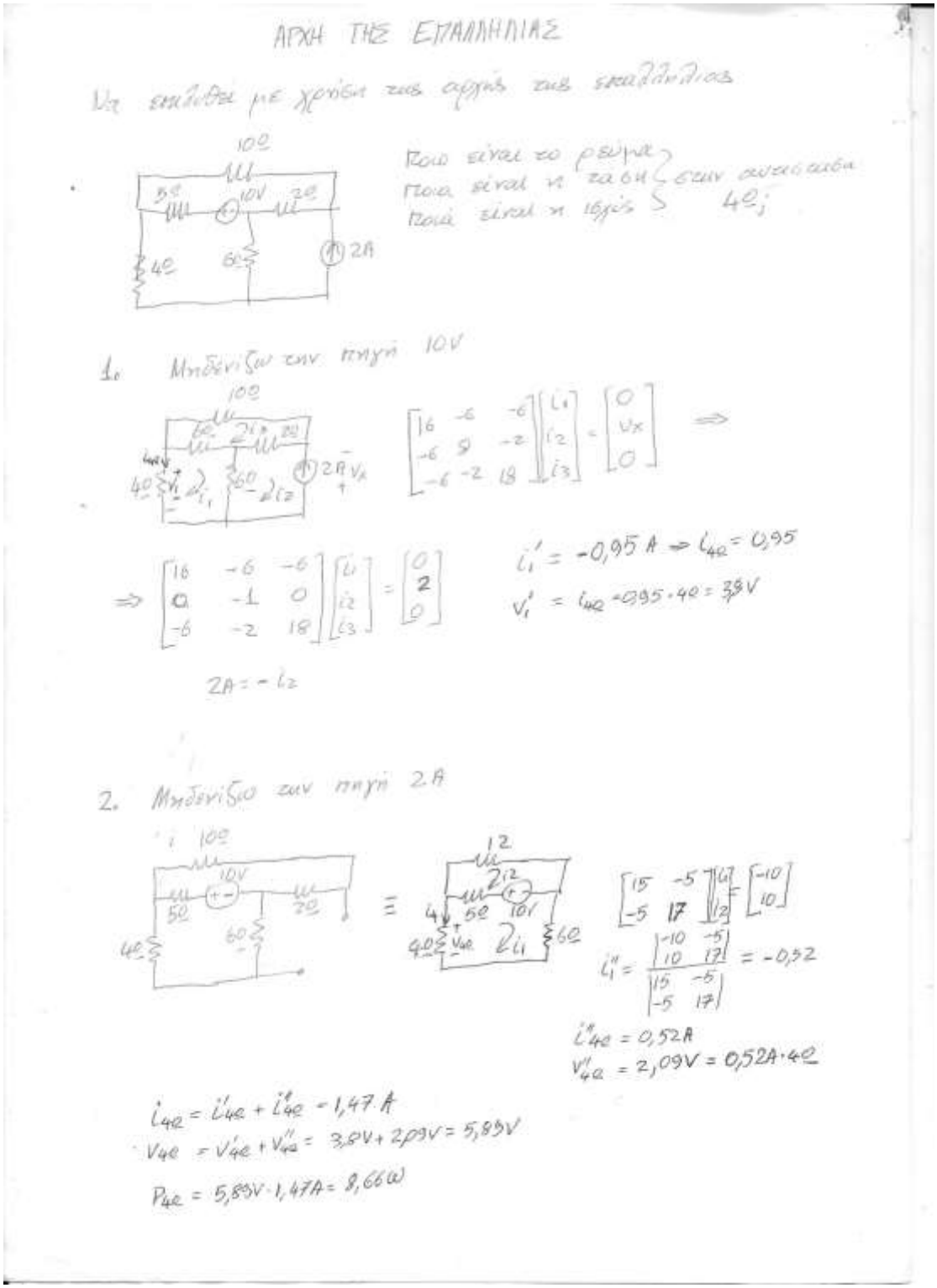
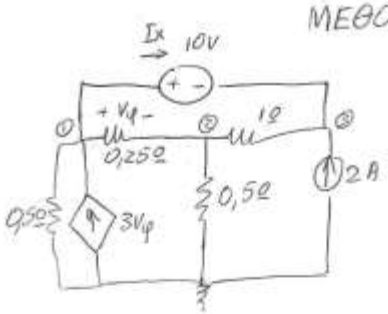
ΑΣΚΗΣΕΙΣ ΕΠΑΝΑΛΗΨΗΣ



ΜΕΘΟΔΟΣ ΚΟΜΒΩΝ



$$\begin{bmatrix} \frac{1}{0,25}+\frac{1}{0,5} & -\frac{1}{0,25} & 0 \\ -\frac{1}{0,25} & \frac{1}{0,25}+\frac{1}{1}+\frac{1}{0,5} & -\frac{1}{1} \\ 0 & -\frac{1}{1} & \frac{1}{1} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 3V_\varphi - I_x \\ 0 \\ 2+I_x \end{bmatrix} \Rightarrow$$

$$\Rightarrow \begin{bmatrix} 6 & -4 & 0 \\ -4 & 7 & -1 \\ 0 & -1 & 1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} - \begin{bmatrix} 3V_\varphi - I_x \\ 0 \\ 2+I_x \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & -1 \\ -4 & 7 & -1 \\ 6 & -5 & 1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ 3V_\varphi + 2 \end{bmatrix} \Rightarrow$$

$$10V = V_1 - V_3 = 1V_1 + 0V_2 - 1V_3 = \begin{bmatrix} 1 & 0 & -1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix}$$

$$V_\varphi = V_1 - V_2$$

$$\Rightarrow \begin{bmatrix} 1 & 0 & -1 \\ -4 & 7 & -1 \\ 6 & -5 & 1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ +3(V_1 - V_2) + 2 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & -1 \\ -4 & 7 & -1 \\ 3 & -2 & 1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ +2 \end{bmatrix}$$

$V_1 = 3,55V$ $\quad V_\varphi = 2,44V$

$V_2 = 4,11V$

$V_3 = -6,44V$

$+I_x + 2 = -V_2 + V_3 \Rightarrow I_x = -2 - V_2 + V_3 = -9,55A$

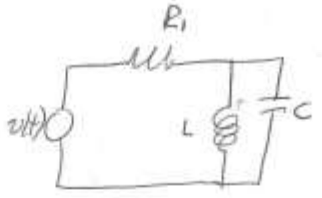
$P_{2A} = 2 \cdot (0 - V_3) = 2(-6,44) = +12,89W$ καταν.

$P_{10V} = I_x \cdot 10V = 10(-9,55)W = 95,5W$ παρεχ.

$P_{3V_\varphi} = 3V_\varphi(-V_1) = -3 \cdot 2,44(3,55) = 26,07W$ παρεχ.

$P_{παρεχ} = 26,07 + 95,5 = 121,57W$

$P_{κατ} = 12,89 + \frac{V_1^2}{0,5} + \frac{V_\varphi^2}{0,25} + \frac{V_2^2}{0,5} + \frac{(V_2 - V_3)^2}{1} = 108,39W$



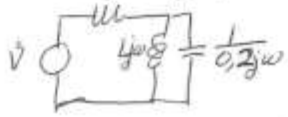
$R = 1\Omega$
$L = 0{,}1H$
$C = 0{,}2F$ $\quad v(t) = 5\cos\omega t$

Ποιά είναι η μιγαδική ισχύς
» » άεργος »
» » πραγματική »

