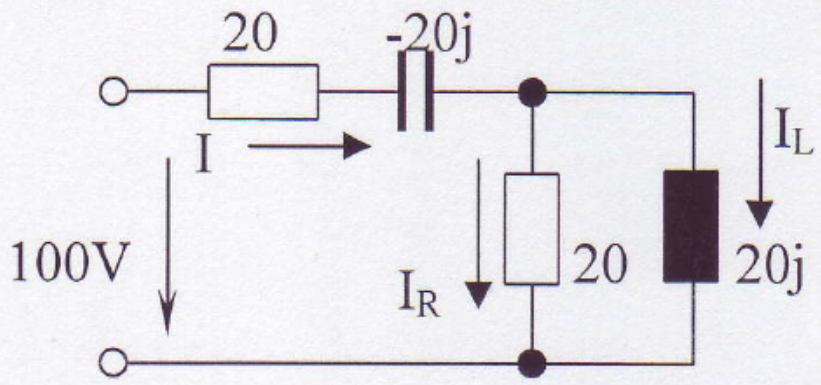


2. ábra: A 8. feladat áramköre

1.) $Z_e = 20 - 20j + (20 \times 20j) =$

$= 20 - 20j + \frac{20 \cdot 20j}{20 + 20j} =$

$= 20 - 20j + 10 + 10j = \underline{\underline{30 - 10j}}$ (1)

$\dot{I} = \frac{U}{Z_e} = \frac{100}{30 - 10j} = \underline{\underline{3 + 1j}}$ (1)

$\dot{I}_L = \dot{I} \cdot \frac{20}{20 + 20j} = \underline{\underline{2 - 1j}}$ (0,5)

$\dot{I}_e = \dot{I} - \dot{I}_L = 3 + 1j - (2 - 1j) =$

$= \underline{\underline{1 + 2j}}$ (0,5)

3.) $Z_e' \Rightarrow Z_c' = \frac{1}{j\omega C}$

$Z_c' = -40j$

if w (omega) gets halved Zc gets doubled

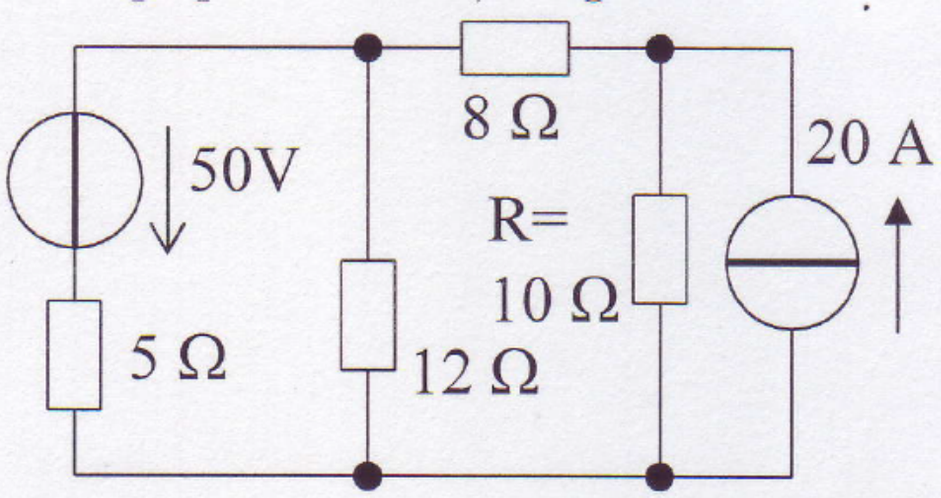
w felére csökken: Z_c duplájára nő

if w (omega) gets halved Z_L gets halved as well

$Z_L' = j\omega L$ w felére csökken: Z_L felére csökken

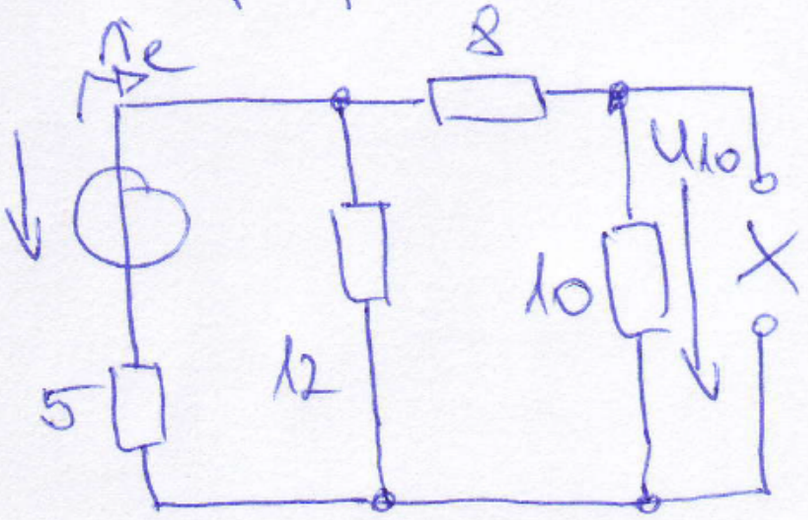
$Z_c' = 20 + (-40j) + (20 \times 10j) = 20 - 40j + \frac{20 \cdot 10j}{20 + 40j} =$

$= 20 - 40j + 4 + 8j = \underline{\underline{24 - 32j}}$ (1)



3. ábra: A 9. feladat áramköre

Szuperpozíció 1. eset.



