Corrigé BTS TPIL Electricité Session 2005

TPIL – Corrigé sujet Elect 2005 (1)

1)

1.1) $I = \frac{10^{-3}}{\sqrt{2}} = 0{,}707\ mA.$ (0,5)

1.2.1) $|i| < I_c \Rightarrow R_2 = 0 \Rightarrow V_2 = 0\ V$ (0,5)

1.2.2) $|i| > I_c \Rightarrow R_2 = 1\ k\Omega$

$\Rightarrow V_2 = R_2 \cdot i$ (0,5)

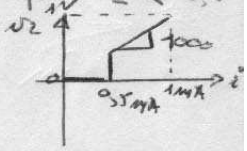
1.2.3) $V_{2c} = R_2 \cdot I_c = 0{,}5\ V$ (0,5)

1.2.4) $I_{max} = 1\ mA > I_c$

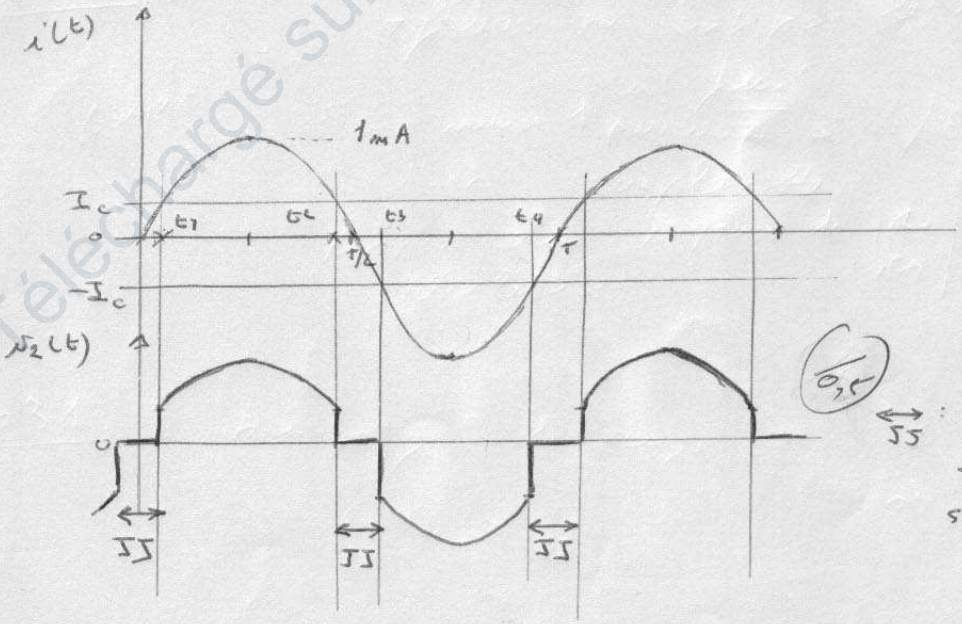
donc $V_2(t) = R_2 \cdot I_{max} = 1\ V$ (0,5)

1.3) (1) ssi $|i(t)| < I_c$ cad ssi $\frac{1}{1V} V_2 < 0{,}5$

alors $V_2 = 0\ V$.



1.4)



(0,5)

↔ JJ : intervalle durant lequel JJ est supraconductrice

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1.5) $i(t) = I_c = I_{max} \sin(\omega t_1)$

$\Rightarrow \omega t_1 = \text{Arcsin}\left(\frac{I_c}{I_{max}}\right) \Rightarrow \boxed{t_1 = \frac{1}{\omega} \text{Arcsin}\left(\frac{I_c}{I_{max}}\right)}$ (1)

1.6) $\boxed{t_1 = 167\ \mu s.}$ (0,5)

2) 2.1) Comp 1 : pas de réaction $\begin{cases} > 0 \\ < 0 \end{cases}$ => AOP en saturé

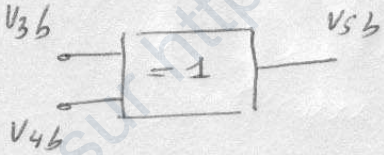
$\Rightarrow V_3 = V_{sat}$ ou $0V \Rightarrow \boxed{V_3 = 5V \text{ ou } 0V.}$

$\begin{cases} V^- = 0V \\ V+ = V_1 \end{cases} \Rightarrow \varepsilon = V_1$ (1)

