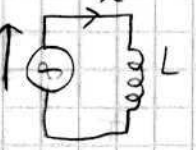
LUCAS HAGGE

Capitulo 6 guía de ejercicios

6.7) $\omega = 1000 \frac{rad}{s}$

$\hat{E} = 311,127\,V$ $\quad f = 159,1549\,Hz$

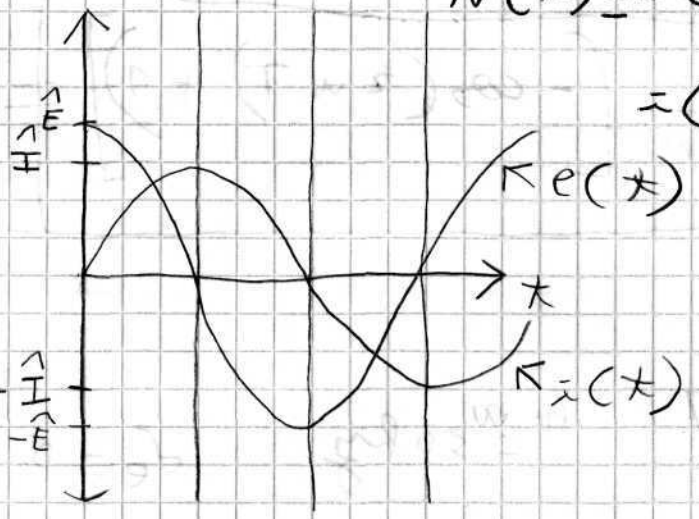
$\hat{I} = 10\,A$ $\quad \delta_e = 90°$



a)

$v(t) = e(t) = \hat{E}\,\text{sen}(\omega t + \delta_e)$

$i(t) = \hat{I}\,\text{sen}(\omega t)$



b)

$\delta_i = \delta_e + \varphi = 0$

$\downarrow$

$-90°$

c)

$X_L = \omega \cdot L$

$X_L = 311\,\Omega$

$\frac{\hat{E}}{X_L} = \hat{I}$

$L = 0,0311\,H$

d)

$p(t) = v(t) \cdot i(t)$

$p(t) = \frac{\hat{E}\hat{I}}{2}\,\text{sen}(2\omega t)$

a)

$$P_m = \frac{1}{\Delta t} \int p(t)\, dt$$

$$\boxed{P_m = \frac{1}{t} \frac{\hat{E}\hat{I}}{2} \left[\frac{-\cos(2wt)}{2w} + \frac{1}{2w} \right]}$$

a)

$$E = \int_0^T p(t)\, dt$$

$$\boxed{E = \frac{\hat{E}\hat{I}}{2 \cdot 2w} \left[-\cos(2wT) + 1 \right] = 0}$$

6.2)

$\hat{E} = 10\,mV \qquad \theta = 50hz \qquad \delta_e = 0$

$\hat{I} = 600\,MA$

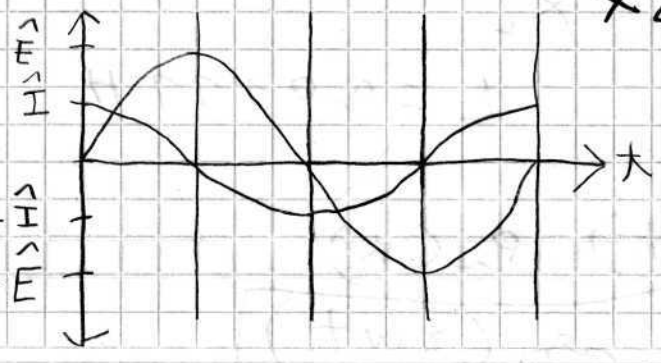
$$e(t) = v(t) = \frac{\int i(t)\, dt}{C}$$

$\boxed{\delta_c = 90° = \varphi}$

$\boxed{X_c = \frac{1}{Cw} = 16{,}66\,\Omega}$ $\qquad i(t) = C\hat{E}w\cos(wt)$

$$\hat{I} = \frac{\hat{E}}{X_c} \qquad C = 0{,}00019098\,F$$

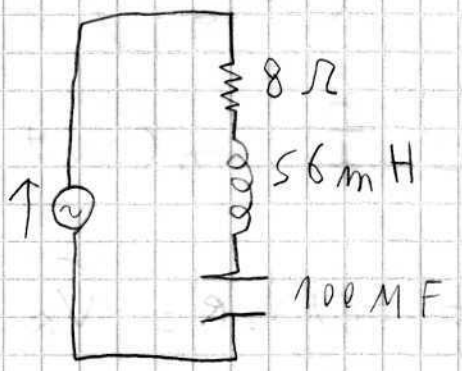
$$i(t) = \hat{I}\sin(wt + 90°)$$



$$\boxed{p(t) = \frac{\hat{E}\hat{I}}{2} \sin(2wt)}$$

NOTA:

6,3)



$\hat{I} = 14,1421\ A$ $\quad \hat{V}_L = 497,8\ V$

$X_L = ?$ $\quad X_C = ?$

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

$X_L = w \cdot L$ $\quad \frac{\hat{V}_L}{X_L} = \hat{I}$

$X_L = 35,2\ \Omega$

$w = 628,57\ \frac{rad}{s}$

$X_C = \frac{1}{wC} = 15,9\ \Omega$

$f = \frac{w}{2\pi} = 100\ Hz$

$Z = \sqrt{R^2 + (X_L - X_C)^2} = 20,88\ \Omega$

$\hat{E} = \hat{I} \cdot Z = 295,29\ V$

$$e(t) = \hat{E} \sin(\omega t) \qquad \varphi_e = 0$$

$$\varphi = \operatorname{arctg}\left(\frac{X_L - X_C}{R}\right) = 67,48°$$

$$i(t) = \hat{I} \sin(\omega t - 67,48°)$$

$$v_R(t) = i(t) \cdot R = \hat{V}_R \sin(\omega t - 67,48°)$$

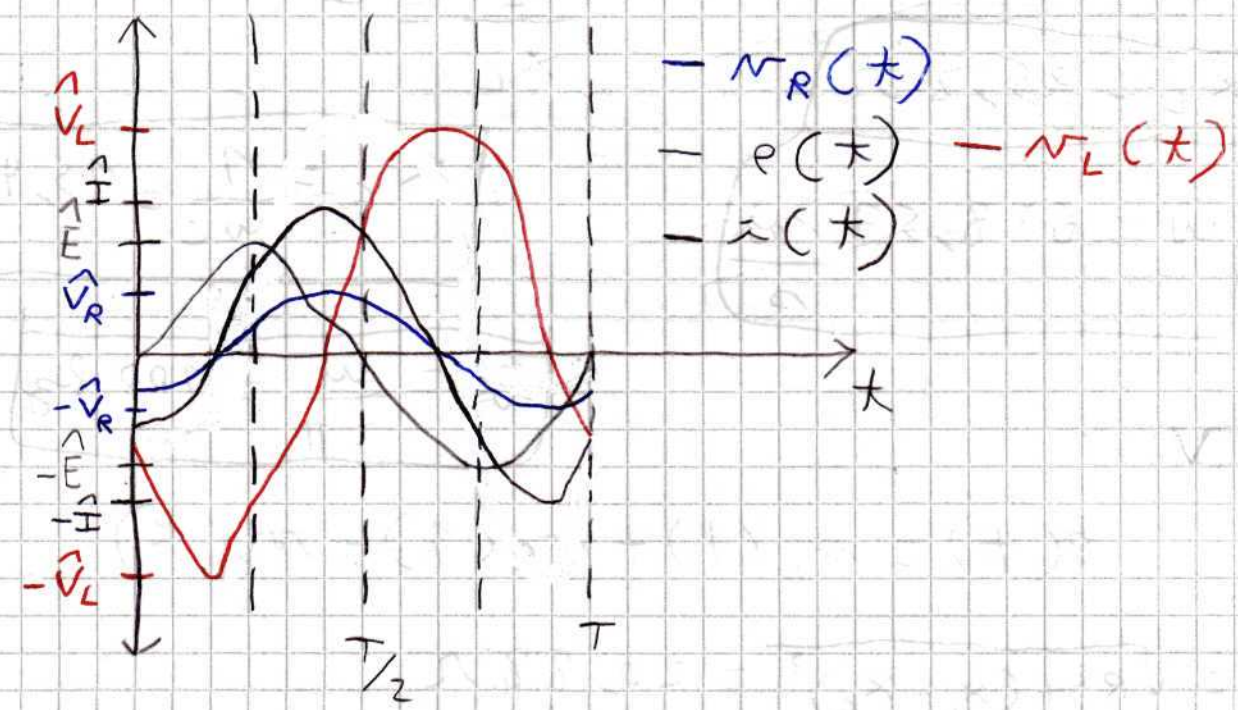
$$v_L(t) = \hat{V}_L \sin(\omega t - 157,48°)$$

