neq 0$.

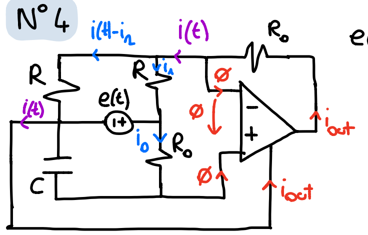
so che $i_1 = A$

$\bar{V}_2 = k\bar{A}$ sse $\left(j\omega L + \frac{1}{j\omega C} + R\right) i_2 = 0$ con $\bar{i}_2 = \frac{\bar{V}_2}{jX}$

$$\rightarrow \bar{V}_2 = \frac{1}{j\omega C}\bar{A} + \left(R + j\omega L + \frac{1}{j\omega C}\right)\left(\frac{\bar{V}_2}{jX}\right) = 0$$

$$\rightarrow \frac{1}{jX}\left(jX + R + j\omega L + \frac{1}{j\omega C}\right)\bar{V}_2 = \frac{1}{j\omega C}\bar{A} \rightarrow \bar{V}_2 = \frac{jX \quad A}{-\omega X C + j\omega C R + 1 - \omega^2 L C}$$ → deve essere reale

N°4



$e(t) = E\cos(\omega t)$. Det corrente $i(t)$. $\bar{E} = E$

$\rightarrow i_{out} = i(t)$

$\rightarrow$ KVL: $R_0 i_0 + R i_1 = 0$

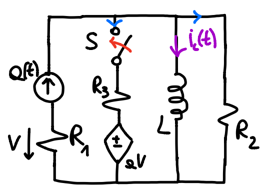
$\rightarrow$ KVL: $R i_1 - R(i(t) - i_1) + e(t) = 0 \longrightarrow 2R i_1 = R i(t) - e(t) \rightarrow i_1 = \frac{R i(t) - e(t)}{2R}$

$$\rightarrow \bar{I} = -\frac{R_0 \bar{i}_0 + R\bar{i}_1}{R_0} \qquad \bar{i}_1 = \frac{R\bar{I} - \bar{E}}{2R}$$

$\rightarrow$ KVL : $\bar{E} - R_0 \bar{i}_0 - \frac{1}{j\omega C}\bar{i}_0 = 0 \rightarrow \bar{i}_0 = \frac{\bar{E}\, j\omega C}{j\omega R_0 C + 1}$

$\rightarrow R_0 \frac{\bar{E}\, j\omega C}{j\omega R_0 C+1} + \cancel{R}\frac{R\bar{i} - \bar{E}}{2\cancel{R}} = 0 \longrightarrow \frac{R\bar{i}}{2} = \frac{\bar{E}}{2} - \frac{R_0 \bar{E}\, j\omega C}{j\omega R_0 C+1} = \frac{\bar{E}}{R}\left(1 - \frac{R_0\, j\omega C}{j\omega R_0 C+1}\right) = \frac{\bar{E}}{R}\left(\frac{1}{j\omega R C+1}\right)$

N° 5



$t=0^-$ a regime, $a(t)=A$. $t=0$, S si chiude. Det eq. di stato, $i_L(t)$ per $t\geq 0$

$\rightarrow t \leq 0^-$: L è c.c.

$i_L - A + i_3 + i_2 = 0 \longrightarrow i_L(0^-) = A$

$V_L = 0 \rightarrow i_2 = 0$ mentre $i_3 = -\frac{aV}{R_3} = 0$

$\rightarrow t\geq 0^+$: cerco $V_L = f(i_L)$

$\hookrightarrow V_L = R_3 i_3 - aV \qquad -aV \nearrow V = a(t)R_1$

cerco $i_3 = a(t) - i_L - \frac{V_L}{R_2}$ $\qquad \hookrightarrow V_L = R_3\left(a(t) - i_L - \frac{V_L}{R_2}\right) \longrightarrow V_L = R_3 a(t) - R_3 i_L - \frac{R_3 V_L}{R_2} - a \cdot a(t) R_1$

