(13.62)

$C = 5{,}1 \cdot 10^{-6}\,F$ $\qquad \bar{P}_{résonance} = 25\,W$

$U_{eff} = 11\,V$

$f_0 = 1300\,s^{-1}$

Formules :

$\cos\varphi = 1$ car $\varphi = 0$ à la résonance

$\cdot\ \bar{P} = U_{eff} \cdot I_{eff} \cdot \cos\varphi = U_{eff} \cdot I_{eff} = \dfrac{U_{eff}^2}{R}$

à la résonance, $Z = R$

$\cdot\ f_0 = \dfrac{1}{2\pi\sqrt{LC}}$

a). $\bar{P} = \dfrac{U_{eff}^2}{R}$; $25 = \dfrac{121}{R} \Rightarrow R = \dfrac{121}{25} \cong \underline{\underline{4{,}8\,\Omega}}$

b). $f_0 = \dfrac{1}{2\pi\sqrt{LC}}$; $f_0^2 = \dfrac{1}{4\pi^2 LC} \Rightarrow L = \dfrac{1}{4\pi^2 f_0^2 C} = \dfrac{1}{4\pi^2\, 1300^2 \cdot (5{,}1 \cdot 10^{-6})} \cong \underline{\underline{2{,}93 \cdot 10^{-3}\,H}}$

c). $f = 2310\,s^{-1}$; $\cos\varphi = \dfrac{R}{Z} \cong \underline{\underline{0{,}164}}$

$Z \cong 29{,}418\,\Omega$

(13.63) $R = 106\,\Omega$

$L = 31 \cdot 10^{-3}\,H$

$C = 3{,}3 \cdot 10^{-6}\,F$

a). Calcul de Z

$f = 215\,s^{-1}$

$$Z = \sqrt{106^2 + \left(2\pi \cdot 215 \cdot 31 \cdot 10^{-3} - \dfrac{1}{2\pi \cdot 215 \cdot 3{,}3 \cdot 10^{-6}}\right)^2} = \underline{\underline{\underset{(A)}{211\,\Omega}}}$$

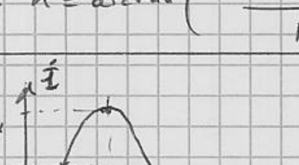
b). $\alpha = \arctan\left(\dfrac{2\pi \cdot 215 \cdot 31 \cdot 10^{-3} - \dfrac{1}{2\pi \cdot 215 \cdot 3{,}3 \cdot 10^{-6}}}{106}\right) \cong \underline{\underline{-59{,}8°}}$ $\Rightarrow$ capacitif $(Z_C > Z_L)$

d). $Z = \left(R^2 + \left(\underset{(A)}{Z_L} - \underset{(B)}{Z_C}\right)^2\right)^{1/2}$ avec $f = 609\,s^{-1}$

$Z \cong \underline{\underline{113{,}1\,\Omega}}$

e). $\alpha = \arctan\left(\dfrac{Z_L - Z_C}{R}\right) \cong \underline{\underline{20{,}4°}}$

(13.64)



$\hat{I}_{max} = \dfrac{\hat{u}}{R} \Rightarrow \dfrac{1}{2}\hat{I}_{max} = \dfrac{\hat{u}}{2R} = \dfrac{\hat{u}}{Z}$ (On suppose $\hat{u}$ indépendant de f)

$\Rightarrow Z = 2R$: condition pour les ω (ω_1 et ω_2).

$Z^2 = 4R^2$

$R^2 + \left(\omega L - \dfrac{1}{\omega C}\right)^2 = 4R^2$

$\left(\omega L + \dfrac{1}{\omega C}\right)^2 = 3R^2$

$\omega L - \dfrac{1}{\omega C} = \pm R\sqrt{3}$

$\omega^2 LC - 1 = \pm R\omega C\sqrt{3}$

$LC\omega^2 \pm R\omega C\sqrt{3} - 1 = 0$

$\rightarrow \sqrt{\Delta} = \sqrt{3R^2 C^2 + 4LC} > RC\sqrt{3}$

$\omega_{1,2} = \dfrac{\pm RC\sqrt{3} \pm \sqrt{\Delta}}{2LC} > 0$ (Condition "physique" !)

On voit que $\omega_2 = \dfrac{RC\sqrt{3} + \sqrt{\Delta}}{2LC} > \omega_1 = \dfrac{-RC\sqrt{3} + \sqrt{\Delta}}{2LC}$

$\Rightarrow \omega_2 - \omega_1 = \dfrac{RC\sqrt{3} + \sqrt{\Delta} + RC\sqrt{3} - \sqrt{\Delta}}{2LC} = \dfrac{2RC\sqrt{3}}{2LC} = \underline{\underline{\sqrt{3} \cdot \dfrac{R}{L}}}$