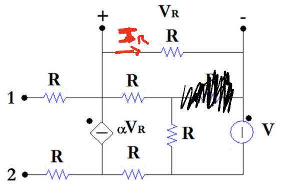
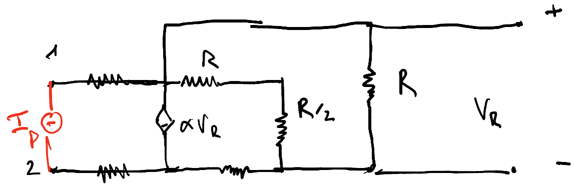
PROVA 22/07/2020

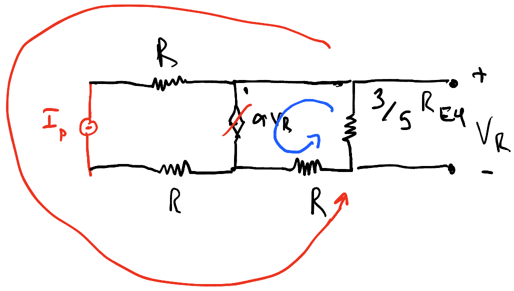
lunedì 2 novembre 2020 15:56



V = 100 V;
R = 10 Ω;
α = 0.05 A/V;



$$R + R/2 = \frac{3}{2}R \qquad \frac{3}{2}R \,/\!/\, R = \frac{3}{5}R$$



$$V_R = (I_p + \alpha V_R)\, R_{Eq} \implies$$

$$\implies V_R = I_p R_{Eq} + \alpha V_R R_{Eq}$$

$$I_p = V_R \frac{(1-\alpha R_{eq})}{R_{Eq}}$$

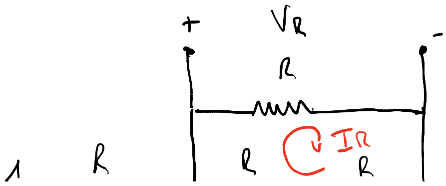
$$V_R = \frac{I_p R_{Eq}}{1-\alpha R_{Eq}}$$

$$V_p = R I_p + V_R + R I_p + R I_p + R \alpha V_R =$$

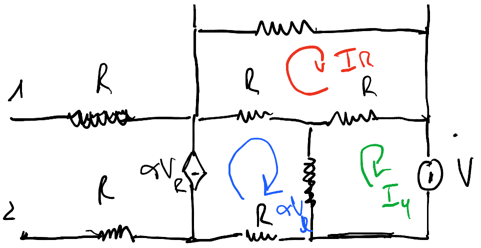
$$= 3 R I_p + \frac{I_p R_{Eq}}{1-\alpha R_{Eq}} + \frac{R\alpha I_p R_{eq}}{1-\alpha R_{eq}}$$

$$R_{TH} = \frac{V_P}{I_P} = 3R + \frac{R_{Eq}}{1-\alpha R_{Eq}} + \frac{R\alpha R_{Eq}}{1-\alpha R_{eq}} = 42{,}85\ \Omega$$

CALCOLO E_{TH}



$$\Big\{\; I_R R = V_R$$



$$\begin{cases} I_R R = V_R \\ 3R I_R - R I_y - R\alpha V_R = 0 \\ V + 2R I_y - R I_R - R\alpha V_R = 0 \end{cases}$$

$$\begin{cases} I_R R = V_R \\ 3 V_R - R I_y - R\alpha V_R \quad \Rightarrow \quad I_y = \dfrac{-R\alpha V_R + 3V_R}{R} \\ V + 2R I_y - V_R - \alpha V_R R = 0 \end{cases}$$

$$I_y = -\frac{R^{\cancel{2}}\alpha I_R + 3\cancel{R} I_R}{\cancel{R}} = -R\alpha I_R + 3 I_R$$

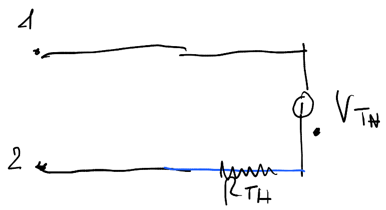
$$V - 2R^2\alpha I_R + 6R I_R - R I_R - \alpha R^2 I_R = 0$$