$\rightarrow \left(1 + \frac{R_3}{R_2}\right) V_L = -R_3 i_L + (R_3 - aR_1)a(t) \longrightarrow V_L = -\frac{R_3 \cdot R_2}{R_2+R_3} i_L + \frac{(R_3 - aR_1)R_2}{R_2+R_3} a(t)$

$\rightarrow \dot{i}_L = -\frac{R_3 R_2}{L(R_2+R_3)} i_L + \frac{R_2(R_3 - aR_1)A}{L(R_2+R_3)}$ eq. di stato

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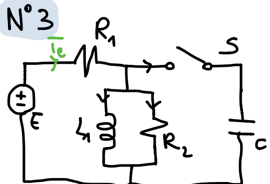
N° 3



$P_a^{R_1} = 2W$, $P_e^{E} = 10 + 10j$, $R_2 = 1\,\Omega$. Det $|\bar{I}_E|$ con S aperto

$\rightarrow 10 = \Sigma P = 2 + P_a^{R_2} \rightarrow P_a^{R_2} = 8\ W = \frac{1}{2} R_2 |\bar{I}_2|^2 \rightarrow \bar{I}_2 = \sqrt{\frac{16}{R_2}} = 4$

$j10 = Q_a^{L} = \frac{1}{2} j\omega L \cdot |\bar{I}_L|^2$

$\rightarrow j\omega L |\bar{I}_L|^2 = j20 \rightarrow \bar{I}_L = \frac{j20}{\omega L |\bar{I}_L|} = j\frac{20}{4} = j5 \qquad \rightarrow \bar{I}_e = \bar{I}_2 + \bar{I}_L = 4 + j5$

$\quad \hookrightarrow 4 \cdot 1 = j\omega L \bar{I}_L \qquad \rightarrow |\bar{I}_e| = \sqrt{16+25} = \sqrt{41}$

$V_{R_2} \nearrow$

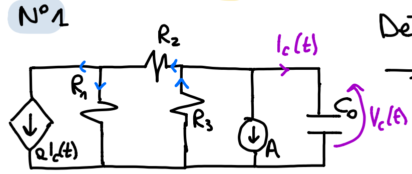
$\rightarrow$ S chiuso. Det c affinché con $\omega = 1$, $P_e^{E} = 10$.

$Q = 0 \longrightarrow P_a^{E} = -j10 = \frac{1}{2}\frac{1}{j\omega C}|\bar{I}_c|^2 \rightarrow 10 = \frac{1}{2} j\omega C\, \bar{V}_c^2 \longrightarrow 10 = \frac{1}{2} 1 C\, 16 \rightarrow C = \frac{20}{16} = \frac{5}{4}$

$\bar{V}_c = \bar{V}_{R_2} = 1 \cdot 4 = 4$

ITE LUGLIO 2015

N° 1



Det eq. di stato.

$\longrightarrow i_c = C\frac{dV_c}{dt}$

$i_c = i_3 - i_2 - A \qquad i_2 R_2 + V_3 + i_1 R_1 = 0 \rightarrow i_1 = \frac{-i_2 R_2 - V_3}{R_1} \qquad =-V_c$

$i_3 = -\frac{V_c}{R_3} \qquad i_2 = i_1 - a\, i_c(t) = -\frac{i_2 R_2}{R_1} + \frac{V_c}{R_1} - a\, i_c(t)$

$\rightarrow i_2 = \left(\frac{V_c}{R_1} - a\, i_c(t)\right)\frac{R_1}{R_1+R_2} = \frac{V_c}{R_1+R_2} - \frac{a\, i_c(t) R_1}{R_1+R_2}$

$\rightarrow i_c = -\frac{V_c}{R_3} - \frac{V_c}{R_1+R_2} + \frac{a\, i_c(t) R_1}{R_1+R_2} - A_0 \longrightarrow i_c = -\frac{R_1+R_2+R_3}{R_3(R_1+R_2)}\frac{\cancel{R_1+R_2}}{R_1+(1+a)R_2} V_c = -\frac{R_1+R_2+R_3}{\ldots} V_c$

