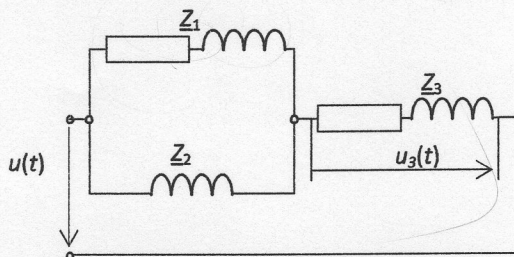
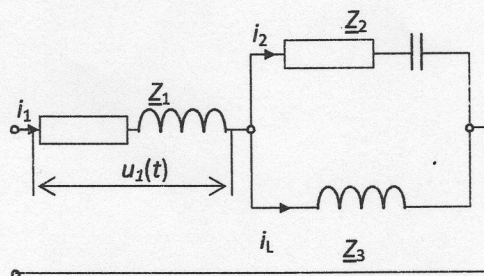


2. domača naloga iz Osnov elektrotehnike II

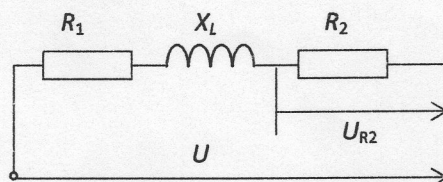
1. V vezju na sliki poznate napetost $u_3(t) = 100 \cdot \sqrt{2} \cdot \cos(\omega t - 45^\circ)$. Elementi vezja so: $Z_1 = 40 + j20 \Omega$, $Z_2 = j20 \Omega$ in $Z_3 = 25 \cdot \sqrt{2} + j25 \cdot \sqrt{2} \Omega$. Izračunajte trenutno vrednost priključene napetosti $u(t)$.



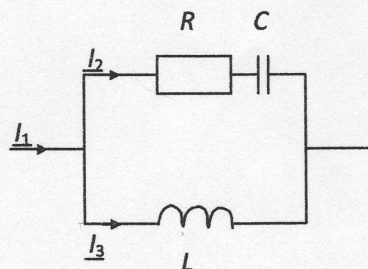
2. V vezju na sliki 2 je trenutna vrednost toka $i_2 = 10 \sqrt{2} \cos(\omega t + 30^\circ)$. Trenutna vrednost napetosti na impedanci Z_1 je $u_1(t) = 50 \cdot \sqrt{2} \cos(\omega t + 30^\circ)$. Določite trenutno vrednost skupnega toka v vezje $i_1(t)$ in vrednost polne upornosti Z_1 , če sta podani $Z_2 = 10 - j10 \Omega$ in $Z_3 = j20 \Omega$.



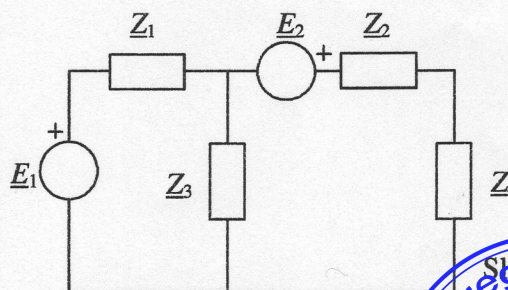
3. V vezju na sliki smo izmerili priključno napetost $U = 80 \text{ V}$ in napetost na upor R_2 , $U_{R2} = 40 \text{ V}$. Izračunajte nadomestno impedanco vezja, če sta $R_1 = 20 \Omega$ in $X_L = 10 \Omega$.



4. V vezju na sliki smo izmerili naslednje toke in priključno napetost: $i_1 = 6 \text{ A}$, $i_2 = 7 \text{ A}$, $i_3 = 4 \text{ A}$ in $U = 120 \text{ V}$. Določite elemente vezja (R , L in C) in narišite kazalčni diagram tokov in napetosti. Vezje obratuje pri krožni frekvenci $\omega = 100 \text{ s}^{-1}$.