$$V - 3R^2\alpha I_R + 5R I_R = 0$$

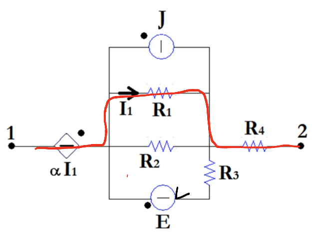
$$\frac{-V}{R} = I_R(-3R\alpha + 5)$$

$$I_R = \frac{-V}{R(-3R\alpha + 5)} = -2,85\ A$$

$$V_{TH} = R I_R + V + R\alpha R I_R = 57\ V$$

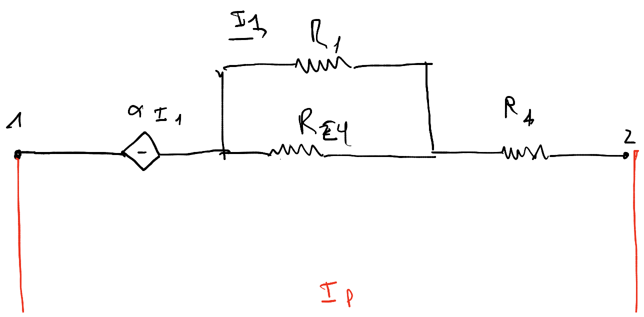


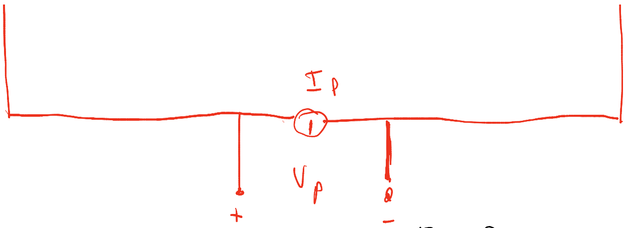
1/07/2020



J = 2 A;
E = 50 V;
R_1 = 10 Ω;
R_2 = 20 Ω;
R_3 = 30 Ω;
R_4 = 40 Ω;
α = 15 V/A.

V_{TH}





$$R_{eq} = \frac{1}{\frac{1}{R_2} + \frac{1}{R_3}} = \frac{R_2 R_3}{R_2 + R_3} = \frac{6}{5}$$

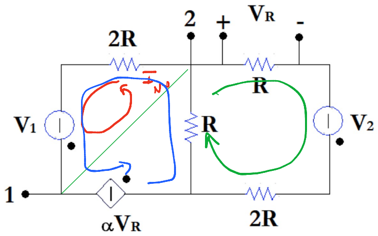
$$\begin{cases} V_p = -\alpha I_1 + I_1 R_1 + R_4 I_p \\ I_1 = \dfrac{I_p / R_1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} = I_p \dfrac{6}{11} \end{cases}$$

$$R_{TH} = \frac{V_p}{I_p} = \frac{-\alpha \cancel{I_p} \frac{6}{11} + R_1 \cancel{I_p} \frac{6}{11} + R_4 \cancel{I_p}}{\cancel{I_p}} = 37{,}27\ \Omega$$

$$-JR_1 + I_1 R_1 = 0 \qquad I_1 = 2\ A$$

$$V_{TH} = -\alpha I_1 + R_1 I_1 = -10\ V$$

10/06/2020



$V_1 = 10$ V;
$V_2 = 20$ V
$R = 10\ \Omega$;
$\alpha = 0.1$ A/V.

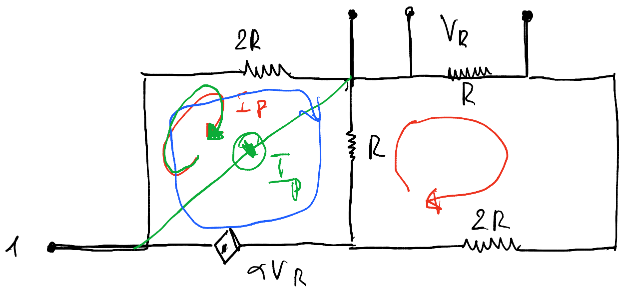
$$\begin{cases} 2R I_{No} - V_1 + 2R\alpha V_R = 0 \\ -V_2 + 2R I_x + R I_x + \alpha V_R R + V_R = 0 \end{cases}$$

$$\begin{cases} 4R I_x - V_2 + \alpha R^2 I_x = 0 \implies I_x = \dfrac{V_2}{\alpha R^2 + 4R} = \dfrac{2}{5}\ A \\ 2R I_{No} - V_1 + 2R^2 \alpha I_x = 0 \end{cases}$$

$$I_{No} = \frac{V_1 - 2R^2 \alpha I_x}{2R} = 0{,}1\ A$$

R_{TH}

2

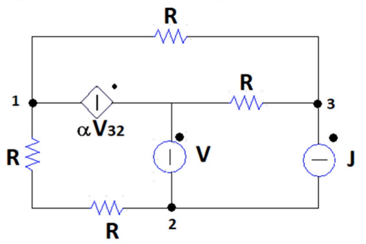


$$\begin{cases} 4R I_R - R\alpha V_R \\ V_R = R I_R \end{cases} \Rightarrow 4R I_R - R^2\alpha I_R = 0$$

