td AL2.0

10h57

① Les signaux sont alternatifs sinusoïdaux.

② $I_{max} = 3\text{ div} \times 1\text{ A/div}$ $\qquad I_{max} = 3A$

$V_{max} = 3\text{ div} \times 1\text{ V/div}$ $\qquad V_{max} = 3V$

$\boxed{I = \frac{I_{max}}{\sqrt{2}}}$ $\qquad \underline{I = 2,13A}$ $\qquad \boxed{V_{max} = \frac{V}{2}}$ $\qquad \underline{V_{max} = 2,13V}$

③ $T = 6,2\text{ div} \times 1\text{ms/div}$ $\qquad T = \underline{6,2\text{ ms}}$

$\boxed{f = \frac{1}{T}}$ $\qquad f = \frac{1}{0,0062}$ $\qquad f \underline{= 161\text{ Hz}}$

$\boxed{\omega = 2\pi f}$ $\qquad \underline{\omega = 1010\text{ rad}}\cdot s^{-1}$

11h02

④ $\Delta t = +1,6\text{ div} \times 1\text{ms/div}$ $\qquad \underline{\Delta t = 1,6\text{ ms}}$

$\boxed{\varphi = \frac{2\pi}{T}\cdot \Delta t}$ $\qquad \varphi = \frac{2\pi}{0,0062}\cdot 0,0016$ $\qquad \varphi = 1,62\text{ rad}$ $\times \frac{180°}{\pi} \rightarrow 93°$

(sensiblement en quadrature)

⑤ La tension est en avance sur le courant.

⑥ $\boxed{i(t) = \sqrt{2}\, I \sin(\omega t)}$ $\qquad i(t) = 3 \sin(1000t)$

$\boxed{u(t) = \sqrt{2}\, V \sin(\omega t + \varphi)}$ $\qquad u(t) = 3 \sin(1000t + 1,82)$

⑦ $\langle i \rangle = \frac{1}{T}\int_0^T \sqrt{2}\, I \sin(\omega t)\, dt = \frac{1}{2\pi}\int_0^{2\pi} \sqrt{2}\, I \sin(\theta)\, d\theta$

$\langle i \rangle = \frac{1}{2\pi}\left[-\sqrt{2}\, I \cos(\theta)\right]_0^{2\pi} = \frac{1}{2\pi}\Big(-\sqrt{2}I \overbrace{\cos(2\pi)}^{=1} - (-\sqrt{2}I \underbrace{\cos(0)}_{=1})\Big)$

$\boxed{\langle i \rangle = 0}$

⑧ Aucun changement sur le chronogramme car la composante continue de $i(t)$ et $v(t)$ est nulle.

11h12

⑨ Le signal $v(t)$ est continu car $v(t) \geq 0$.

⑩ $\underline{V_{max} = 20V}$

$\underline{T = 0,003\text{ s}}$

$\boxed{f = \frac{1}{T}}$ $\qquad f = \frac{1}{0,003}$ $\qquad f \underline{= 333\text{ Hz}}$

⑪ $t \in [0 ; \frac{T}{3}[$: $\boxed{v(t) = V_{max}}$

$t \in [\frac{T}{3} ; T[$: $\boxed{v(t) = 0}$

⑫ $\langle v \rangle = \frac{1}{T}\int_0^T v(t)\, dt = \frac{1}{T}\Big(\underbrace{\int_0^{T/3} V_{max}\, dt}_{T\frac{V_{max}}{3}} + \underbrace{\int_{T/2}^{T} 0\, dt}_{\rightarrow 0}\Big)$ aire sous la courbe

$\langle v \rangle = \frac{1}{T}\left[V_{max}\, t\right]_0^{T/3}$

$\langle v \rangle = \frac{1}{T} V_{max} \frac{T}{3}$ $\qquad \boxed{\langle v \rangle = \frac{V_{max}}{3}}$ $\qquad \underline{\langle v \rangle = 6,67V}$

11h18

⑬ $V = \sqrt{\frac{1}{T}\int_0^T v(t)^2\, dt} = \sqrt{\frac{1}{T}\Big(\int_0^{T/3} V_{max}^2\, dt + \underbrace{\int_{T/3}^{T} 0 \cdot dt}_{=0}\Big)}$

$V = \sqrt{\frac{1}{T}\left[V_{max}^2\, t\right]_0^{T/3}} = \sqrt{\frac{1}{T} V_{max}^2 \frac{T}{3}}$

$\boxed{V = \frac{V_{max}}{\sqrt{3}}}$

$V = \frac{20}{\sqrt{3}}$ $\qquad \underline{V = 11,5V}$

⑭ $\boxed{P_v = \langle v \rangle\, I}$ $\qquad P_v = 11,5 \times 5$ $\qquad \underline{P_v = 57,5W}$

⑮ $P_j = R I^2$ $\qquad \boxed{P_j = \frac{V^2}{R}}$ $\qquad P_j = \frac{11,5^2}{100}$ $\qquad \underline{P_j = 1,32W}$

11h25

11h17

11h25

(16) Loi des noeuds : $i_R(t) + i(t) = I_0$ (1)

Loi des mailles : $u_R(t) = u_C(t)$ (2)

Caractéristiques :

condensateur : $i(t) = C \dfrac{du_C}{dt}(t)$ (3)

résistance : $u_R(t) = R \cdot i_R(t) \overset{(2)}{\Longrightarrow} i_R(t) = \dfrac{u_C(t)}{R}$

Finalement $\dfrac{u_C(t)}{R} + C \dfrac{du_C}{dt}(t) = I_0$

$$u_R(t) + \underbrace{RC}_{\tau = RC} \frac{du_C}{dt}(t) = R I_0$$

(17) Solution homogène $K e^{-t/\tau}$
particulière $R I_0$ $\Big\}$ $u_C(t) = R I_0 + K e^{-t/\tau}$

Condition initiale $u_C(0) = 0 \Rightarrow 0 = R I_0 + K e^0$
$\Rightarrow K = -R I_0$

Finalement $\boxed{u_C(t) = R I_0 \left(1 - e^{-t/RC}\right)}$

11h32