$U_{10} = ?$

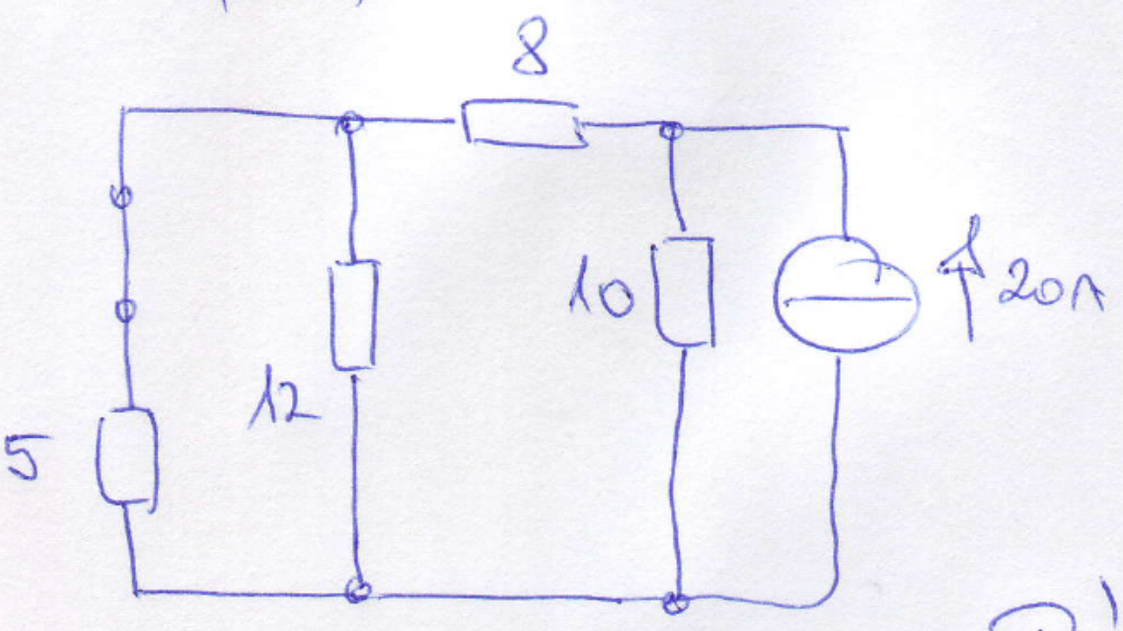
$R_e = 5 + 12 \times (8+10) = 12{,}2\ \Omega$

$I_e = \frac{50V}{12{,}2\Omega} \cong 4{,}1A$

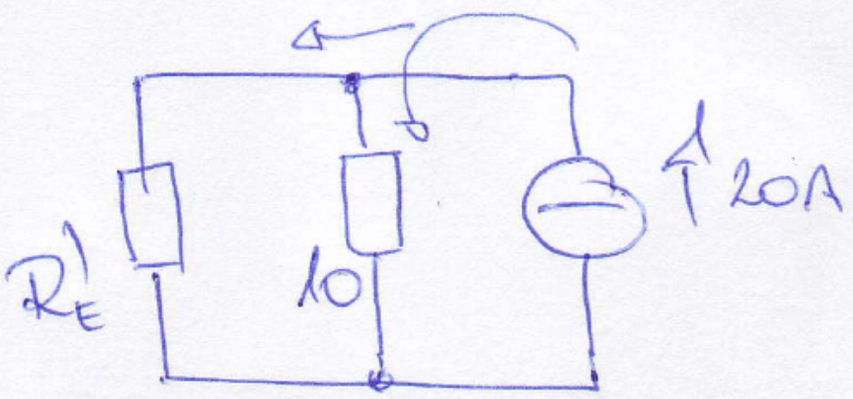
$I_{10} = I_e \cdot \frac{12}{12+(10+8)} = 4{,}1 \cdot \frac{12}{30} = 1{,}64A \downarrow$

$U_{10} = 10 \cdot 1{,}64A = 16{,}4V \downarrow$ (1,5)

