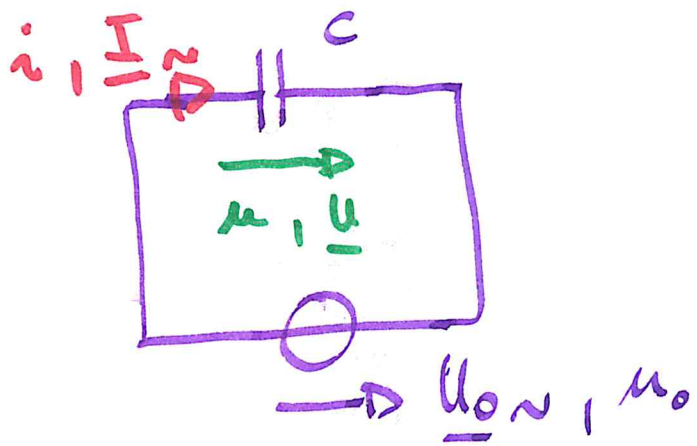


EC, Revisie, 25.4.19

- R to alternative voltage source
- L to alternative source
- C to alternative source



①

②

Impedance: $\underline{z} = \frac{\underline{u}}{\underline{i}}$

$[R] = \Omega = \frac{V}{A}$

$[j\omega L] = Hz \cdot \frac{Vs}{A} = \frac{1}{s} \cdot \frac{Vs}{A} = \Omega$

Ex.: $1 Hz = 1 \frac{1}{s}$

Def. $L = \frac{\Phi}{I}$; $\Phi = L \cdot I$
L Inductance

$[L = \frac{\Phi}{I}] = \frac{Vs}{A} = \frac{Wb}{A}$

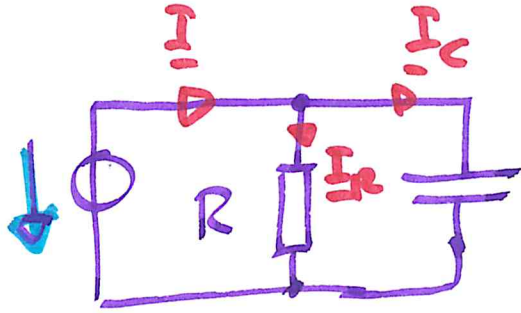
$$\begin{cases} u = R i ; \underline{u} = R \cdot \underline{I} \quad \text{---} R \text{---} \\ u = \omega L i ; \underline{u} = j\omega L \underline{I} \quad \text{---} L \text{---} \\ u = \omega C u ; \underline{I} = j\omega C \underline{u} \quad \text{---} C \text{---} \end{cases}$$

$$\begin{aligned} \rightarrow \underline{z} &= \underline{z}_R = R & \omega \Omega \\ \rightarrow \underline{z} &= \underline{z}_L = j\omega L & \omega \Omega \\ \rightarrow \underline{z} &= \underline{z}_C = \frac{1}{j\omega C} & \omega \Omega \end{aligned} \quad \left. \vphantom{\begin{aligned} \rightarrow \underline{z} &= \underline{z}_R = R \\ \rightarrow \underline{z} &= \underline{z}_L = j\omega L \\ \rightarrow \underline{z} &= \underline{z}_C = \frac{1}{j\omega C} \end{aligned}} \right\} \text{Impedance}$$

$$\left[\frac{1}{j\omega C} \right] = \frac{1}{\frac{1}{s} \frac{As}{V}} = \Omega$$