$$v_C(t) = \hat{V}_C \sin(\omega t + 22,52°)$$

$$\hat{V}_R = \hat{I} R$$

$$\hat{V}_L = \hat{I} X_L$$

$$\hat{V}_C = \hat{I} X_C$$



$$p_R(t) = v_R(t) \cdot i(t) = \hat{V}_R \hat{I} \sin^2(\omega t - 67,48°)$$

NOTA: *

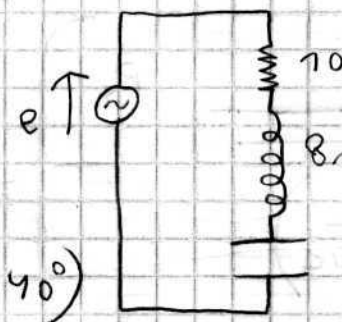
$$p_L(t) = v_L(t) \cdot i(t) = \hat{V}_L \hat{I} \sin(2\omega t - 134^\circ)$$

$$p_C(t) = v_C(t) \cdot i(t) = \hat{V}_C \hat{I} \sin(2\omega t + 45^\circ)$$

6.4)

$\hat{E} = 240\,V$

$\delta_e = -40^\circ$



$$e(t) = \hat{E} \sin(\omega t - 40^\circ)$$

$$e = v_R + v_L + v_C$$

$$\boxed{e = R \cdot i + L \cdot \frac{di}{dt} + \frac{1}{C} \int i \, dt}$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{100\Omega^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

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

$$\omega L = \frac{1}{\omega C}$$

$$\omega^2 = \frac{1}{LC} \rightarrow \boxed{7071 \frac{rad}{s} = \omega}$$

$$\boxed{i(t) = \frac{e(t)}{Z} = 2{,}4\,A \sin(\omega t - 40^\circ)}$$

$$p(t) = i^2(t) \cdot R = \hat{I}^2 \cdot R \sin^2(\omega t - 40°)$$

$$P_m = \frac{\hat{I}^2 \cdot R}{2} = 2880\ W$$

$\omega \to 0 \Rightarrow Z \to \infty$

$\omega \to \infty \Rightarrow Z \to \infty$

$$\frac{V_R(\omega)^2}{V_R(\omega_0)^2} = \left[\frac{\frac{\cancel{E}}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}} R}{\frac{\cancel{E}}{\cancel{R}} \cdot \cancel{R}} \right]^2 = \frac{1}{2}$$

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

$$R = \omega L - \frac{1}{\omega C}$$

$$\frac{\omega C R + 1}{\omega C} = \omega L$$

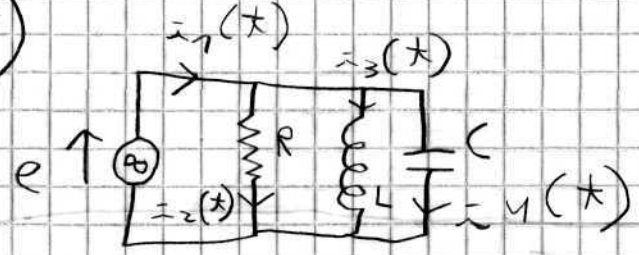
$$0 = \omega^2 LC - \omega \cdot C \cdot R - 1$$

$$\omega_1 = 7\ 723{,}64\ \frac{rad}{s}$$

$$\omega_2 = -6473{,}64\ \frac{rad}{s}$$

NOTA:

6.5)



$R = 10\,\Omega$

$L = 8\,mH$

$C = 2{,}5\,\mu F$

$$e(t) = v_R = v_L = v_C$$

$$i_1(t) = i_2(t) + i_3(t) + i_4(t)$$

$$v_R = i_2(t)\,R \qquad \boxed{i_2(t) = \frac{e(t)}{R}}$$

$$v_L = L\,\frac{\partial i_3(t)}{\partial t} \qquad \boxed{i_3(t) = \frac{1}{L}\int e(t)\,\partial t}$$

$$v_C = \frac{Q}{C} = \frac{1}{C}\int i_4(t)\,\partial t$$

$$\boxed{i_4(t) = C\,\frac{\partial e(t)}{\partial t}}$$

$$\boxed{i_1(t) = \frac{e(t)}{R} + \frac{1}{L}\int e(t)\,\partial t + C\,\frac{\partial e(t)}{\partial t}}$$