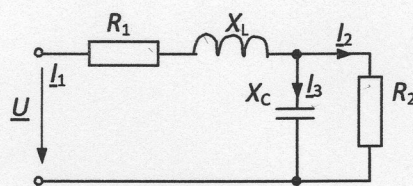


5. Izračunajte toke skozi elemente v vezju na sliki 4 in skupno navidezno moč. Elementi vezja so: $E_1 = 120 \text{ V}$, $E_2 = 80 - j60 \text{ V}$, $Z_1 = 10 \Omega$, $Z_2 = 5 + j5 \Omega$, $Z_3 = -j15 \Omega$ in $Z_4 = 10 - j5 \Omega$.



Moč?

6. V vezju na sliki določite X_C tako, da bosta priključena napetost \underline{U} in tok I_3 medsebojno premaknjena za fazni kot 45° . $R_1 = 2 \Omega$, $X_L = 10 \Omega$ in $R_2 = 4 \Omega$.



Rešitve:

1. $u(t) = 129,06 \sqrt{2} \cos(\omega t - 38,71^\circ)$

2. $i_1(t) = 10 \cos(\omega t - 15^\circ)$
 $\underline{Z}_1 = 5 + j5 \Omega$

3. $R_2 = 21,2 \Omega$
 $\underline{Z} = 41,2 + j10 \Omega$

4. $R = 14,663 \Omega$
 $C = 1,13 \text{ mF}$
 $L = 0,3 \text{ H}$

5. $\underline{I}_1 = 7,72 - j0,69 \text{ A}$
 $\underline{I}_2 = 8,18 - j3,54 \text{ A}$
 $\underline{I}_3 = -0,456 + j2,85 \text{ A}$
 $\underline{S} = 1793,7 - j124,8 \text{ VA}$

6. $X_C = 2 \Omega$

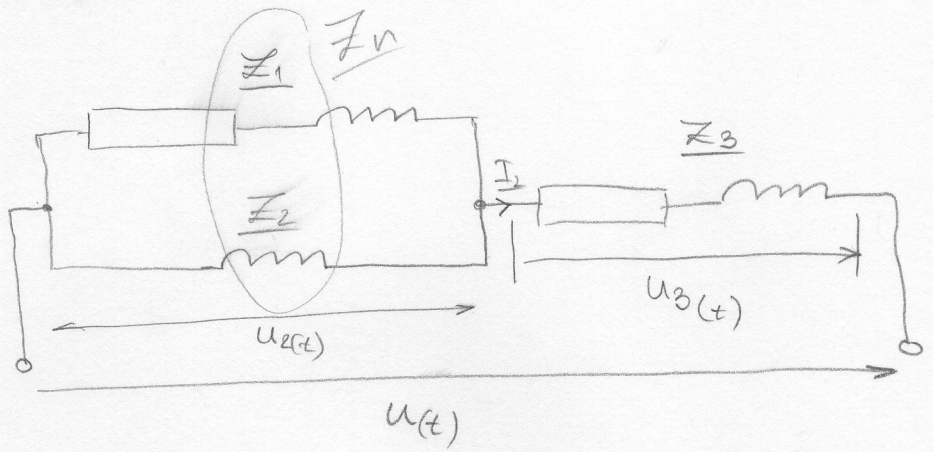
2DN/①

$$u_3(t) = 100\sqrt{2} \cos(\omega t - 45^\circ)$$

$$\underline{Z}_1 = 40 + j20 \Omega$$

$$\underline{Z}_2 = j20 \Omega$$

$$\underline{Z}_3 = 25\sqrt{2} + j25\sqrt{2} \Omega$$



$$u(t) = ?$$

$$\begin{aligned} \underline{U}_3 &= \frac{100\sqrt{2}}{\sqrt{2}} e^{j45^\circ} = 100 e^{j45^\circ} \\ &= 100 \cos(-45^\circ) + j100 \sin(-45^\circ) \\ &= 50\sqrt{2} - j50\sqrt{2} \end{aligned}$$

$$\underline{I}_2 = \frac{\underline{U}_3}{\underline{Z}_3} = \frac{50\sqrt{2} - j50\sqrt{2}}{25\sqrt{2} + j25\sqrt{2}} = \underline{-j2A}$$

$$\underline{Z}_n = \frac{\underline{Z}_1 \underline{Z}_2}{\underline{Z}_1 + \underline{Z}_2} =$$