$I_R = 0 \qquad V_R = 0$

$V_p = 2R I_p \qquad R_{NO} = \dfrac{V_p}{I_p} = 2R$

30/01/2019



V = 25 V;
J = 1 A;
R = 10 Ω;
α = 0.5;

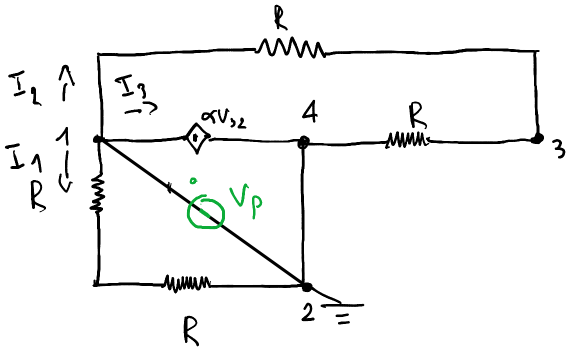
$V_1 = V_2 = 0 \qquad V_4 = V$

$J = V_3\left(\frac{1}{R} + \frac{1}{R}\right) - V_4\left(\frac{1}{R}\right)$

$RJ = 2V_3 - V$

$V_3 = \dfrac{RJ + V}{2} = 17{,}5\,V$

$I_{No} = I_x + I_y = \dfrac{V_3 - V_1}{R} - \alpha(V_3 - V_2) = \dfrac{17{,}5}{R} - \dfrac{17{,}5}{2} = -7A$

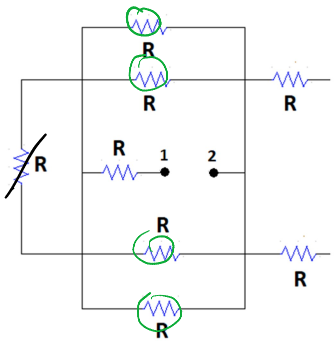


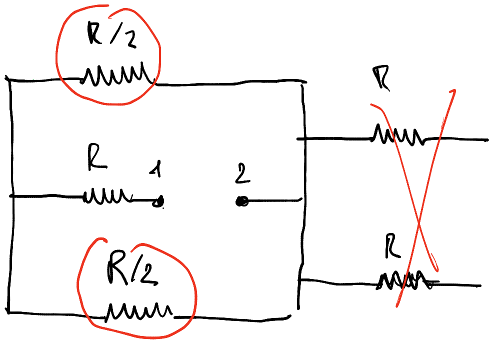
$V_1 = V_p \qquad V_2 = V_4 = 0 \qquad I_p = I_1 + I_2 + I_3 = \dfrac{V_p}{2R} + \dfrac{V_p}{2R} + \alpha V_{32}$

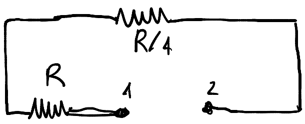
$V_3 = \dfrac{V_p}{2} \qquad = \dfrac{V_p}{R} + \alpha\dfrac{V_p}{2}$

$R_{No} = \dfrac{V_p}{I_p} = \dfrac{\cancel{V_p}}{\cancel{V_p}\left(\frac{1}{R} + \frac{\alpha}{2}\right)} = \dfrac{1}{1/R + \alpha/2} = 2{,}857\,\Omega$