$R_3(R_2+(1+a)R_1)$

$\rightarrow \dot{V}_c + \frac{R_1+R_2+R_3}{R_3C(R_2+(1+a)R_1)}V_c + \frac{A_0}{\sim} = 0 \rightarrow$ eq. di stato

N°2

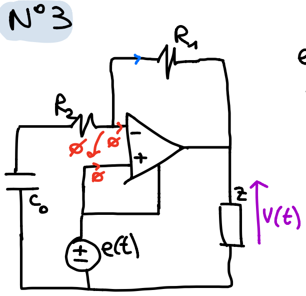
$\rightarrow$ as. stabile sse: $R_3(R_2+(1+a)R_1)>0 \rightarrow R_2+(1+a)R_1>0 \rightarrow (1+a)>-\frac{R_2}{R_1} \rightarrow a>-\frac{R_2}{R_1}-1$

$\rightarrow V_c(1)=V_0$, $V_c(t)$ per $t>0$

$\rightarrow V_0=K \rightarrow V_c(t)=V_0 e^{-\frac{R_1+R_2+R_3}{R_3C(R_2+(1+a)R_1)}(t-1)} + A\ldots$

~~$\rightarrow t\to\infty$: $P_e^c=\frac{1}{2}\bar{V}_c\bar{I}_c^*=0$ poiché V_c è in scarica~~

N°3



$e(t)=E\,\mathrm{sen}(\omega t)$, si det $v(t)$.

$\bar{E}=Ee^{j\frac{\pi}{2}}=-j\bar{E}$

$\rightarrow \bar{V}+R_1\bar{I}_1-\bar{E}=0 \rightarrow \bar{V}=\bar{E}-R_1\bar{I}_1$ KVL

$\rightarrow \bar{I}_1R_2+\bar{E}+\frac{1}{j\omega C_0}\bar{I}_1=0 \rightarrow \bar{I}_1=-\frac{\bar{E}j\omega C_0}{j\omega C_0R_2+1}$ KVL

$\rightarrow \bar{V}=\bar{E}+\frac{\bar{E}j\omega C_0R_1}{j\omega C_0R_2+1}$

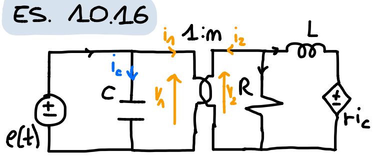
$\rightarrow v(t)=\mathrm{Re}\left\{\bar{V}e^{\omega t}\right\}=\mathrm{Re}\left\{\frac{j\omega C_0R_2+1+j\omega C_0R_1}{j\omega C_0R_2+1}\bar{E}\right\}=\mathrm{Re}\left\{\frac{\sim(1-j\omega C_0R_2)}{\omega^2C_0^2R_2^2+1}\right\}=$

$=$

N°4

Z tc $P_e^E=P^{R_2}+jQ^c$; $Z=-jQ_e^c$

ES. 10.16



so che: $V_2=mV_1$

$i_2=\frac{1}{m}i_1$

Det. c tc $P_e^E=P \rightarrow Q_e^E=0$.

$P_e^E=\frac{1}{2}\bar{E}\bar{I}_e^*$

cerco $\bar{I}_e$: $\bar{I}_e=i_1+i_c$, $i_c = \bar{E}j\omega c$

$i_1=-\frac{1}{m}i_2$

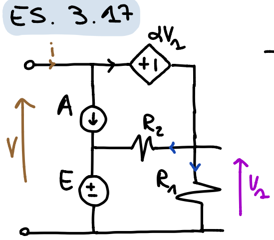
so che: $i_2=-i_R-i_L=-\frac{m\bar{E}}{R}-\frac{\bar{E}(m-rj\omega c)}{j\omega L}$, $i_R=\frac{m\bar{E}}{R}$