Example

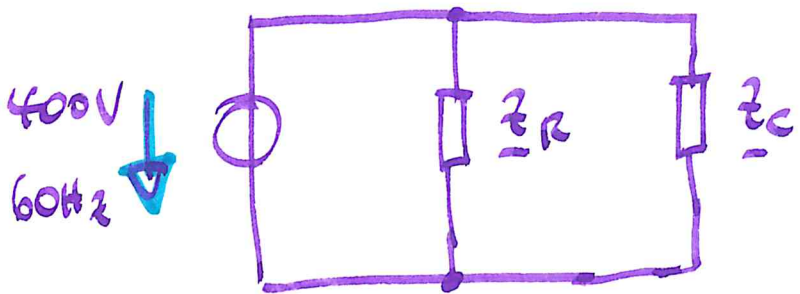
400V,
60Hz



$$R = 40 \Omega$$

$$C = 60 \mu F$$

\cong



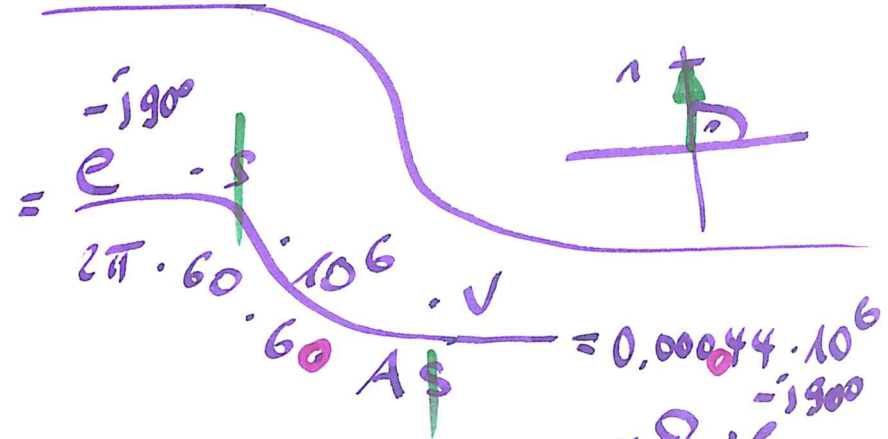
$$Z_R = 40 \Omega$$

$$Z_C = \frac{1}{j\omega C}$$

$$\frac{1}{j 2\pi \cdot 60 \text{ Hz} \cdot 60 \cdot 10^{-6}} \frac{As}{V} =$$

③ ④

$$F = \frac{As}{V} \quad ; \quad j = \sqrt{-1} = e^{j90^\circ}$$



$$= \frac{e^{-j90^\circ}}{2\pi \cdot 60 \cdot 10^6} \cdot 60 \text{ A} = 0,00044 \cdot 10^6$$

$$= 0,00044 \cdot 10^6 \Omega \cdot e^{-j90^\circ}$$

$$= 44 \Omega e^{-j90^\circ} = Z_C$$

$$U_C = U_R = 400 \text{ V} = 400 \cdot e \cdot V$$

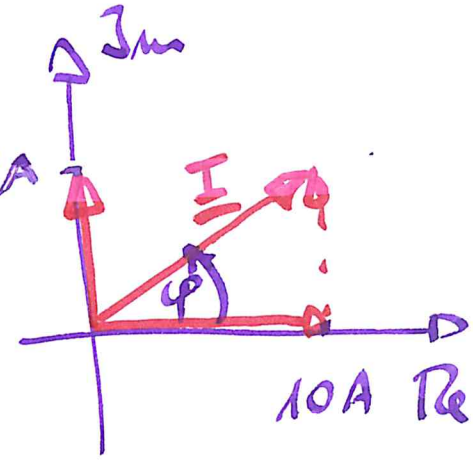
$$I = \frac{U}{Z} \quad ; \quad I_R = \frac{U}{Z_R} = \frac{400 \text{ V}}{40 \Omega} = 10 \text{ A}$$

$$I_C = \frac{U}{Z_C} = \frac{400 \text{ V}}{44 \Omega \cdot e^{-j90^\circ}} = 9,09 \text{ A } e^{+j90^\circ}$$

$$\underline{I} = \underline{I}_R + \underline{I}_C = 10A + 9.09A e^{+j90^\circ} \quad (5) \quad (6)$$

$$= \sqrt{10^2 + 9.09^2} A \cdot e^{j42.3^\circ}$$

$$= 13.5A \cdot e^{j42.3^\circ}$$



$$\varphi = \arctan\left(\frac{9.09}{10}\right)$$

$$\underline{I} = 13.5A \cdot e^{j42.3^\circ}$$

Phasor diagram for:

