EX P RSF2

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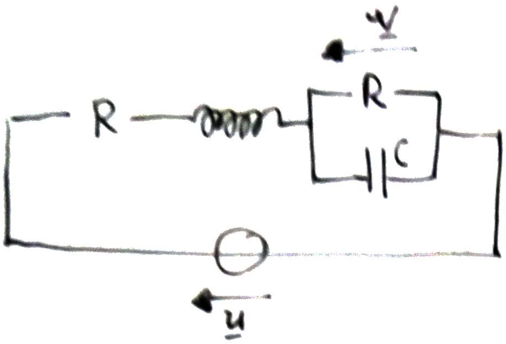

$u(t) =$

$$\underline{v} = \frac{\underline{Z_1}}{R+jL\omega+\underline{Z_1}}\,\underline{u} \qquad \underline{Z_1} = \frac{R}{1+jRC\omega}$$

$$= \frac{1}{1+\frac{1}{\underline{Z_1}}(R+jL\omega)}\,\underline{u} \qquad \frac{1}{\underline{Z_1}} = \frac{1}{R} + jC\omega$$

$$= \frac{1}{1+\left(\frac{1}{R}+jC\omega\right)(R+jL\omega)}$$

$$= \frac{1}{1+1+\frac{j\omega}{R}+jRC\omega-LC\omega^2}$$

$$= \frac{1}{2-\tau^2\omega^2+2j\tau}\,\underline{u} \qquad \frac{L}{R} = RC = \tau \Rightarrow LC = \tau^2$$

$$\Leftrightarrow \underline{V} = \frac{1}{2-\tau^2\omega^2+2j\tau}\,\underline{U}$$

$$\underline{V} = Ve^{j\varphi} \Rightarrow \begin{cases} |\underline{V}| = V = \dfrac{U}{\sqrt{(2-\tau^2\omega^2)^2+4\tau^2\omega^2}} = \dfrac{U}{\sqrt{4+\tau^4\omega^4}} \\ \varphi = \arg \underline{V} = \arg \underline{U} - \arg(2-\tau^2\omega^2+2j\tau\omega) \end{cases}$$

$$\sin\varphi = -\frac{2\tau\omega}{\sqrt{4+\tau^4\omega^4}} \quad < 0$$

$$\tan\varphi = -\frac{2\tau\omega}{2-\tau^2\omega^2}$$

$$\varphi = -\arctan\frac{2\tau\omega}{2-\tau^2\omega^2} \qquad (\text{si dénom} > 0 \iff 2 > \tau^2\omega^2)$$

$$= \pi - \arctan\frac{2\tau\omega}{2-\tau^2\omega^2} \qquad \text{si } 2 < \tau^2\omega^2$$

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$$\underline{Z_1} = R + jL\omega + \frac{\frac{jL_1\omega}{jC_1\omega}}{jL_1\omega + \frac{1}{jC_1\omega}}$$

$$= R + jL\omega + \frac{jL_1\omega}{1-L_1C_1\omega^2} = R + jL\omega\left(1 + \frac{\frac{L_1}{L}}{1-L_1C_1\omega^2}\right)$$

$$= R + jL\omega\left(1 + \frac{L_1}{L - LL_1C_1\omega^2}\right)$$

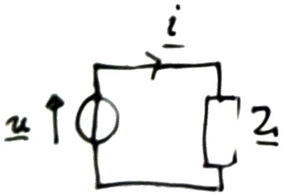
$$= R + jL\omega\left(\frac{L+L_1-L_1LC_1\omega^2}{L-L_1LC_1\omega^2}\right)$$

$$= R + jL\omega\left(\frac{\frac{L+L_1}{LL_1C_1} - \omega^2}{\frac{L}{LL_1C_1} - \omega^2}\right)$$

$$= R + jL\omega\left(\frac{\omega_1^2-\omega^2}{\omega_2^2-\omega^2}\right)$$

On pose $\begin{cases} \omega_1^2 := \dfrac{L+L_1}{LL_1C_1} \\ \omega_2^2 := \dfrac{L}{LL_1C_1} = \dfrac{1}{L_1C_1} \end{cases}$

$\boxed{2/2}$



$$\underline{u} = U_m e^{j\omega t}$$

$$\underline{i} = I_m e^{j(\omega t+\varphi)}$$

$$\underline{u} = \underline{Z_1}\,\underline{i}$$

- Module : $U_m = |\underline{Z_1}|\, I_m \Rightarrow I_m = \dfrac{U_m}{\sqrt{R^2+X^2}}$
- Argument : $0 = \arg\underline{Z} + \varphi$; $\varphi = -\arg\underline{Z} = -\arg(R+jX)$

$= -\arctan \frac{X}{R}$ car $R > 0$

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$$\frac{1}{\underline{Z}} = \frac{1}{R} + \frac{1}{jL\omega} + jC\omega$$

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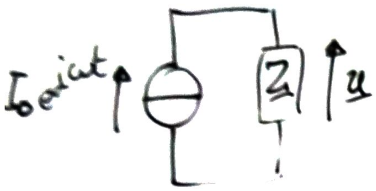

$$\underline{u} = \underline{Z}\, I_0 e^{j\omega t}$$

$$\underline{U} = \underline{Z}\, I_0 = \frac{1}{\frac{1}{R} + \frac{1}{jL\omega} + jC\omega} I_0$$

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$$U = |\underline{U}| = \frac{I_0}{\sqrt{\frac{1}{R^2} + \left(C\omega - \frac{1}{L\omega}\right)^2}}$$

sera max qd le dénominateur est minimum ie

$$\frac{1}{R^2} + \left(C\omega - \frac{1}{L\omega}\right)^2 = 0$$

$$\Leftrightarrow C\omega - \frac{1}{L\omega} = 0$$

$$\Leftrightarrow \omega = \omega_0 = \frac{1}{\sqrt{LC}}$$

$$\Rightarrow U_{max} = R \cdot I_0$$

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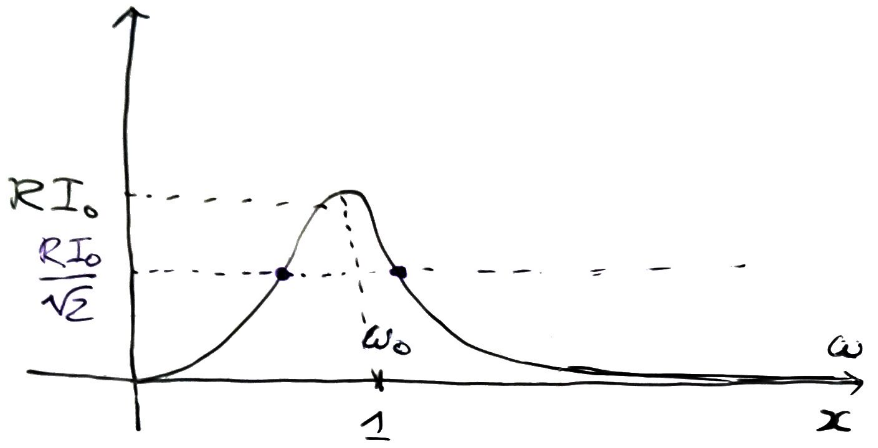

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