$m\bar{E}-\bar{I}_Lj\omega L-r\bar{E}j\omega c=0 \rightarrow \bar{I}_L=\frac{\bar{E}(m-rj\omega c)}{j\omega L}$

$\rightarrow \bar{I}_e=\frac{\bar{E}}{m}\left(\frac{m}{R}+\frac{m-jr\omega c}{j\omega L}\right)+\bar{E}j\omega c=\frac{\bar{E}}{m}\left(\frac{m}{R}-\frac{jm\omega}{\omega^2L}-\frac{r\omega^2Lc}{\omega^2L^2}+j\omega c\right)$

$\mathrm{Im}\left\{P_e^E\right\}=0 \rightarrow -\frac{m}{\omega L}+\omega c=0 \rightarrow c=\frac{m}{\omega^2L}$

ES. 3.17



$\rightarrow i_{mr}=G_{mr}V+A_{mr}$

$\rightarrow i=(i_1+i_2)-A$

KVL) $E+R_2i_2-R_1i_1=0 \rightarrow i_1=\frac{E+R_2i_2}{R_1}$

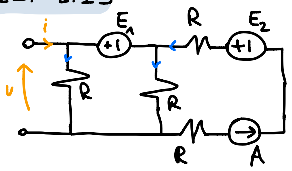
KVL) $R_2i_2+aV_1-V+E=0 \rightarrow R_2i_2+a(E+R_2i_2)-V+E=0$, $V_1=R_1i_1$

$\rightarrow R_2(1+a)i_2=V-(1+a)E \rightarrow i_2=\frac{V-(1+a)E}{R_2(1+a)}$

→ $i_1 = \frac{E}{R_1} + \frac{V-(1+\alpha)E}{R_1(1+\alpha)}$ → $i = -\left(\frac{E}{R_1} + \frac{V-(1+\alpha)E}{(1+\alpha)}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)\right) - A$

→ $i = \frac{R_1+R_2}{R_1R_2(1+\alpha)}V + \frac{E}{R_2} - A$ $\exists\ \forall\ \alpha \neq -1$

ES. 2.15



$i_{mr} = G_{mr}V + A_{mr}$

→ spengo generatori: $G_{mr} = \frac{i_{mr}}{V}$ → $i = i_{R_1} + i_{R_2}$

$i_{R_1} = \frac{V}{R} = i_{R_2}$ → $i = \frac{2V}{R}$ → $G_{mr} = \frac{2}{R}$

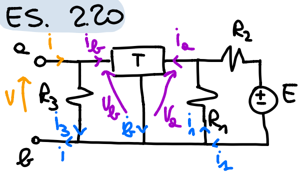
→ spengo V: $i_{mr} = A_{mr}$ → $i = i_{R_1} + i_{R_2} - A$

$i_{R_1} = 0$ perché // a c.c. → $i = A_{mr} = -\frac{E_1}{R} - A = -\frac{E_1 + AR}{R}$

$i_{R_2} = -\frac{E_1}{R}$

→ $i_{mr} = \frac{2}{R}V - \frac{E_1 + AR}{R}$

ES. 2.20



→ $V_{Th} = R_{Th}\, i + E_{Th}$ $\begin{cases} i_a = 0 \\ i_b = gV_a \end{cases}$

→ spengo generatori: $R_{Th} = \frac{V_{Th}}{i}$ → $V_{Th} = R_3 i_3 = R_3 i$

→ $E=0$ → $V_{R_2}=0$ → $V_a = 0$ → $i_b = 0$ → $i_3 = i$

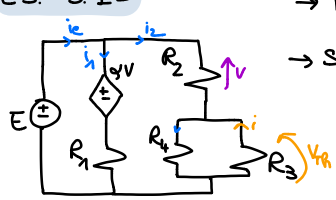
→ $R_{Th} = R_3$

→ spengo i: $V_{Th} = E_{Th} = R_3 i_b$

$i_b = gV_a$ → $V_a = -R_1 i_1 = -\frac{R_1 E}{R_1+R_2}$ $\xrightarrow{\text{partitore}}$ $i_b = -\frac{gR_1E}{R_1+R_2}$ → $E_{Th} = -\frac{gR_1R_3E}{R_1+R_2}$

