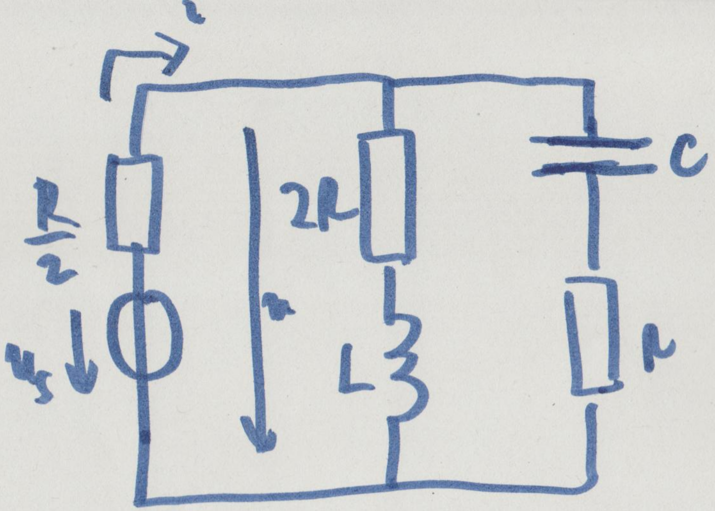
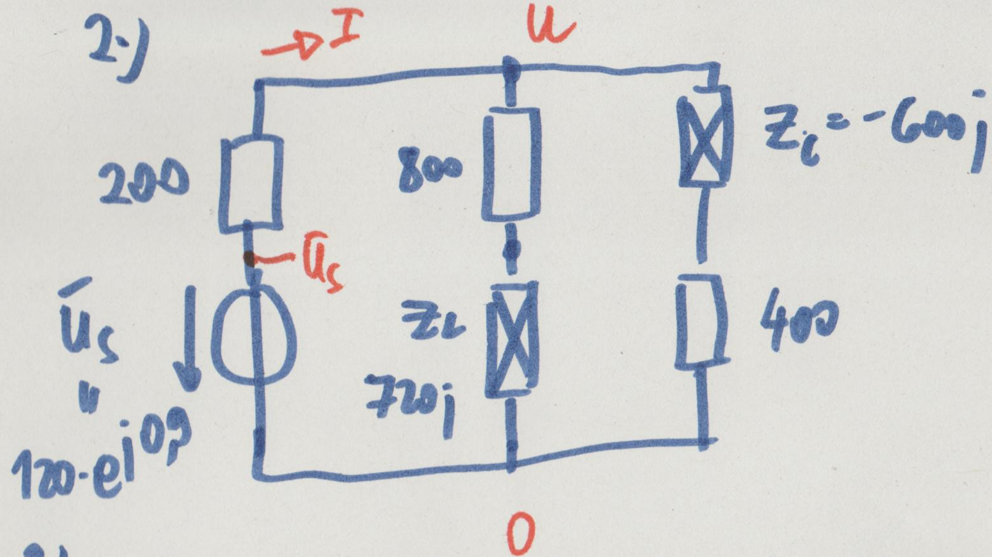


2.)



ω_0 körfrekvencia $R=400\,\Omega$

$$\omega_0 L = 720\,\Omega$$

$$\frac{1}{\omega_0 C} = 600\,\Omega$$

$$u_s(t) = 120\,V \cdot \cos(\omega_0 t + 0{,}9)$$

1.) $Z_C = -jX_C = -j\frac{1}{\omega_0 C} = -600j\cdot\Omega$

$Z_L = jX_L = j\cdot\omega_0 L = 720j\cdot\Omega$

V, A, Ω,

3.)

$$\frac{\bar{u}}{800+720j} + \frac{\bar{u}}{400-600j} + \frac{\bar{u}-\bar{u}_s}{200} = 0$$

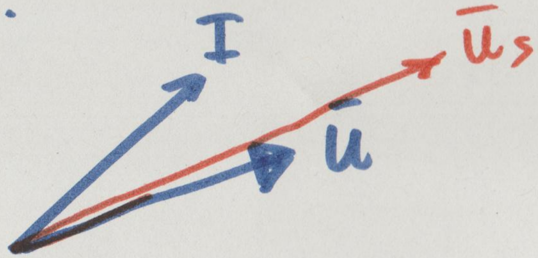
$$\bar{u} = \frac{\bar{u}_s/200}{\frac{1}{800+720j} + \frac{1}{400-600j} + \frac{1}{200}} = 92{,}567\,e^{j\,0{,}817}\,V$$

$$\bar{I} = \frac{\bar{u}_s-\bar{u}}{200} = 0{,}1438\,e^{j\,1{,}167}\,A$$

4.) $u(t) = 92{,}567\cdot\cos(\omega_0 t + 0{,}817)\,V$

$i(t) = 0{,}1438\cdot A\cdot\cos(\omega_0 t + 1{,}167)$

fazorok:



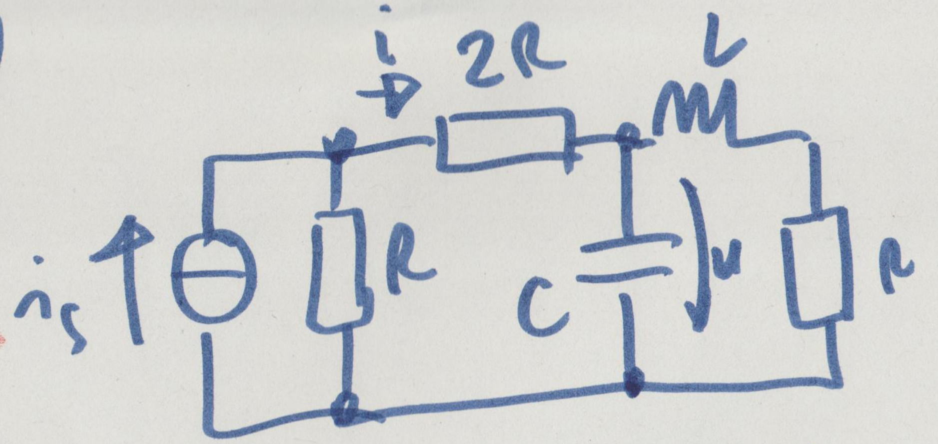
u és u_s közötti fázis különbség

$$\Delta\varphi = \varphi_{us} - \varphi_u = 0{,}9 - 0{,}817 = 0{,}083$$
$$[4{,}75^\circ]$$

i és u

$$\Delta\varphi = \varphi_i - \varphi_u = 1{,}167 - 0{,}817 = 0{,}35$$
$$[20{,}05^\circ]$$

2.)



