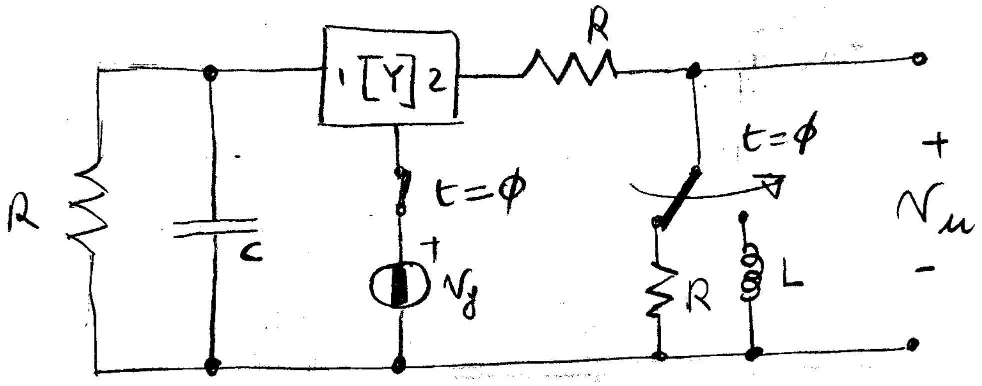
ELE_INFO_2001_12_19 ES. 3 (1)

$$[Y] = \begin{bmatrix} 2/3 & -1/3 \\ -1/3 & 2/3 \end{bmatrix}$$

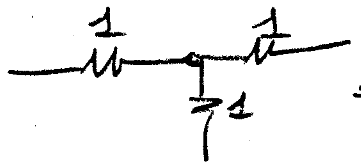


$R = 1$
$C = 1$ [F]
$L = 1$ [H]
$v_g(t) = \cos(2t)$

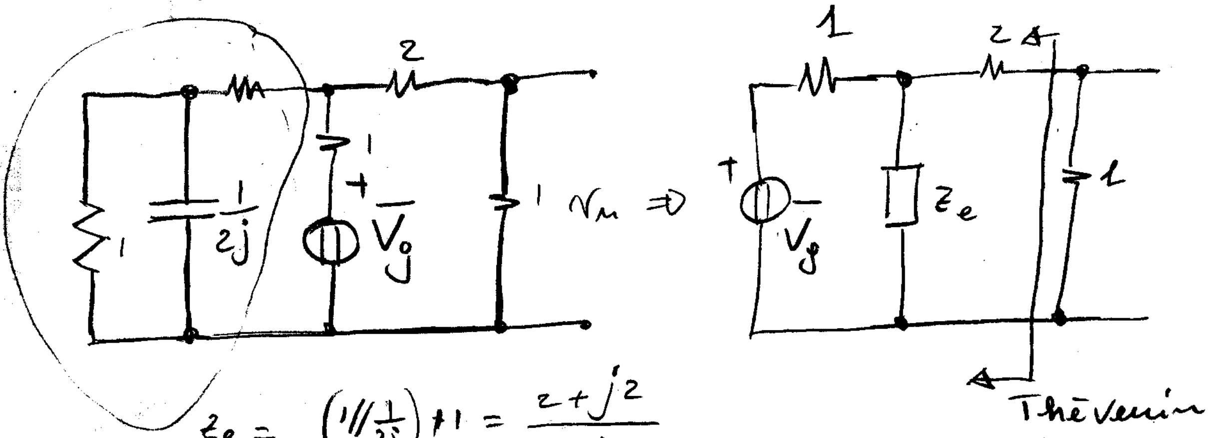
Determinare l'uscita per tutto l'asse dei tempi.

1) $t < 0$. Il circuito è a regime sinusoidale ⇒ soluzione con metodo fasori.

$$[Z] = [Y]^{-1} = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \Rightarrow \text{rete a "T"}$$

