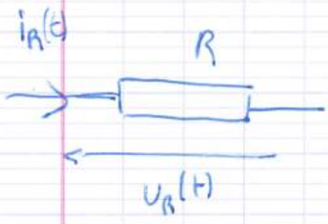
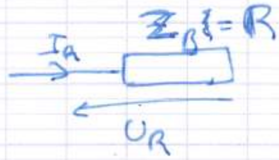
Electro
13/02

Resistance





$\underline{Z_R} = R = R \cdot e^{j\emptyset}$

$|\underline{Z_R}| = R \quad Arg(\underline{Z_R}) = 0$

$\underline{U_R} = \underline{Z_R} \cdot \underline{I_R} = R \cdot \underline{I_R}$

$U_R = |\underline{U_R}| \ (\Omega)$

$\underline{I_R} = \frac{\underline{U_R}}{R} \quad \begin{cases} I_R = \frac{U_R}{R} \\ Arg(\underline{I_R}) = \varphi_{Z_R} = \varphi_R = \varphi_x - 0 = \varphi_U \end{cases}$

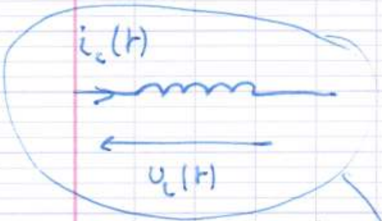
$\varphi_{I_R} = \varphi_U \Rightarrow \varphi_{I_R} - \varphi_U = 0$

Le module d'une impedance est en ohm

By Hyperion

INDUCTANCE

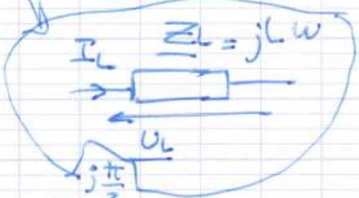
$u_L(t) = U_L \cdot \sqrt{2} \cdot \sin(\omega t + \varphi_u)$



$\underline{I}_L = I_L \cdot e^{j\varphi_i}$

$\underline{U}_L = U_L \cdot e^{j\varphi_u}$

$u_L(t) = L \cdot \frac{di}{dt}$



$\underline{Z}_L = jL\omega = L\omega \cdot e^{j\frac{\pi}{2}}$

$Z_L = |\underline{Z}_L| = L \cdot \omega \ (\Omega)$ $\quad \underline{U}_L = \underline{Z}_L \cdot \underline{I}_L = jL \cdot \omega \cdot \underline{I}_L$

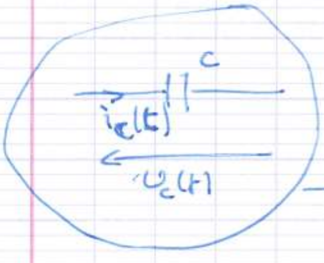
$Arg(\underline{Z}_L) = \frac{\pi}{2}$

$$\underline{Z}_L = \frac{\underline{U}_L}{\underline{I}_L} \Rightarrow \begin{cases} Z_L = \frac{U_L}{I_L} = L\omega \\ Arg(\underline{Z}_L) = \frac{\pi}{2} \end{cases}$$

$\varphi_u - \varphi_{i_L} = \frac{\pi}{2}$ Dephasage de U par rapport à I.
Comme > 0, alors u est en avance.
en convention récepteur
L'intensité est en retard.

By Hyperion

CONDENSATEUR



$u_c(t) = U_c\sqrt{2}\cos(\omega t + \varphi_u)$

$i_c(t) = I_c\sqrt{2}\sin(\omega t + \varphi_{Ic})$

$\underline{Z}_c = \frac{1}{jC\omega} = \frac{1}{C\omega} e^{-j\frac{\pi}{2}}$

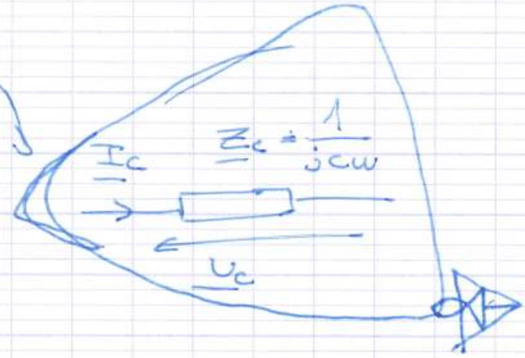
$\underline{Z}_c = \frac{-j}{C\omega} = j\left(\frac{-1}{C\omega}\right)$