Szuperpozíció 2. eset



$\Rightarrow$



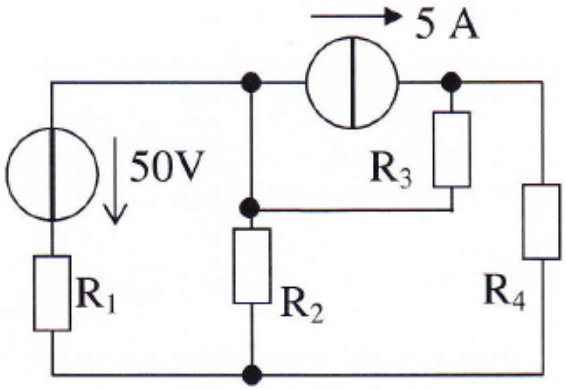
$R'_E = (5 \times 12) + 8 = 11{,}53\ \Omega$

$I_{10} = 20A \cdot \frac{11{,}53}{11{,}53+10} = 10{,}71A \downarrow \quad U_{10} = 10 \cdot 10{,}71 = 107{,}1V$ (1,5)

Szuperpozíció összegzés:

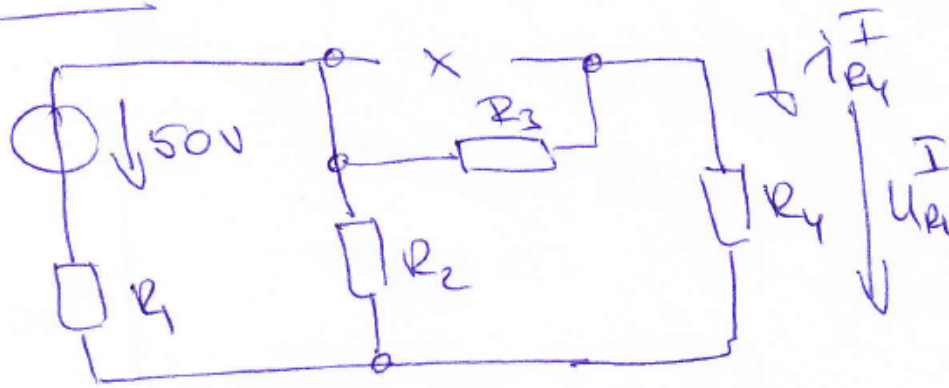
$U_{10} = \sum_n U_{10i} = 16{,}4V + 107{,}1V = \underline{123{,}5V} \qquad I_{10} = \frac{U_{10}}{10} = \underline{12{,}35A}$

$P_{10} = U_{10} \cdot I_{10} = \underline{1525{,}2\ W}$ (1)



4. ábra: A 10. feladat áramköre

1. eset :



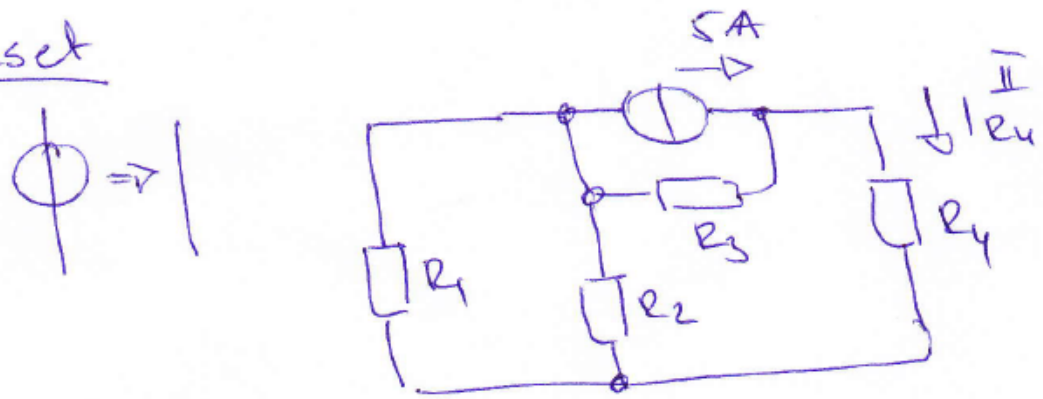
$$R_e = R_1 + R_2 \times (R_3 + R_4) = 10 + (20 \times 120) = 10 + 17{,}14 = 27{,}14$$

$$I = \frac{U}{R_E} = \frac{50}{27{,}14} = 1{,}84\,A$$

$$I_{R_4}^{I} = 1 \cdot \frac{R_2}{R_2 + (R_3 + R_4)} = 1{,}84\,A \cdot \frac{20}{20+120} = 0{,}26\,A \downarrow$$

(1)