COMPITINO 2018

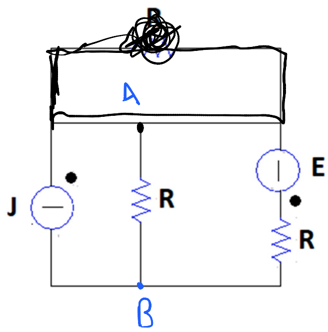






$$R_{eq} = R + \frac{R}{4} = \frac{5}{4} R$$

ES 2



$E = 10\,V$

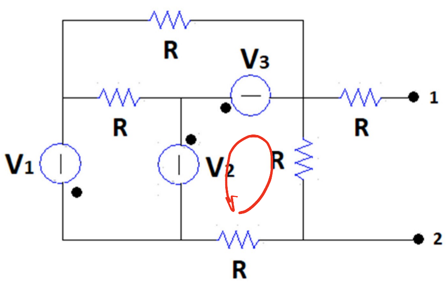
$J = 1\,A$

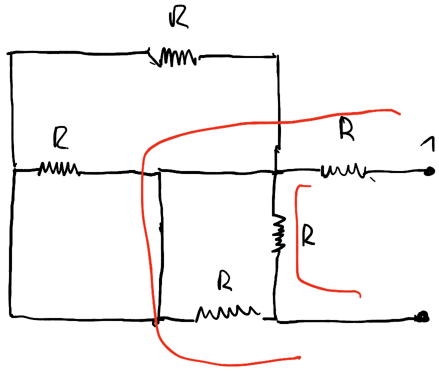
$R = 20\,\Omega$

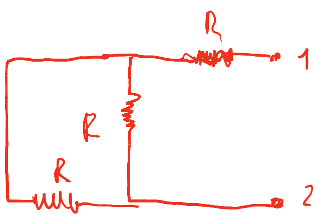
$$P_J = J\,V_{AB} = J\left(V'_{AB} + V''_{AB}\right)$$

$$J\left(R\,\frac{J}{2} - \frac{E}{2}\right) = 5\,W$$

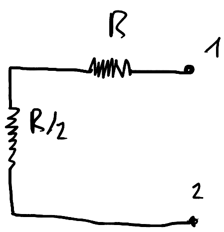
ES 3







$\longrightarrow$



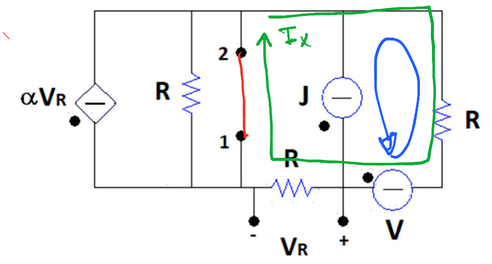
$$R_{eq} = R + R/2 = \frac{3}{2} R$$

$$2R\,I_x - V_3 + V_2 = 0$$

$$I_x = \frac{V_3 - V_2}{2R} = 0{,}5\,A$$

$$-V_3 + V_2 + \frac{R}{2} = V_{TH} \qquad V_{TH} = -5\,V$$

ES 4

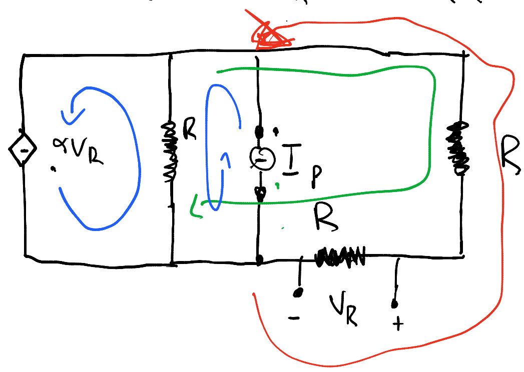


$$2R I_x - R J - V = 0$$

$$I_x = \frac{RJ + V}{2R} = 1 \quad A$$

$$I_{NO} = I_x + \alpha V_R \qquad V_R = R I_x$$

$$I_x + \alpha R I_x = I_x(1+\alpha R) = 1 + \alpha R = 2A$$



$$V_p = 2R I_p$$

$$R_{TH} = \frac{V_P}{I_P} = 2R$$

$$\begin{cases} 3R I_x - R I_p + R\alpha V_R \\ V_R = R I_x \end{cases} \qquad (3R + \alpha R^2) I_x - R I_p = 0$$

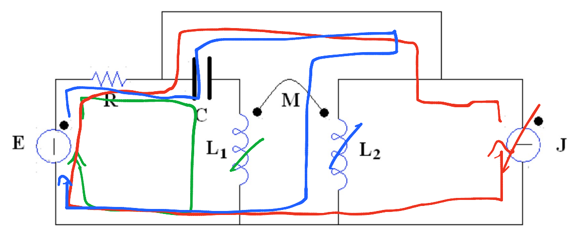
$$I_x = \frac{\cancel{R} I_P}{(3\cancel{R} + \alpha \cancel{R}^2)} = \frac{I_P}{(3 + \alpha R)}$$

$$V_p = 2R I_x = 2R \frac{I_p}{3+\alpha R}$$

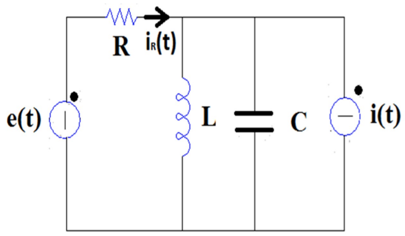
$$R_{NO} = \frac{V_P}{I_p} = 2R \frac{\cancel{I_P}}{3+\alpha R} \frac{1}{\cancel{I_p}} = 5 \,\Omega$$