Ποια είναι η τάση στον πυκνωτή

$v(t) = 5\cos\omega t \quad \dot{V} = 5\angle 0^\circ$

$\omega = 10$



$$\dot{V} = \left[R + \left(0{,}1j\omega // \frac{1}{0{,}2j\omega}\right)\right]\dot{I} = \left[1 + \frac{0{,}1j\omega\frac{1}{0{,}2j\omega}}{0{,}1j\omega + \frac{1}{0{,}2j\omega}}\right]\dot{I} = \left[1 + \frac{0{,}5}{\frac{-0{,}02\omega^2+1}{0{,}2j\omega}}\right]\dot{I} =$$

$$= \left[1 + \frac{0{,}1j\omega}{1-0{,}02\omega^2}\right]\dot{I} = \left[1 + \frac{j}{1-2}\right]\dot{I} = [1-j]\dot{I} \Rightarrow$$

$$\dot{I} = \frac{\dot{V}}{1-j} = \frac{5\angle 0^\circ}{\sqrt{1^2+1^2}\ \angle \tan^{-1}(-1)} = \frac{5\angle 0^\circ}{\sqrt{2}\ \angle -45} = 3{,}53\angle 0-(-45^\circ) = 3{,}53\angle 45^\circ$$

$$S = \dot{V}\dot{I} = 5 \cdot 3{,}53\angle 0 + (45^\circ) = 17{,}68\angle 45^\circ$$

$$|S| = 17{,}68 V{\cdot}A$$

$$S = P + jQ = |S|\cos(45^\circ) + j|S|\sin(45^\circ) =$$
$$= 9{,}286 + j15{,}05$$

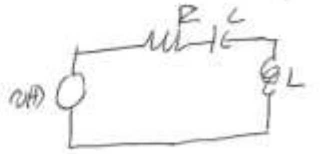
$P = 9{,}286\ W$
$Q = 15{,}05\ VAr$

$$V_c = v(t) - Ri(t) \Rightarrow \dot{V}_c = \dot{V} - R\dot{I} \quad \text{ή} \quad V_c = i(t)\ Z_L // Z_C \Rightarrow$$

$$\Rightarrow \dot{V}_c = \dot{I}\left(\frac{0{,}1j\omega\frac{1}{0{,}2j\omega}}{0{,}1j\omega + \frac{1}{0{,}2j\omega}}\right) = \dot{I}\frac{0{,}5}{\frac{-0{,}02\omega^2+1}{0{,}2j\omega}} = \dot{I}\ \frac{0{,}5 \cdot 0{,}2 \cdot 10j}{1-2} =$$

$$= \dot{I}\frac{j}{-1} = |I|\sqrt{(-1)^2}\ \angle 45^\circ - 90^\circ = 3{,}53\angle -45^\circ$$

$$v_c(t) = 3{,}53\cos(10t - 45^\circ)$$



$R = 1\Omega$

$C = 0{,}1F$

$L = 0{,}5H$

$v(t) = 10\cos(20t)$

Ποιά είναι η τάση στην R
στην L

$$\dot{V} = \left(R + \frac{1}{Cj\omega} + j\omega L\right)\dot{I} = \left(1 + \frac{1}{0{,}1j20} + j20\cdot 0{,}5\right)\dot{I} = \left(1 + 10j + \frac{1}{2j}\right)\dot{I} =$$

$$= \left[\frac{2j - 20 + 1}{2j}\right]\dot{I} = \left[\frac{-19+2j}{2j}\cdot\frac{-2j}{-2j}\right]\dot{I} = \left[\frac{-38j+4}{4}\right]\dot{I} \Rightarrow \dot{I} = \frac{\dot{V}\,4}{4-38j}$$

$$\Rightarrow \dot{I} = \frac{|\dot{V}|\cdot 4}{\sqrt{4^2-38^2}}\angle 0 - \angle 4-38j = \frac{40}{38{,}2}\angle(0-\angle{-83{,}99}) = 1{,}05\angle 83{,}99^\circ$$

$$\dot{V}_R = \dot{I}\cdot R = 1{,}05\angle 83{,}99^\circ \Rightarrow v_R(t) = 1{,}05\cos(20t + 83{,}99^\circ)$$

$$\dot{V}_L = \dot{I}Lj\omega = 1{,}05\angle 83{,}99^\circ\cdot 0{,}5\cdot 20j = 1{,}05\angle 83{,}99^\circ\ 10\angle 90^\circ =$$

$$= 10{,}5\ \angle 173{,}99^\circ \Rightarrow$$

$$\Rightarrow v_L(t) = 10{,}5\cos(20t + 173{,}99^\circ)$$