2. eset



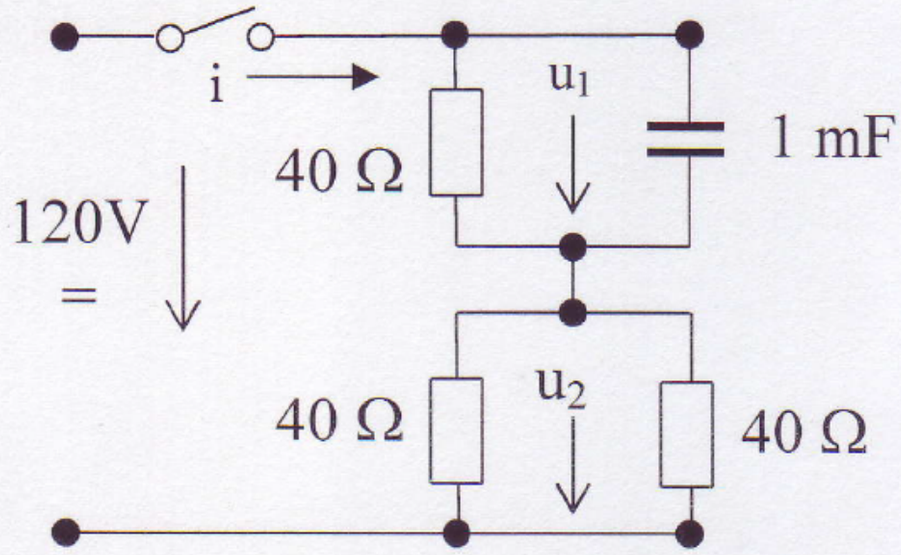
$$I_{R_4}^{II} = 5 \cdot \frac{R_3}{R_3 + (R_4 + R_1 \times R_2)} = 5 \cdot \frac{60}{60+60+10\times20} = 5 \cdot \frac{60}{126{,}7} =$$

$$= 2{,}36\,A \downarrow$$

(1)

Szuperpozíció

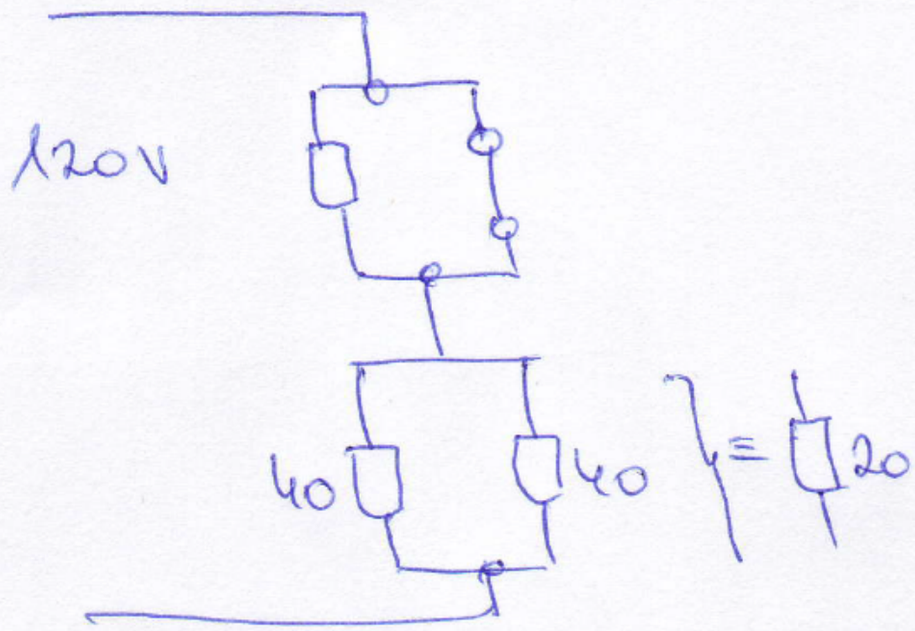
$$\Sigma I_{R_4} = 2{,}36 + 0{,}26 = 2{,}62\,A \qquad U_{R_4} = I_{R_4} \cdot 60 = 157{,}2\,V \qquad P_{R_4} = U \cdot I = 411{,}8\,W$$



4. ábra: A 10. feladat áramköre

$t = 0$: C rövidzár

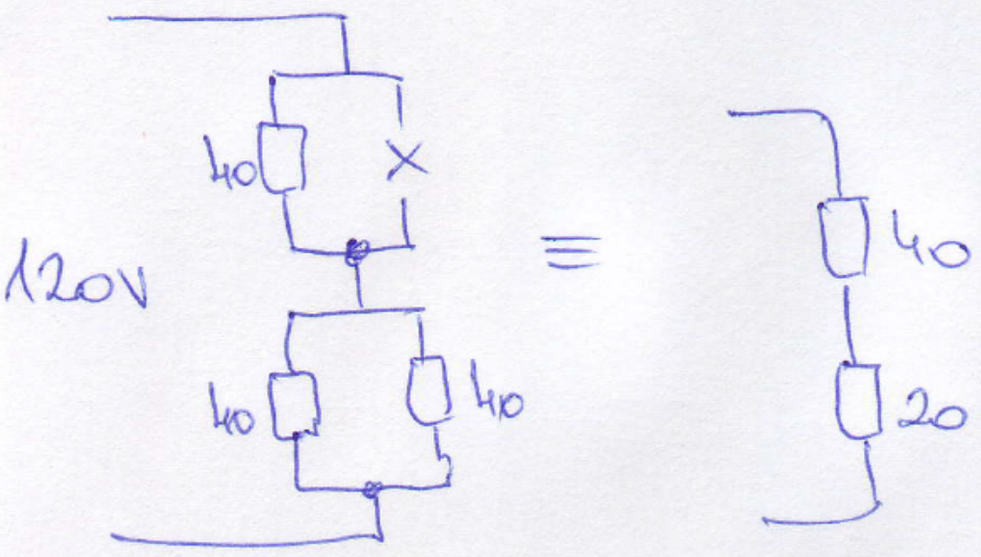
Short circuit



$u_1 = 0$ (C rövidzár) $\quad u_2 = 120V \quad i = \frac{120}{20} = 6A$ (1)