$$= \frac{(40 + j20)(j20)}{(40 + j20) + j20} = 5 + j15 \Omega$$

$$\underline{U}_2 = \underline{I}_2 \cdot \underline{Z}_n = j2 \cdot (5 + j15) = -30 - j10 \text{ V}$$

$$\underline{U} = 100\sqrt{2} \cdot j180,71 \text{ V}$$

$$u(t) = 12906\sqrt{2} \cos(\omega t - 38,71^\circ)$$

2DN / ②

$$i_2 = 10\sqrt{2} \cdot \cos(\omega t + 30^\circ)$$

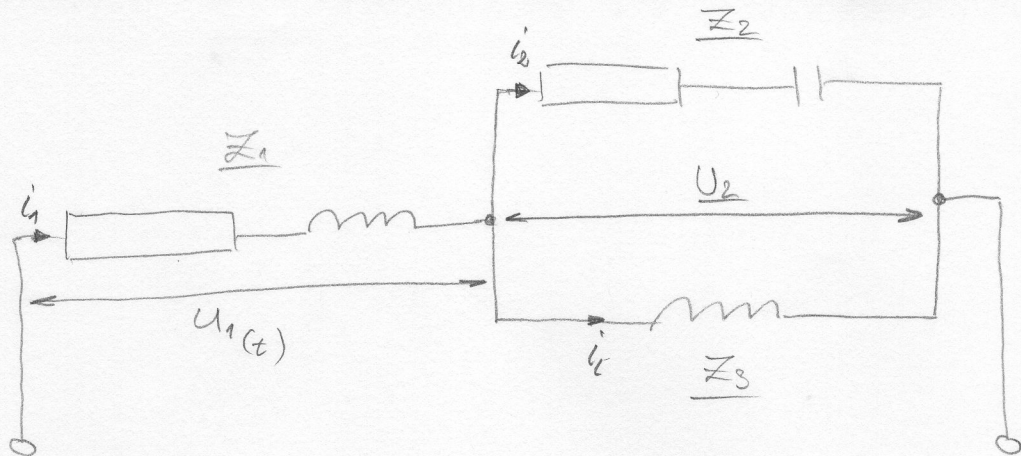
$$u_1(t) = 50\sqrt{2} \cdot \cos(\omega t + 30^\circ)$$

$$Z_2 = 10 - j10 \Omega$$

$$Z_3 = j20 \Omega$$

$$i_1(t) = ?$$

$$Z_1 = ?$$



$$I_2 = \frac{10\sqrt{2}}{\sqrt{2}} \cdot e^{j30^\circ} = \boxed{5\sqrt{3} + j5 \text{ A}}$$

$$U_2 = I_2 \cdot Z_2 = (5\sqrt{3} + j5) (10 - j10) = \boxed{136,6 - j36,6 \text{ V}}$$

$$141,42 e^{-j15^\circ}$$

$$I_L = \frac{U_2}{Z_3} = \frac{136,6 - j36,6}{j20} = \boxed{-1,83 - j6,83 \text{ A}}$$

$$I_1 = I_2 + I_L = (5\sqrt{3} + j5) + (-1,83 - j6,83)$$

$$Z_{23} = \frac{Z_2 Z_3}{Z_2 + Z_3} = 20 \Omega$$

$$\boxed{6,83 - j1,83 \text{ A}} = 7,07 \cdot e^{-j15^\circ}$$

$$Z = 25 + j5 \Omega$$

$$i(t) = 7,07 \sqrt{2} \cos(\omega t - 15^\circ)$$

$$Z_1 = \frac{U_1}{I_1} = \frac{25\sqrt{3} + j25}{6,83 - j1,83} = \boxed{5 + j5 \Omega}$$

$$U_1 = \frac{50\sqrt{2}}{\sqrt{2}} e^{j30^\circ} = \frac{25\sqrt{3}}{\sqrt{2}} + j25 = \boxed{50 e^{j30^\circ}}$$



2DN/3

Težnja medost:

$U = 80V$

$U_{R2} = 40V$

$R_1 = 20\Omega$

$X_L = 10\Omega$

$Z = ?$

$Z = R_1 + jX_L + R_2$

$U^2 = (U_{R1} + U_{R2})^2 + U_{XL}^2$

$U^2 = U_{R1}^2 + 2U_{R1}U_{R2} + U_{R2}^2 + \frac{U_{R1}^2}{4}$

$4U^2 = 4U_{R1}^2 + 8U_{R1}U_{R2} + 4U_{R2}^2 + U_{R1}^2$

$4 \cdot 80^2 = 5 \cdot U_{R1}^2 + 320U_{R1} + 4 \cdot 40^2$

$5U_{R1}^2 + 320U_{R1} - 19200 = 0$

$U_{R1}^2 + 64U_{R1} - 3840 = 0$

$U_{R1,2} = \frac{-64 \pm \sqrt{64^2 - 4(-3840)}}{2}$

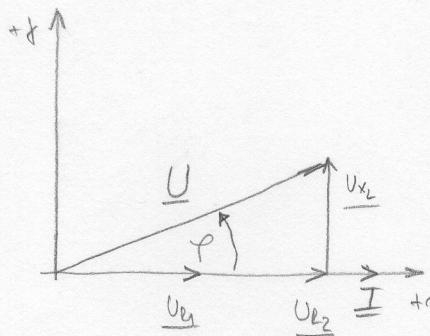
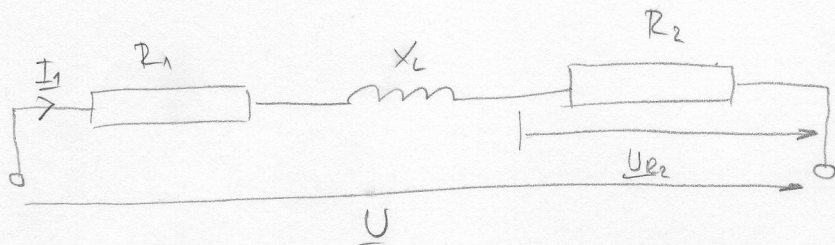
$U_{R1} = 101,75 \text{ ne uveljavljamo}$

$U_{R2} = 37,74V$

$I_1 = \frac{U_{R1}}{R_1} = 1,89A$

$Z = 20\Omega + 21,2\Omega + j10\Omega$

$Z = 41,2 + j10\Omega$



$I_{R2} = I_{XL}$

$\frac{U_{R1}}{R_1} = \frac{U_{XL}}{X_L}$

$\frac{U_{R1}}{U_{XL}} = \frac{R_1}{X_L} = \frac{20}{10} = 2$

$2U_{XL} = U_{R1}$
 $U_{XL} = \frac{U_{R1}}{2}$

$R_2 = \frac{U_{R2}}{I_1} = \frac{40V}{1,89A} = 21,2\Omega$



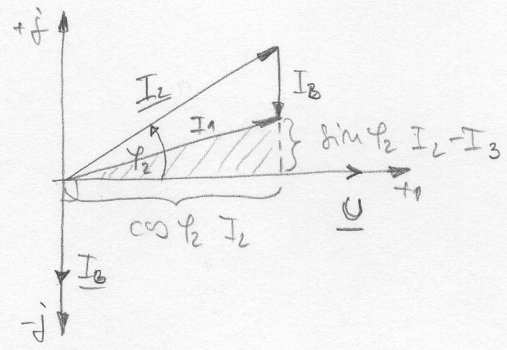
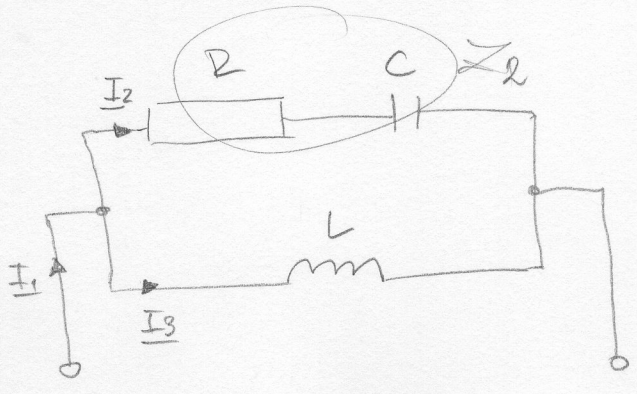
200/

(4)

režimo!