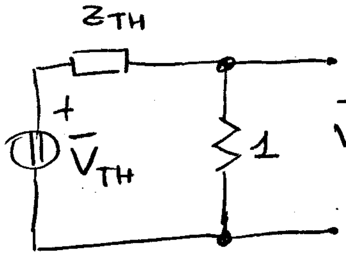


⇒ il circuito diventa



$$Z_e = \left(1 // \frac{1}{2j}\right) + 1 = \frac{2 + j2}{1 + j2}$$

$$Z_{TH} = (Z_e // 1) + 2 = \frac{8 + j10}{3 + j4}$$



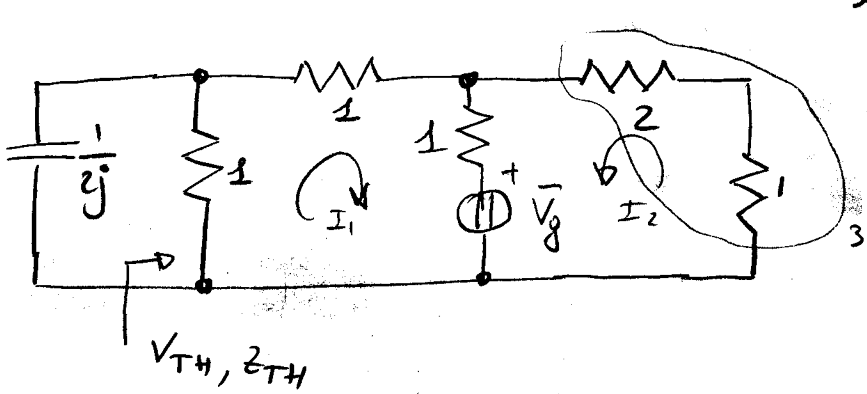
$$\bar{V}_u = \frac{\bar{V}_{TH}}{1 + Z_{TH}} \cdot 1 = \bar{V}_g \frac{3 + j4}{11 + j14} = \frac{89 + j2}{121 + 196} \Rightarrow$$

$$\bar{V}_u = \frac{\sqrt{89^2 + 2^2}}{317} e^{j \operatorname{arctg}\left(\frac{2}{89}\right)} \Rightarrow \boxed{v_u(t) = 0.28 \cos\left(2t + \frac{2}{89}\right) \quad t < 0}$$

$$\operatorname{arctg}\left(\frac{2}{89}\right) \cong \frac{2}{89}$$

2) $t \geq \emptyset$. Per $t \geq 0$ occorre calcolare le c.i. sul condensatore. Il circuito pertanto è: ②

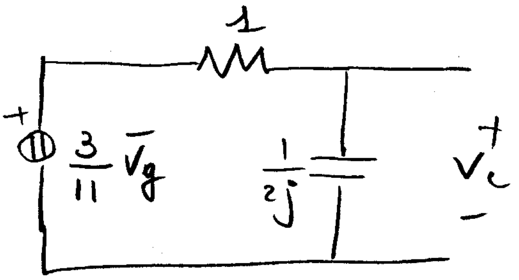
• **C.i.**



$$Z_{TH} = ((3/\!/1)+1)/\!/1 = \frac{7}{11}$$

$V_{TH} \Rightarrow$ metodo maglie $\Rightarrow \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} \bar{V}_g \\ \bar{V}_g \end{bmatrix} \Rightarrow I_1 = \frac{3}{11} \bar{V}_g$

$$V_{TH} = R I_1 = \frac{3}{11} \bar{V}_g$$



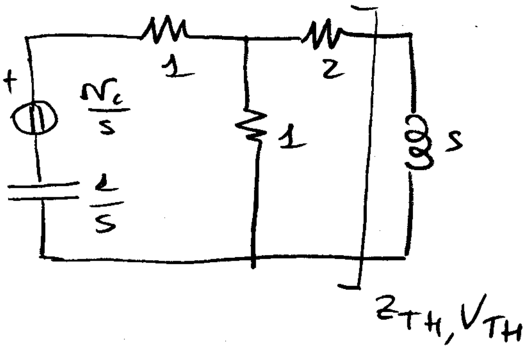
$$\bar{V}_c = \frac{3}{11} \bar{V}_g \frac{1}{1+\frac{1}{2j}} \frac{1}{2j} = \frac{3}{11} \frac{\bar{V}_g}{1+2j} =$$

$$= \frac{3}{5 \cdot 11}(1-2j) = \frac{3}{55} e^{j \operatorname{arctg}(-2)} \Rightarrow$$

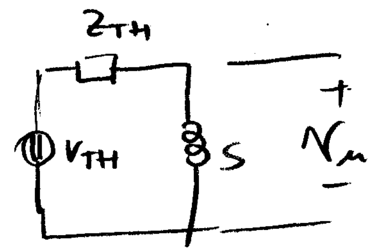
$$v_c(t) = \frac{3}{55} \cos(2t - 1.1) \Rightarrow$$

$$v_c(0^-) \cong \frac{1}{41}$$

• Uscite per $t \geq \emptyset \Rightarrow$ Laplace



$$Z_{TH} = \frac{4s+1}{s} \qquad V_{TH} = \frac{v_c}{2s+1} \Rightarrow$$



$$v_u(s) = \frac{1}{2} \frac{v_c(0^-)}{(s+\frac{1}{2})(s+2-\sqrt{3})(s+2+\sqrt{3})}$$

$A = \frac{1}{3}$

$B = -\frac{1}{6}$

$C = -\frac{1}{6}$

$$v_u(t) = \frac{v_c(0^-)}{6}\left[e^{-t/2} - \frac{1}{2} e^{-(2-\sqrt{3})t} - \frac{1}{2} e^{-(2+\sqrt{3})t}\right]$$

$t \geq \emptyset$