$t \to \infty$: C szakadás

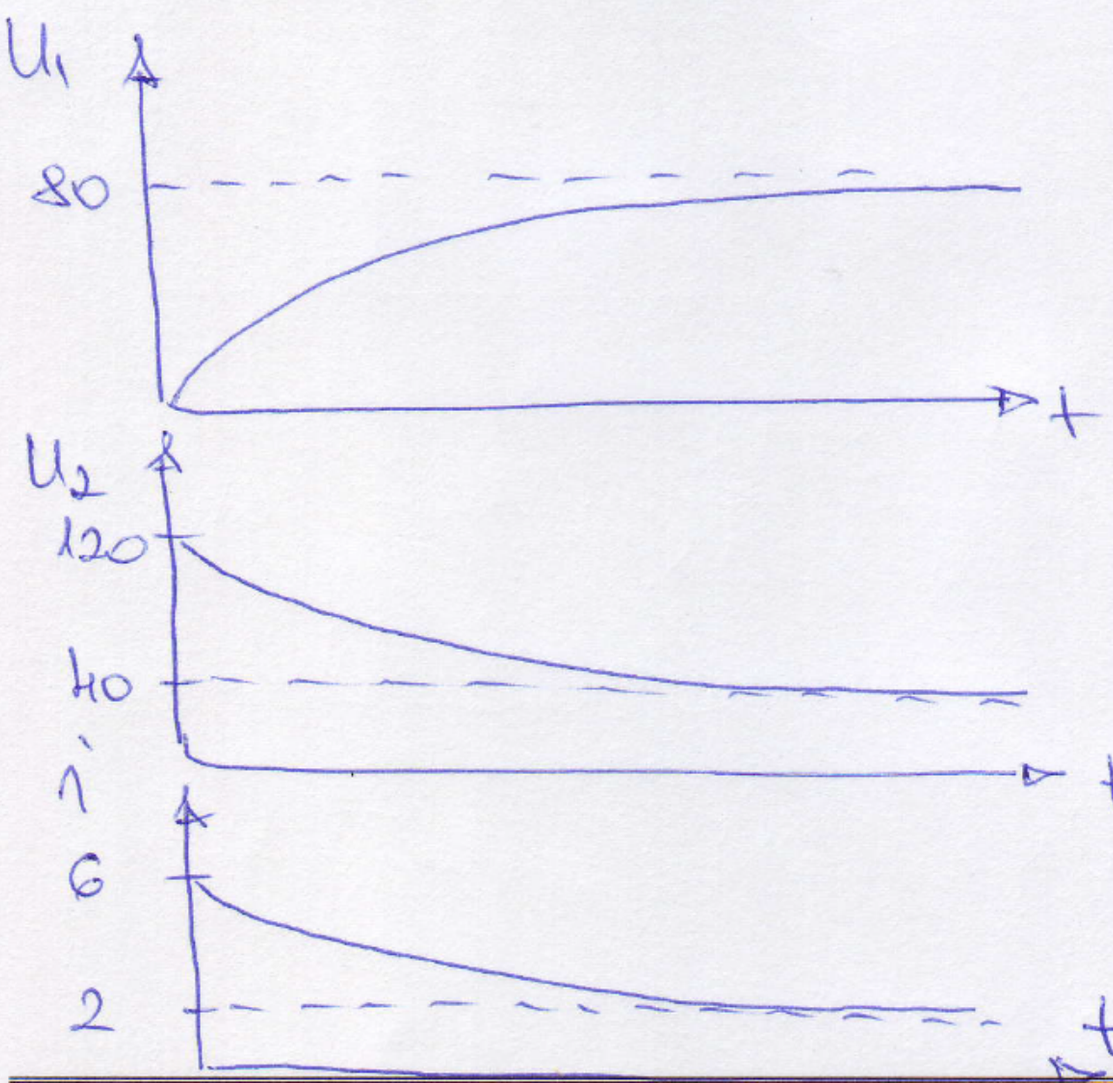
Open circuit



$u_1 = 120 \cdot \frac{40}{40+20} = 80V$

$u_2 = 120 \cdot \frac{20}{40+20} = 40V$

$i = \frac{120}{40+20} = 2A$ (1)