- $I_1 = 6A$
- $I_2 = 7A$
- $I_3 = 4A$
- $U = 120V$

$R, L, C = ?$



$$I_1^2 = (\cos \varphi_2 \cdot I_2)^2 + (\sin \varphi_2 \cdot I_2 - I_3)^2$$

$$I_1^2 = \cos^2 \varphi_2 \cdot I_2^2 + \sin^2 \varphi_2 \cdot I_2^2 - 2I_2 I_3 \sin \varphi_2 + I_3^2$$

$$6^2 = I_2^2 (\underbrace{\cos^2 \varphi_2 + \sin^2 \varphi_2}_1) - 2I_2 I_3 \sin \varphi_2 + I_3^2$$

$$6^2 = 7^2 - 2 \cdot 7 \cdot 4 \sin \varphi_2 + 4^2$$

$$\sin \varphi_2 = 0,56 \Rightarrow \varphi_2 = \underline{\underline{31,19^\circ}}$$

$$\underline{\underline{R = 14,66 \Omega}}$$

$$X_C = 8,88 \Omega$$

$$X_C = \frac{1}{\omega C} \Rightarrow C = \frac{1}{X_C \omega} = \frac{1}{8,88 \cdot 1000}$$

$$\underline{\underline{C = 1,13 \text{ mF}}}$$

$$X_L = \frac{U}{I_3} = \frac{120}{4} = 30 \Omega \Rightarrow X_L = \omega L$$

$$L = \frac{X_L}{\omega} = \underline{\underline{0,3 \text{ H}}}$$

$$\underline{Z_2} = \frac{U}{I_2} = \frac{120V}{7A} = 17,14 \Omega$$

$$\underline{Z_2} = 17,14 e^{j31,19^\circ}$$

$$\underline{Z_2} = 14,66 - 8,88j \Omega$$



2DN / (S)

$E_1 = 120V$

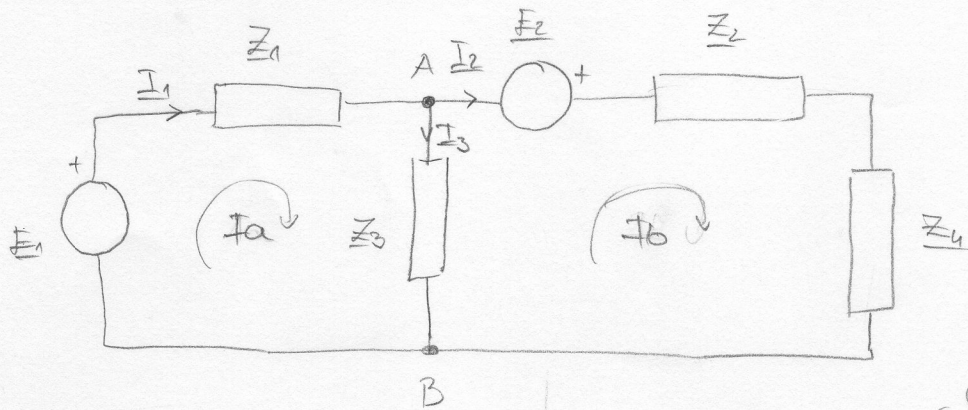
$E_2 = 80 - j60V$

$Z_1 = 10\Omega$

$Z_2 = 5 + j5\Omega$

$Z_3 = j15\Omega$

$Z_4 = 10 - j5\Omega$



	a	$I_a(Z_1 + Z_3) - I_b Z_3 = E_1$	
a	$I_a(Z_1 + Z_3)$	$I_b Z_3$	E_1
	b	$I_a(Z_1 + Z_3) - I_b(Z_2 + Z_3 + Z_4) = E_2$	
b	$I_a Z_3$	$I_b(Z_2 + Z_3 + Z_4)$	E_2

pagaya in circuit

$I_{1,2,3} = ?$
 $S = ?$

$I_1 = I_a$
 $I_2 = I_b$
 $I_3 = I_a - I_b$

$$\begin{bmatrix} 7,72 & -j0,69 \\ 8,18 & j3,54 \end{bmatrix}$$

$I_a = 7,72 - j0,69 = I_1$

$I_b = 8,18 + j3,54 = I_2$

$I_3 = I_a - I_b = -0,46 + j2,85 A$

$S = \sum I^2$