$Z_c = |\underline{Z}_c| = \frac{1}{C\omega}\ (\Omega)$

$Arg(\underline{Z}_c) = \frac{-\pi}{2}$

$\frac{U_c}{I_c} = \frac{1}{C\omega}$

$\varphi_u - \varphi_{Ic} = -\frac{\pi}{2}$



$\underline{U}_c = \underline{Z}_c \cdot \underline{I}_c$

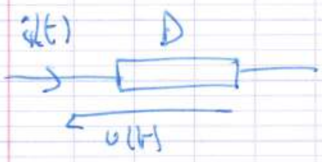
$\underline{U}_c = \frac{1}{jC\omega} \cdot \underline{I}_c$

$\frac{\underline{U}_c}{\underline{I}_c} = \frac{1}{jC\omega} = \frac{1}{C\omega} \cdot e^{-j\frac{\pi}{2}}$

Dipôle inconnu :

$u(t) = U\cdot\sqrt{2}\cdot\cos(\omega t)$ $\varphi_u = 0$

$i(t) = I\cdot\sqrt{2}\cdot\cos(\omega t+\varphi_i)$ $\varphi_i = \varphi$



× Si $\varphi = 0$ → Résistance $R = \frac{U}{I}$

$\varphi_i - \varphi_u > 0$ × Si $\varphi = \frac{\pi}{2}$ → Condensateur $C = \frac{I}{\omega U}$ ← $\frac{1}{C\omega} = \frac{U}{I}$

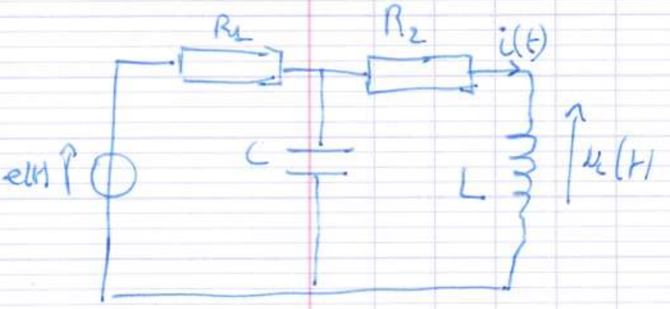
↳ I est en avance

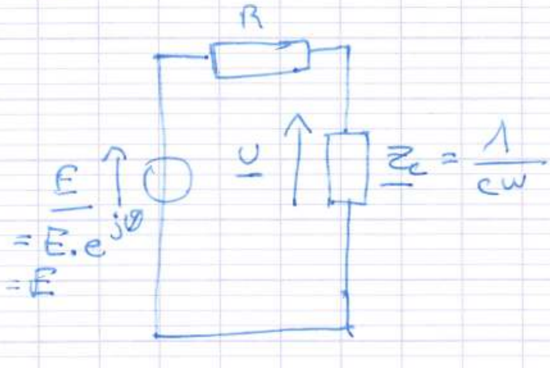
$\varphi_i - \varphi_u < 0$ × Si $\varphi = -\frac{\pi}{2}$ → Inductance $L = \frac{U}{\omega I}$ ← $L\omega = \frac{U}{I}$

φ déphase de I par rapport à U.

TD2 : Réseaux linéaire en régime sinusoïdal forcé

Exercice n°1 : $e(t) = E_m \sin(\omega t) = E\sqrt{2}\sin(\omega t)$





$$\underline{U} = \underline{E} \times \frac{\underline{Z_c}}{\underline{Z_c}+R} = \underline{E} \times \frac{\frac{1}{Cj\omega}}{\frac{1}{Cj\omega}+R} = \frac{\underline{E}}{1+jRC\omega}$$

$$\begin{cases} U = \dfrac{E}{\sqrt{1+(RC\omega)^2}} \\ \text{Arg}(\underline{U}) = \varphi_u = -\text{Arctan}(RC\omega) \end{cases}$$

By Hyperion