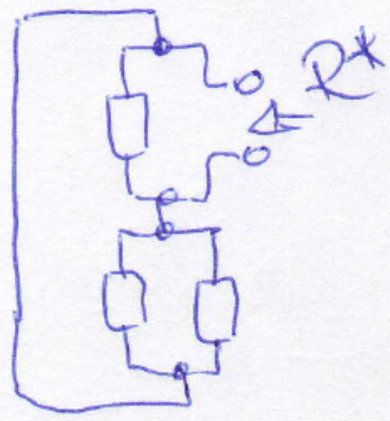
$u_1 = 80\left(1 - e^{-\frac{t}{T}}\right)$

$u_2 = 40 + 80 \cdot e^{-\frac{t}{T}}$

$i = 2 + 4 \cdot e^{-\frac{t}{T}}$ (1)

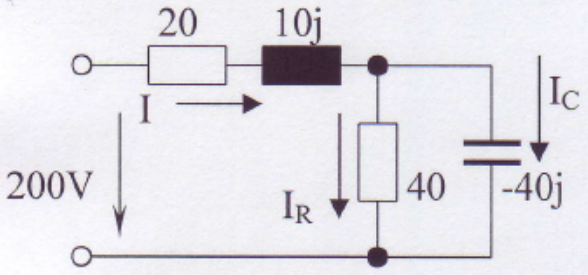
$T = R^* \cdot C$

R^* :



$R^* = 40 \times 40 \times 40 = 13,3$

$T = 13,3\,ms$ (1)



3. ábra: A 9. feladat áramköre

$$Z_e = 20 + 10j + (40 \times (-40j)) =$$

$$= 20 + 10j + 20 - 20j = \underline{40 - 10j} \quad (1)$$

$$\dot{I} = \frac{200}{40 - 10j} = \underline{4{,}7 + 1{,}17j \ (A)} \quad (0{,}5)$$

$$\dot{I}_C = \dot{I} \cdot \frac{40}{40 - 40j} = (4{,}7 + 1{,}17j)\frac{40}{40 - 40j} = \underline{1{,}76 + 2{,}93j \ (A)} \quad (0{,}5)$$

$$\dot{I}_R = \dot{I} - \dot{I}_C = 4{,}7 + 1{,}17j - (1{,}76 + 2{,}93j) = \underline{2{,}94 - 1{,}76j \ (A)} \quad (0{,}5)$$

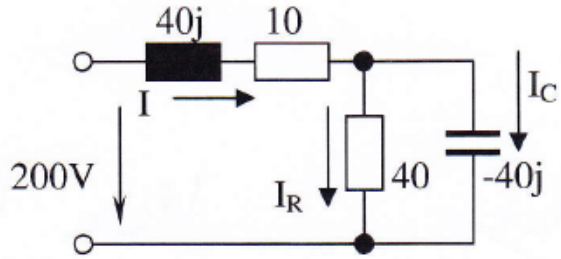
Fele frekvencián.

On half w (omega)

$10j \Rightarrow 5j \qquad -40j \Rightarrow -80j$

$$Z_e = 20 + 5j + (40 \times (-80j)) =$$

$$= 20 + 5j + 32 - 16j = \underline{52 - 11j} \quad (1{,}5)$$



3. ábra: A 9. feladat áramköre

$$Z_e = 40j + 10 + (40 \times -40j) =$$

$$= 40j + 10 + \frac{-1600j}{40-40j} =$$

(1)