$R = 5\ k\Omega$ $\quad C = 0{,}01\ nF$

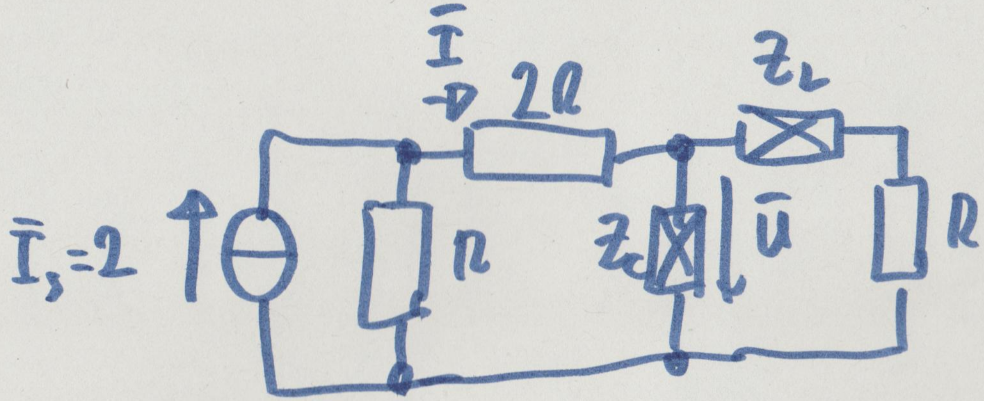
$\omega_0 = 10\ Mrad/s$

$L = 0{,}8\ mH$ $\quad i_s(t) = 2\ mA \cdot \cos(\omega_0 t)$

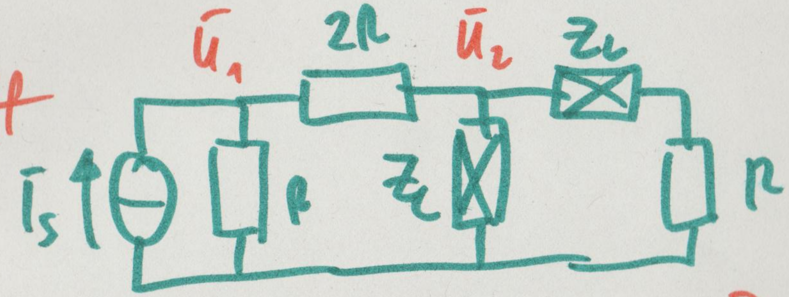
V, mA, kΩ, Mrad/s, μs, mH, nF

$Z_L = j\omega L = j \cdot 10 \cdot 0{,}8 = 8j\ k\Omega$

$Z_C = \frac{1}{j\omega C} = \frac{1}{j \cdot 10 \cdot 0{,}01} = -10j\ k\Omega$



Csff



$$\begin{pmatrix} 0{,}3 & -0{,}1 \\ -0{,}1 & 0{,}1562+0{,}0109j \end{pmatrix}\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$$

$$-I_s + \frac{\bar{U}_1}{R} + \frac{\bar{U}_1 - \bar{U}_2}{2R} = 0$$

$$\frac{\bar{U}_2 - \bar{U}_1}{2R} + \frac{\bar{U}_2}{Z_C} + \frac{\bar{U}_2}{Z_L + R} = 0$$

$$\cancel{\begin{pmatrix} 0{,}3 & -0{,}1 \\ -0{,}1 & 0{,}2 \end{pmatrix}} \begin{pmatrix} \\ \\ \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$$

$u_1 = 8{,}4634 - j\,0{,}1479 = 8{,}4647\, e^{-j\,0{,}017}$ $[-1°]$

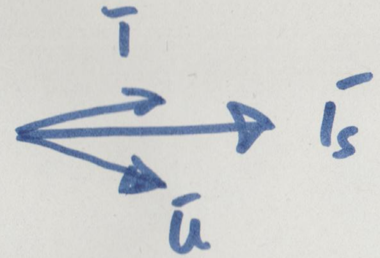
$u_2 = 5{,}3903 - j\,0{,}4437 = 5{,}4085 \cdot e^{-j\,0{,}082}$ $[-4{,}7°]$

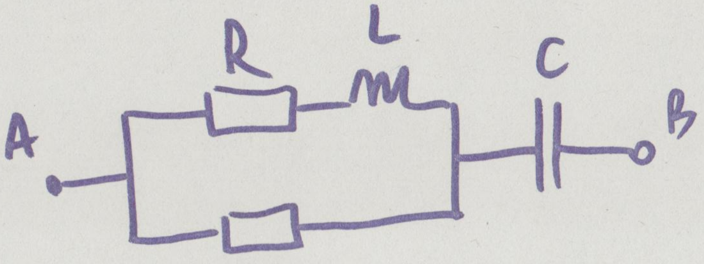
$$\bar{I} = \frac{U_1 - U_2}{2R} = 0{,}3087\, e^{j\,0{,}095}\ \text{mA}$$

$$i(t) = 0{,}3087 \cdot \cos(\omega t + 0{,}095)\ \text{mA}$$

$$\bar{U} = \bar{U}_2 = \cancel{0}\ 5{,}4085 \cdot e^{-j\,0{,}082}\ \text{V}$$

$$u(t) = 5{,}4085 \cdot \cos(\omega t - 0{,}082)\ \text{V}$$

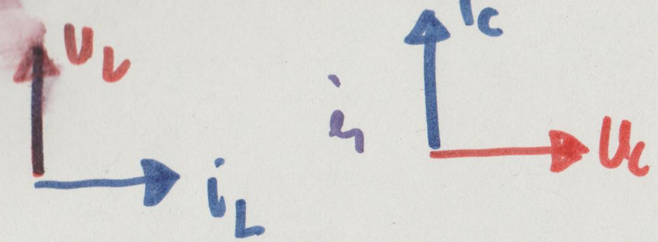


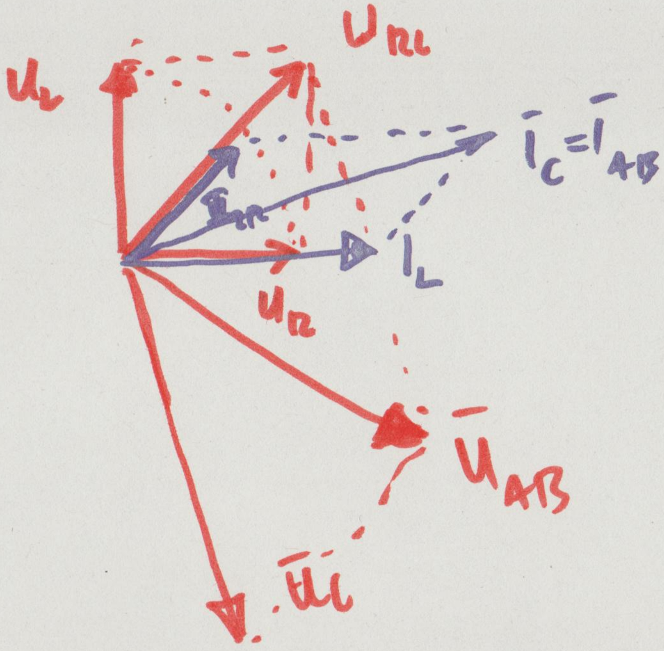


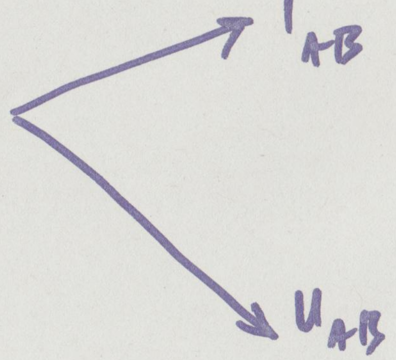
Szerkesszünk **kvalitatív** ábrát

U_{AB} és I_{AB} fazorain!

$\omega L = R$ és $\dfrac{1}{\omega C} = 2R$







1) $U_L - I_L$

2) $|U_R| = |U_L|$

$\bar{U}_L \parallel \bar{I}_R = \bar{I}_L$

3) $\bar{U}_{RL} = \bar{U}_R + \bar{U}_L$

4) $\bar{U}_{RL} = U_{2R}$

5) $\bar{U}_{2R} \parallel \bar{I}_{2R}$

~~I_{2R} felvétele~~

6) $\bar{I}_{AB} = \bar{I}_C = \bar{I}_{2R} + \bar{I}_L$

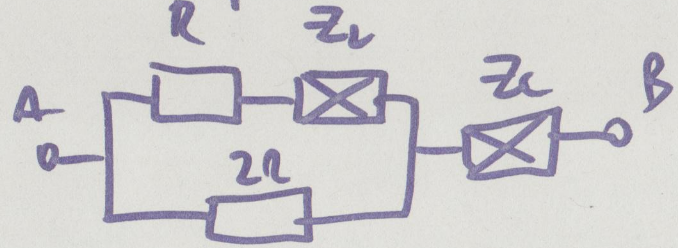
7) $\bar{U}_C \perp \bar{I}_C$

8) $\bar{U}_{AB} = \bar{U}_{2R} + \bar{U}_C$

$\Rightarrow$ kapacitív jellegű

Számítsuk ki, pl. $R = 1\,k\Omega$

Z_{AB} :



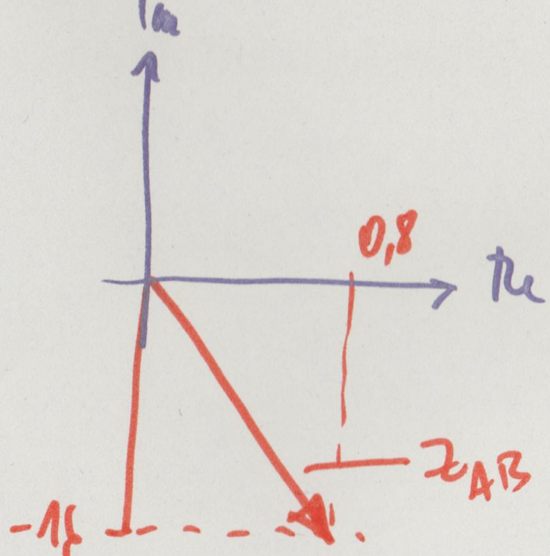
$$Z_{AB} = (R + Z_L) \times 2R + Z_C =$$

$$= (1 + j) \times 2 + (-2j) = 0{,}8 + 0{,}4j - 2j =$$

$Z_L = jR = j$

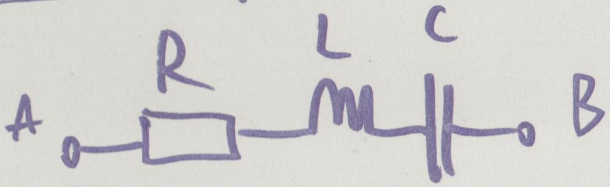
$Z_C = -j2R = -2j$

$$Z_{AB} = 0{,}8 - 1{,}6j$$



kapacitív jellegű

Soros rezgőkör



$R = 7\ k\Omega$

$L = 5\ mH$

$C = 0{,}008\ uF$

$Z_{AB} = ?\ ;\ w = 1\ Mrad/s$

$Z_{AB} = ?\ \ w = 10\ Mrad/s$

$w = ?$ hogy Z_{AB} tisztán valós

$w=1 \quad X_L = wL = 1\cdot 5 = 5$

$X_C = \frac{1}{1\cdot 0{,}008} = 125$

$Z_{AB} = 7 + j\cdot 5 + (-j\cdot 125) =$

$= (7 - 120j)\ k\Omega$

$w=10 \quad X_L = w\cdot L = 10\cdot 5 = 50$

$X_C = \frac{1}{10\cdot 0{,}008} = 12{,}5$

$Z_{AB} = 7 + 50\cdot j - 12{,}5 j = (7 + 37{,}5j)\ k\Omega$

· ha Z_{AB} tisztán valós

$Z_{AB} = R + jwL + \frac{1}{jwC} = R + j(X_L - X_C)$

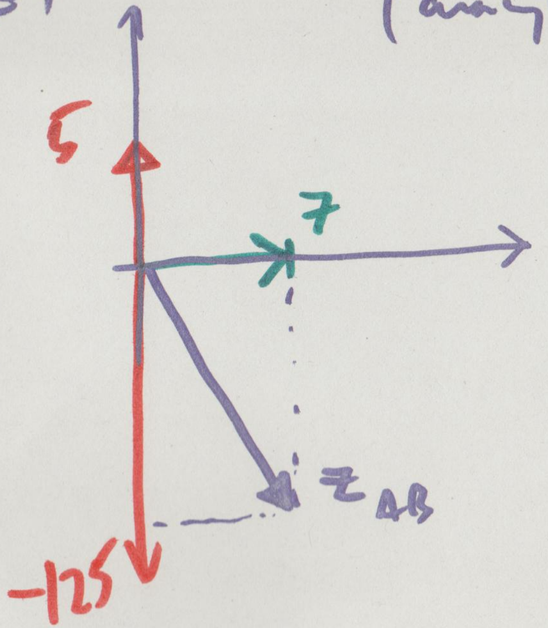
$X_L - X_C = 0 \Rightarrow X_L = X_C \Rightarrow wL = \frac{1}{wC}$

$w = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{5\cdot 0{,}008}} = \frac{1}{0{,}2} = 5\ Mrad/s$

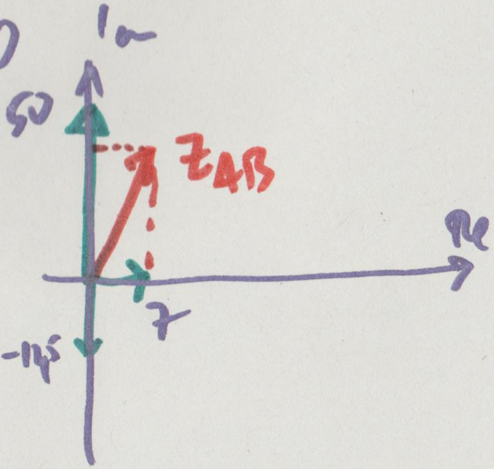
Impedancia szemléltetése

(aránytalan!)

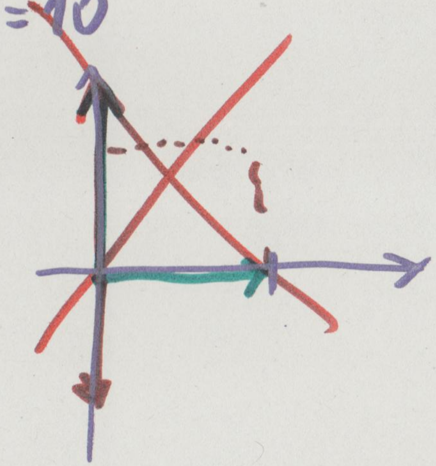
$w=1$



$w=10$



$w=10$



$w=5$