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

$$w_0 L - \frac{1}{w_0 C} = 0$$

$$w_0^2 = \frac{1}{LC}$$

$$\boxed{w_0 = \sqrt{\frac{1}{LC}} = 7071{,}06 \ \frac{rad}{s}}$$

$$e(t) = \hat{E} \cdot \operatorname{sen}(wt + \delta_e)$$

$T \rightarrow$ período

$$\hat{E} = 240V$$

$$\delta_e = -40°$$

$$\boxed{P_{med} = \frac{1}{T} \int_0^T P(t)\, dt}$$

Para R: $P(t) = v_2(t) \cdot i_R(t)$

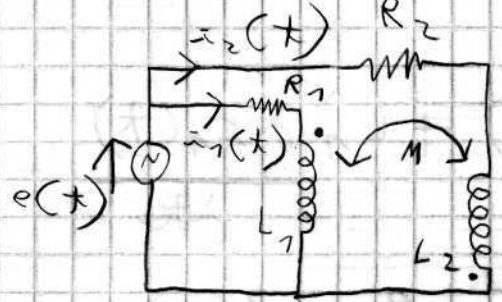
$$P(t) = \frac{e^2(t)}{R}$$

$$\boxed{P_{med} = \frac{\hat{E}^2}{2R}}$$

$w \rightarrow 0 \Rightarrow Z \rightarrow \infty$

$w \rightarrow \infty \Rightarrow Z \rightarrow \infty$

6.6)

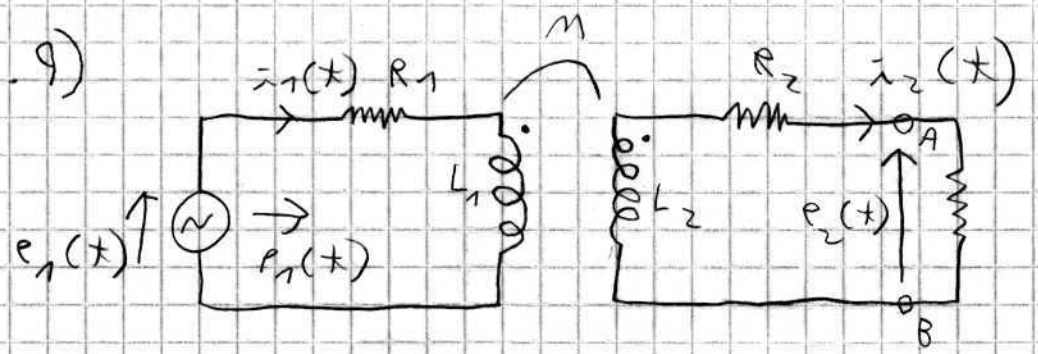


$$e(t) = R_2 \cdot i_2(t) + L_2 \frac{\partial i_2(t)}{\partial t} - M \frac{\partial i_1(t)}{\partial t}$$

$$e(t) = R_1 \cdot i_1(t) + L_1 \frac{\partial i_1(t)}{\partial t} - M \frac{\partial i_2(t)}{\partial t}$$

$$e(t) \cdot (i_1(t) + i_2(t)) = P(t)$$

6.9)

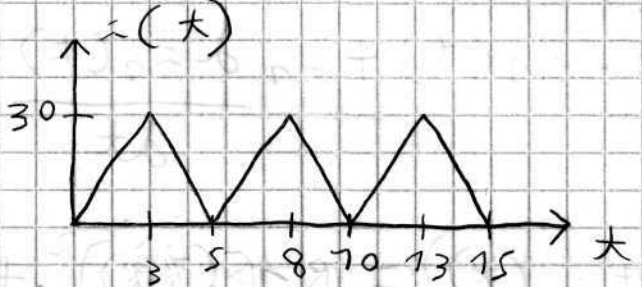


$$e_2(t) = M\frac{di_1(t)}{dt} - L_2\frac{di_2(t)}{dt} - R_2 i_2(t)$$

$$e_1(t) = R_1 i_1(t) + L_1\frac{di_1(t)}{dt} - M\frac{di_2(t)}{dt}$$

$$e_2(t)\cdot i_2(t) + R_2 i_2^2(t) = e_1(t)\cdot i_1(t) - i_1^2(t)\cdot R_1$$

6.10)



$$f(t) = \begin{cases} y = 10x & 0 < x < 3 \\ y = -15x + 75 & 3 < x < 5 \end{cases}$$

$$\text{val media} = \frac{1}{T}\int_0^T f^2(t)\,dt$$

$$\text{val media} = \frac{1}{T}\left[\int_0^3 100t^2\,dt + \int_3^5 (225t^2 - 2250t + 5625)\,dt\right]$$

NOTA:

$$\text{val medio} = \frac{1}{T}\left[33{,}33 \cdot 3^3 + 75(5^3 - 3^3) - 7125(5^2 - 3^2) + 5625 \cdot 2\right]$$

$$\boxed{\text{val medio} = 300}$$

$$\boxed{\text{eficaz} = \sqrt{\text{val medio}} = 17{,}31}$$

6.12)

$$e_1(t) = \hat{E}_1 \operatorname{sen}(\omega t + \delta_1)$$

$$i_2(t) = \hat{I}_2 \operatorname{sen}(\omega t + \delta_{i2})$$