$$= 40j + 10 + 20 - 20j = 30 + 20j \ (\Omega)$$

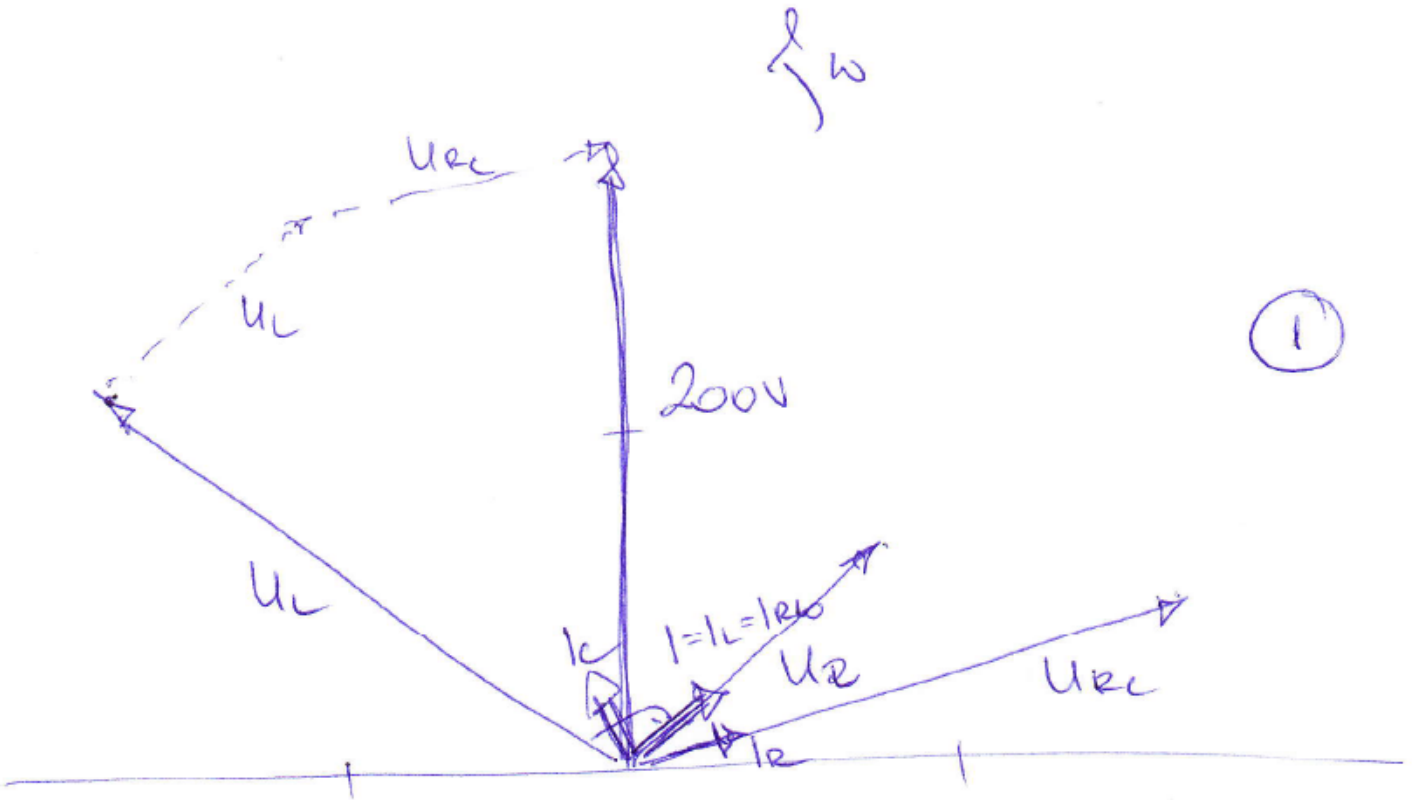
(1)

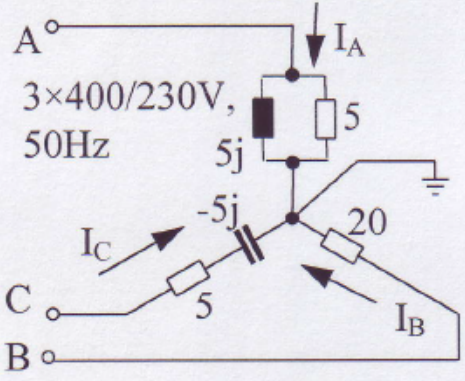
$$\begin{cases} I = I_L = I_{Ue} = \dfrac{200}{30+20j} = \dfrac{60-40j}{13} = 4{,}61 - j3 \ (A) \\ I_C = I \cdot \dfrac{40}{40-40j} = (4{,}61 - j3) \cdot \dfrac{4}{4-4j} = (4{,}61 - j3)(0{,}5 + j0{,}5) = \\ = 3{,}8 + j0{,}8 \ (A) \\ I_e = I - I_C = (4{,}61 - j3) - (3{,}8 + j0{,}8) = 0{,}81 - j3{,}8 \ (A) \end{cases}$$

(1)

$$\begin{cases} U_L = I \cdot 40j = (4{,}61 - 3j)\,40j = 120 + j184{,}4 \ (V) \\ U_R = I \cdot 10 = 46{,}1 - j30 \ (V) \\ U_{eC} = U - U_L - U_R = 33{,}9 - j\,\cancel{211}\,154{,}4 \ (V) \end{cases}$$

Phasor diagram





2. ábra: A 8. feladat áramköre

a.) $\underline{I}_A = \frac{230}{5j} + \frac{230}{5} = 46 - j46\,A$

$|\underline{I}_A| = \sqrt{46^2 + 46^2} = 65\,A$

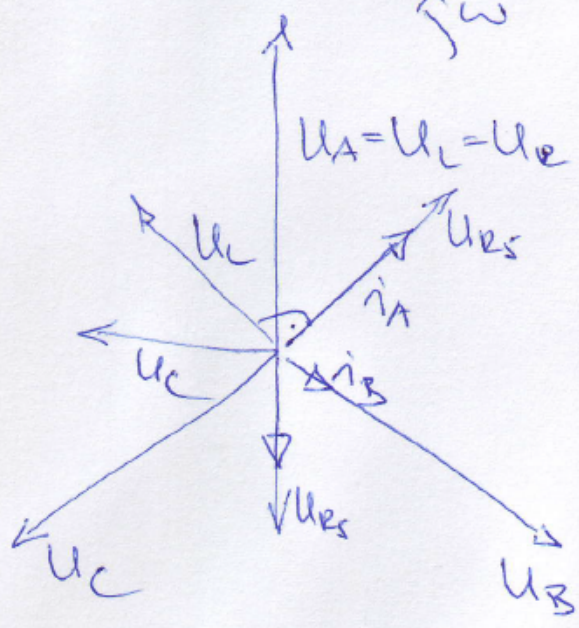
$\underline{I}_B = \frac{230}{20} = 11{,}5\,A$