ES 5

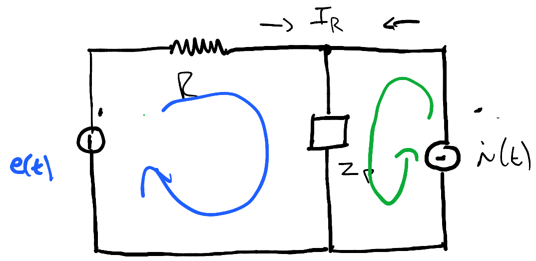
5) Scrivere un sistema di equazioni per risolvere il circuito in figura, utilizzando il metodo delle **correnti di ramo** (o del tableau). Il circuito si ipotizzi a regime periodico sinusoidale con pulsazione **ω**, e si utilizzi il metodo fasoriale per scrivere le equazioni (**4 punti**).



COMPITINO 02/12/2017



$e(t) = 10\sqrt{2}sin(1000t)\ V$
$i(t) = \sqrt{2}sin(1000t + \pi/2)\ A$
$R = 10\ \Omega$
$L = 10\ mH$
$C = 10\ \mu F$



$$Z_p = \frac{\frac{\cancel{j\omega} L}{\cancel{j\omega} C}}{j\omega L + 1/j\omega C} = \frac{L/C}{\frac{-\omega^2 LC + 1}{j\omega C}}$$

$$\frac{L}{\cancel{C}} \cdot \frac{j\omega \cancel{C}}{-\omega^2 LC + 1} = \frac{j\omega L}{-\omega^2 LC + 1} = 11{,}11\, j$$

$$\dot{E} = R I_R + I_R Z_p + \dot{I} Z_p$$

$$\dot{E} - I Z_p = I_R(R + Z_p)$$

$$I_R = \frac{E - I Z_p}{R + Z_p} = 0{,}9448 - 1{,}0497 j$$

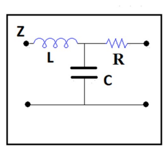
$$= 1{,}4122\, e^{-j\, 0{,}837}$$

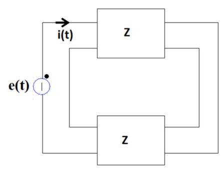
$$\dot{V}_I = E - R I_R = 0{,}5525 + 10{,}4972 j$$

$$P = \Re e\{\dot{V}_I I^*\} = \{(0{,}5525 + 10{,}4972) \cdot (-j)\}$$

$$= 10{,}4972\ W$$

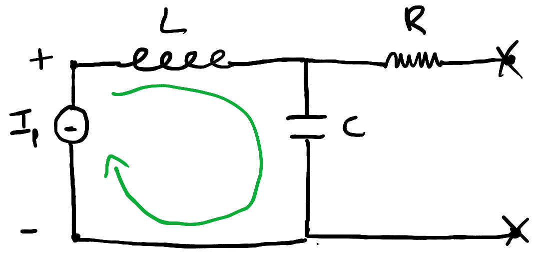
Es 3





$e(t) = 10\sqrt{2}sin(1000t)$
$R = 10\ \Omega$
$L = 10\ mH$
$C = 100\ \mu F$

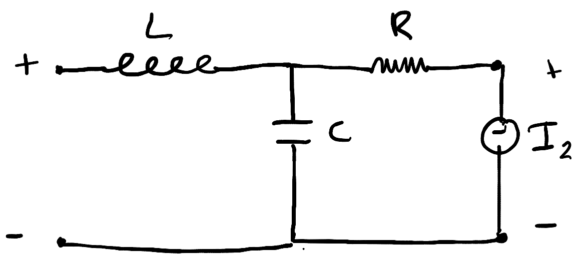
$$\begin{cases} \dot{V}_1 = Z_{11}\dot{I}_1 + Z_{12}\dot{I}_2 \\ \dot{V}_2 = Z_{21} I_1 + Z_{22}\dot{I}_2 \end{cases}$$



$$\dot{V}_1 = j\omega L I_1 + \frac{1}{j\omega C} I_1 = \underbrace{I_1\left(j\omega L + \frac{1}{j\omega C}\right)}_{Z_{11}}$$

$Z_{11} = \phi$

$$\dot{V}_2 = \frac{1}{j\omega C} \cdot I_1 \Rightarrow Z_{21} = \frac{1}{j\omega C}$$



$$\dot{V}_2 = R I_2 + \frac{I_2}{j\omega C} = \underbrace{I_2\left(R + \frac{1}{j\omega C}\right)}_{Z_{22}}$$

$$\dot{V}_1 = \underbrace{\frac{1}{j\omega C}}_{Z_{21}} I_2$$