18940

td C2.3

① $E_n = k\,\Omega_n$

$U_n = E_n + R I_n$ en régime permanent

$\Rightarrow U_n = k\,\Omega_n + R I_n$ $\qquad k = \dfrac{U_n - R I_n}{\pi N_n / 30}$

$k = \dfrac{150 - 1.10}{\pi\, 2400/30}$ $\qquad k = 0{,}56\ Vs$ (ou NmA^{-1})

② $C_{un} = k\, I_n$ $\qquad C_{un} = 0{,}56 \cdot 10$ $\qquad C_{un} = 5{,}6\ Nm$

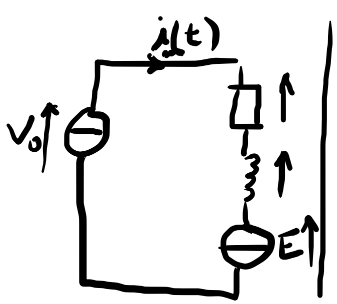
③ $P_n = C_{un} \cdot \dfrac{\pi N_n}{30}$ $\qquad P_n = 5{,}6 \cdot \pi \dfrac{2400}{30}$

$P_n = 1410\ W$

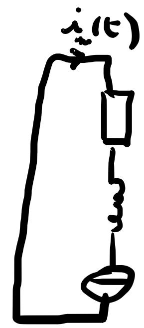
④ $\eta_m = \dfrac{P_{un}}{P_{an}}$ $\qquad \eta_n = \dfrac{P_{un}}{U_n I_n}$ $\qquad \eta_m = \dfrac{1410}{150 \cdot 10}$

$\eta_m = 0{,}94$

⑤ $0 \leq t < \alpha T_R$ (a)



$\alpha T_R < t < T_R$ (b)



⑥ phase a : $V_0 = R\, i_m(t) + L \dfrac{di_m(t)}{dt} + E$

phase b : $0 = R\, i_m(t) + L \dfrac{di_m(t)}{dt} + E$

⑦ En négligeant $R\, i_m(t) \rightarrow$ (a) $\dfrac{di_m}{dt} = \dfrac{V_0 - E}{L} > 0$

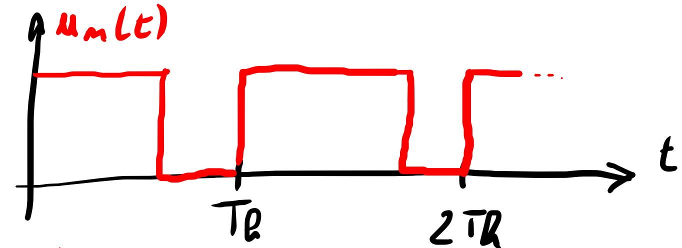
(b) $\dfrac{di_m}{dt} = -\dfrac{E}{L} < 0$

Soit

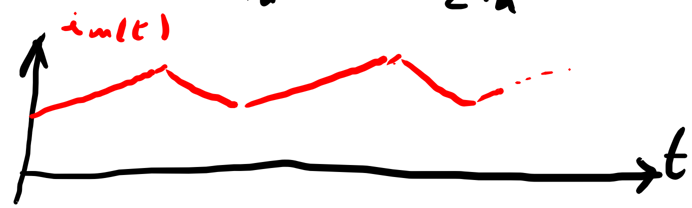
(a) $i_m(t) = I_{min} + \dfrac{V_0 - E}{L} t \qquad 0 \leq t < \alpha T_R$

(b) $i_m(t) = I_{max} - \dfrac{E}{L} t \qquad \alpha T_R \leq t < T_R$

⑧



⑨



⑩ $E = \dfrac{1}{T_R} \displaystyle\int_0^{T_R} u_m(t)\,dt = \dfrac{1}{T_R} \alpha T_R U_0$

$E = \alpha U_0$

⑪ Phase (a) : $i_m(\alpha T_R) = I_{max}$

donc $I_{max} = \dfrac{U_0 - \alpha U_0}{L} \alpha T_R + I_{min}$

d'où $\Delta I_m = I_{max} - I_{min} = \dfrac{1 - \alpha}{L f_R} \alpha U_0$

$(T_R = \dfrac{1}{f_R})$

⑫ maximum éventuel à $\dfrac{d \Delta I_m}{d\alpha} = 0$

$\Rightarrow 1 - 2\alpha = 0$ soit $\alpha = \dfrac{1}{2}$

⑬ $\Delta I_0 = \dfrac{U_0}{4 L f_R}$

⑭ $f_R = \dfrac{U_0}{4 L \Delta I_0}$ $\qquad f_R = \dfrac{200}{4.10 \cdot 0{,}125 \cdot 905}$

$f_R = 80\ kHz$

⑮ $\alpha_n = U_n / U_0 = 0{,}75$

⑯ $U_R = \alpha\, U_{Rm}$ $\qquad U_R = 7{,}5\ V$