$|\underline{I}_B| = 11{,}5\,A$

$\underline{I}_C = \frac{230}{5-5j} = \frac{230}{5-5j} \cdot \frac{5+5j}{5+5j} = \frac{230\cdot 5 + 230\cdot 5j}{50} = 23 + 23j\,A$

$|\underline{I}_C| = \sqrt{23^2 + 23^2} = 32{,}52\,A$ (1)

b.)



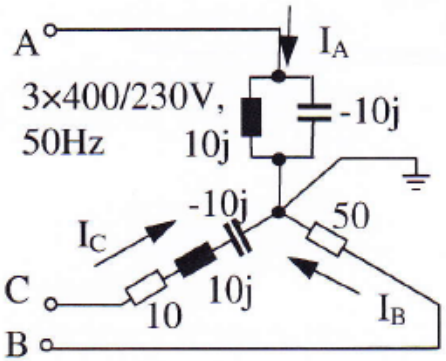
(1)

c.) $\underline{I}_C = 0$ $\underline{I}_A = \underline{I}_B$ Az A-B ág vonali feszültségre kerül.

If we disconnect C phase, V_{AB} will be the line to line voltage (1)

$\underline{Z} = (5 \times 5j) + 20 = 22{,}5 + 2{,}5j$

$\underline{I}_A = \underline{I}_B = \frac{400}{22{,}5 + 2{,}5j} = 1{,}75 - 0{,}19j\,A$ $|\underline{I}_A| = \sqrt{1{,}75^2 + 0{,}19^2} = 1{,}76$



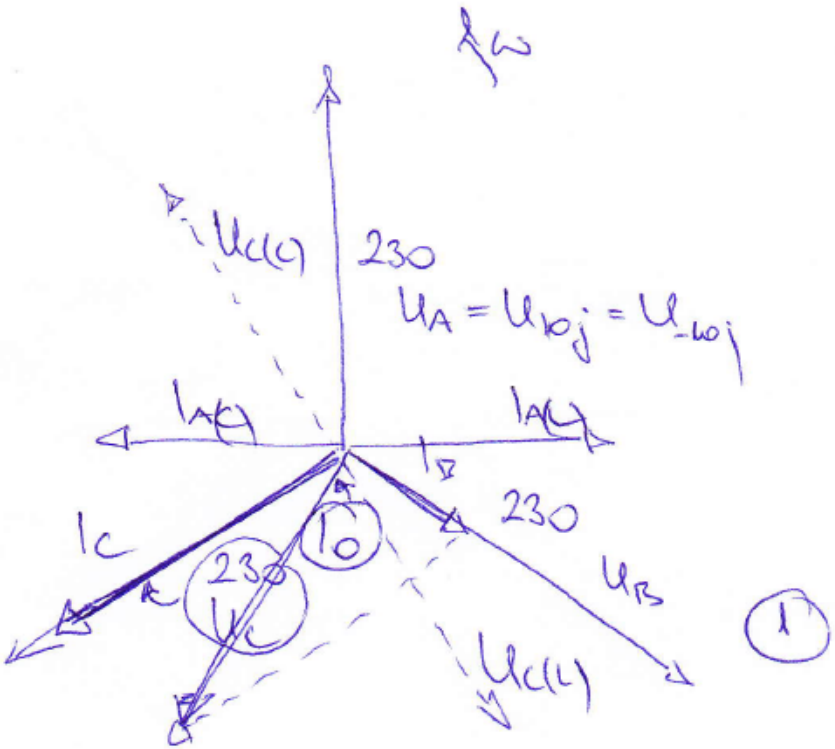
2. ábra: A 8. feladat áramköre

$$I_A = \frac{230}{10j \times (-10j)} = \Phi \qquad |I_A| = \Phi$$

$$I_B = \frac{230}{50} = 4{,}6\,A \qquad |I_B| = 4{,}6\,A$$

$$I_C = \frac{230}{10 + 10j - 10j} = 23\,A \qquad |I_C| = 23\,A$$

(1)



(1)

$$I_{A(L)} = \frac{230}{10j} = -23j\,A$$

$$I_{A(C)} = \frac{230}{-10j} = 23j\,A$$

(1)

$$U_{C(L)} = 23A \cdot 10j = 230j\ V$$

$$U_{C(C)} = 23A \cdot (-10j) = -230j\ V$$