$\boxed{V_3 = 5V \text{ si } \varepsilon > 0 \Rightarrow \text{si } V_1 > 0}$

$\boxed{V_3 = 0V \text{ si } \varepsilon < 0 \Rightarrow \text{si } V_1 < 0.}$

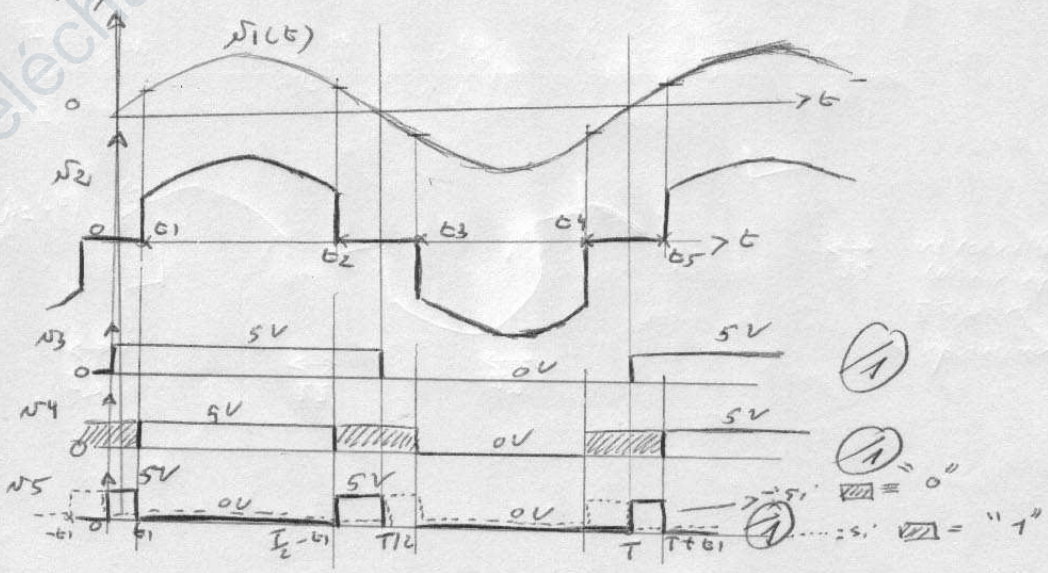
2.2)



V_{3b}	V_{4b}	V_{5b}
0	0	0
0	1	1
1	0	1
1	1	0

(1)

2.3)



(1) (1) (1) (1) si = "0" si = "1"

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2.4) $\langle v_5 \rangle = \frac{1}{T} \times \left(5 \times t_1 + 5 \times \frac{T}{2} - t_1\right) = \frac{1}{T} \times 10 t_1$

$$\boxed{\langle v_5 \rangle = \frac{10 t_1}{T} = 10 f \cdot t_1} \quad (1)$$

3)

3.1) $\underline{Z}_{eq} = \underline{Z}_{R4} // \underline{Z}_C = \dfrac{\frac{R_4}{j \cdot C\omega}}{R_4 + \frac{1}{j \cdot C\omega}} = \dfrac{R_4}{1 + R_4 j C\omega}$ (0,5)

3.2) Montage inverseur :

$$\underline{T} = \frac{\underline{V_6}}{\underline{V_5}} = -\frac{\underline{Z}_{eq.}}{\underline{Z}_{R3}} = -\frac{R_4}{R_3} \times \left(\frac{1}{1 + j \cdot R_4 C\omega}\right) \quad (1)$$

3.3)

$$|\underline{T}| = \frac{R_4}{R_3} \times \frac{1}{\sqrt{1 + (R_4 C\omega)^2}} \quad (1)$$

$$G_{dB} = 20 \log \frac{R_4}{R_3} - 10 \log \left[1 + (R_4 C\omega)^2\right] \quad (0,5)$$

3.4) Passe bas actif 1er ordre. (1)

3.5) $\underline{T}_{max} = \dfrac{R_4}{R_3} \Rightarrow \boxed{G_{max} = 20 \log\left(\frac{R_4}{R_3}\right)}$ (1)

3.6) $\underline{T} = \dfrac{\underline{T}_0}{1 + j \frac{\omega}{\omega_c}} \Rightarrow \begin{cases} T_0 = \dfrac{R_4}{R_3} \\ f_c = \dfrac{1}{2\pi R_4 C} \end{cases}$ (1)

3.7) $R_4 = \dfrac{1}{2\pi f_c \cdot C} = 159155\,\Omega$ (0,5)

$G_{max} = 2 = 20 \log\left(\frac{R_4}{R_3}\right) \Rightarrow \dfrac{2}{20} = \log\left(\frac{R_4}{R_3}\right)$

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$\Rightarrow 10^{(4/20)} = \frac{R_4}{R_3} \Rightarrow R_4 = 1{,}26\, R_3$

$\Rightarrow \boxed{R_3 = 12642\ \Omega.}$ (0,5)

3.8) $|\underline{T}|_{\text{à } 100\text{Hz}} = \frac{R_4}{R_3} \times \frac{1}{\sqrt{1+\left(\frac{100}{10}\right)^2}} = 0{,}12527$ (0,5)

$\rightarrow \boxed{G_{dB\ \text{à } 100\text{Hz}} = 20\log|\underline{T}| = -18\,dB.}$ (0,5)

3.9) (0,5)