→ $V_{Th} = R_3 i - \frac{gR_1R_2E}{R_1+R_2}$ → se R_3 è c.a. $V_{Th} = E_{Th}$ generatore indip. di tensione

ES. 3.15



→ $R_3 \mid P_a^{R_3}$ max. → sse $R_3 = R_{Th}$

→ spengo generatori: $R_{Th} = \frac{V_{Th}}{i}$

↳ $V_{Th} = R_2 i_2$

$E=0$ → $\alpha V + R_1 i_1 = 0$ → $\alpha R_2 i_2 = -R_1 i_1$

→ $i_4 R_4 + R_2 i_2 = 0$ → $R_4(i_2 - i) + R_2 i_2 = 0$ → $-iR_4 + (R_4+R_2)\,i_2 = 0$ → $i_2 = \frac{R_4}{R_4+R_2}\, i$

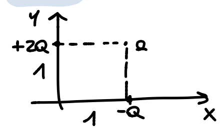
$V_{Th} = R_2 i_2 = \frac{R_2R_4}{R_2+R_4}\, i$ → $R_{Th} = \frac{R_2R_4}{R_2+R_4}$

→ $P_a^{R_3}$ max → $= \frac{1}{2}\cdot\frac{e_{Th}^2}{4\,\mathrm{Re}\{Z_{Th}\}} = \frac{1}{8}\,\frac{\cancel{(R_2+R_4)}\,R_4^{\cancel{2}}E^2}{R_2\cancel{R_4}\,(R_2+R_4)^{\cancel{2}}} = \frac{R_4E^2}{8R_2(R_2+R_4)}$

↳ R_{Th} $E_{Th} = V_{Th}\big|_{i=0}$ → $R_2 i_2 + R_4 i_2 = E$ → $i_2 = \frac{E}{R_2+R_4}$

$V_{Th} = \frac{R_4 E}{(R_2+R_4)}$

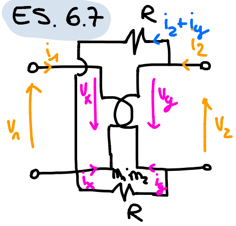
ES. 1



$$\bar{E}_{2Q} = \frac{2Q}{4\pi\varepsilon d^2} = \frac{2Q}{4\pi\varepsilon_0} u_x \qquad d^2 \hookrightarrow 1 \qquad \bar{E}_{-Q} = \frac{Q}{4\pi\varepsilon_0}(-u_y)$$

$$\bar{E} = \frac{2Q}{4\pi\varepsilon_0} u_x - \frac{Q}{4\pi\varepsilon_0} u_y$$

ES. 6.7



$n_1 = 4 \quad n_2 = 2 \quad R = 1\,\Omega$

$$\rightarrow \begin{cases} V_1 = R_{11} i_1 + R_{12} i_2 \\ V_2 = R_{21} i_1 + R_{22} i_2 \end{cases} \qquad \begin{cases} V_x = \frac{n_1}{n_2} V_y \\ i_x = -\frac{n_2}{n_1} i_y \rightarrow i_1 = \frac{n_2}{n_1} i_y \end{cases}$$

• $R_{11} = \frac{V_1}{i_1}\Big|_{V_2=i_2=0} \rightarrow i_x = i_1 \rightarrow \text{KVL} \,|\, V_1 = V_x \rightarrow V_x - R i_y - V_y - R i_y = 0 \rightarrow V_x - 2R\left(\frac{n_1}{n_2} i_1\right) - V_x \frac{n_2}{n_1}$

$\rightarrow V_x - 4 i_1 - V_x \frac{1}{2} = 0 \rightarrow \frac{1}{2} V_x = 4 i_1 \rightarrow V_x = 8 i_1$

$\rightarrow V_1 = 8 i_1 \rightarrow R_{11} = 8$

• $R_{12} = \frac{V_1}{i_2}\Big|_{V_2=i_1=0} \rightarrow V_1 = V_x \rightarrow V_x - R(i_2+i_y) - V_y - R(i_2+i_y) = 0 \rightarrow \frac{V_x}{2} = 2R(i_2+\underbrace{i_y}_{0}) = 4 i_2$

$\rightarrow R_{12} = 4$

• $R_{21} = \frac{V_2}{i_1}\Big|_{V_1=i_2=0} \rightarrow V_2 = V_y \rightarrow V_y + 2R(\underbrace{i_2}_{0}+i_y) - 2V_y = 0 \rightarrow V_y = -2R i_y = 2R\cdot 2 i_1 = 4 i_1$

$\hookrightarrow R_{21} = 4$

• $R_{22} = \frac{V_2}{i_2}\Big|_{V_1=i_1=0} \rightarrow V_2 = -V_y \rightarrow -V_y + 2R i_2 = 0 \rightarrow V_y = 2 i_2 = V_2$

$\hookrightarrow R_{22} = 2$

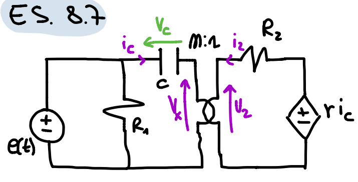
$\rightarrow$ Det V_1 e i_2 t.c. $i_1 = 0 \wedge V_2 = 2V$

$V_1 = 4 i_2 \rightarrow V_1 = 4\text{ V}$

$V_2 = 2 = 2 i_2 \rightarrow i_2 = 1\text{ A}$

$P_R^{AB} = 2\cdot 1(1)^2 = 2\text{ W}$

ES. 8.7



$e(t) = E\,\text{sen}(\omega t)$, $v_c\left(\frac{\pi}{\omega}\right) = 0$. Det equazione di stato.

$\rightarrow$ i_c in funz. di V_c:

$\rightarrow V_x + V_c - e(t) = 0 \rightarrow$ cerco i_c: $V_2 + R_2 i_2 - r i_c = 0 \rightarrow \frac{V_x}{m} - R_2 m i_c - r i_c = 0$

$V_x = -V_c + e(t) \qquad V_x = m V_2 \qquad i_2 = -m i_c$

$\rightarrow -\frac{V_c}{m} + \frac{e(t)}{m} = (R_2 m + r) i_c \rightarrow i_c = -\frac{V_c}{m(R_2 m + r)} + \frac{e(t)}{m(R_2 m + r)} \rightarrow$ eq. di stato $\rightarrow \dot{V}_c + \frac{V_c}{mC(R_2 m + r)} - \frac{e(t)}{mC(R_2 m + r)} = 0$

$r > -R_2 m$

$\rightarrow V_c(t)$ per $t \geq \frac{\pi}{\omega}$

• cerco $V_{c_{IP}}(t)$: $\rightarrow \frac{d\bar{V}_c}{dt} = -\frac{\bar{V}_c}{mC(R_2 m + r)} - \frac{jE}{mC(R_2 m + r)} \rightarrow \left(j\omega + \frac{1}{mC(R_2 m + r)}\right)\bar{V}_c = -\frac{jE}{mC(R_2 m + r)}$

$\rightarrow \bar{V}_c = -\frac{jE}{j\omega mC(R_2 m + r) + 1} = \underbrace{\frac{E\omega mC(R_2 m + r) + jE}{1 - \omega^2 m^2 C^2 (R_2 m + r)^2}}_{\gamma}$

$V_c(t) = Re\left\{V_c e^{j\omega t}\right\} = Re\left\{\gamma\left(E\omega mC(R_2 m + r) + jE\right)\left(\cos(\omega t) + j\,\text{sen}(\omega t)\right)\right\} = \gamma\left[E\omega mC(R_2 m + r)\cos(\omega t) - E\,\text{sen}(\omega t)\right]$

• cerco K: $0 = K + V_{c_{IP}}$ $\hookrightarrow V_c(t) = K e^{\sim} + H$