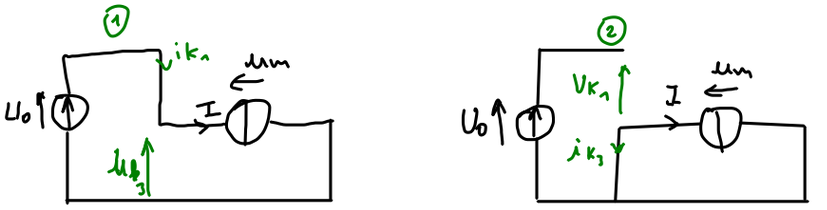
td MOD 2.2 — 10h38

① 

association sources de courant et de tension

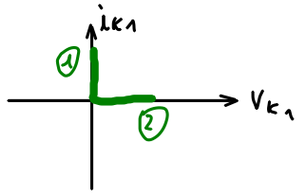
Source de tension : circuit ouvert

Source de courant : court-circuit

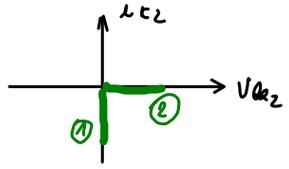
② La structure est simplifiable car :

T_2 : toujours ouvert → suppression

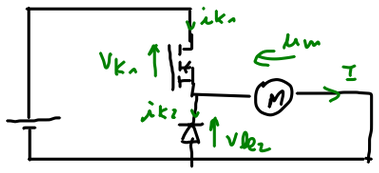
T_4 : toujours fermé → fil.

③ 

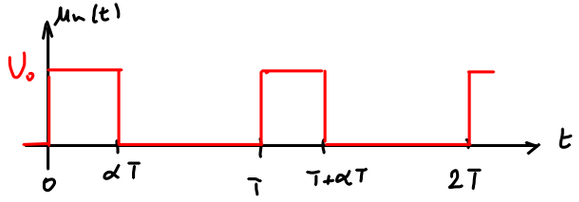
transistor



diode — 10h42

④ 

10R46

⑤ 

10h48

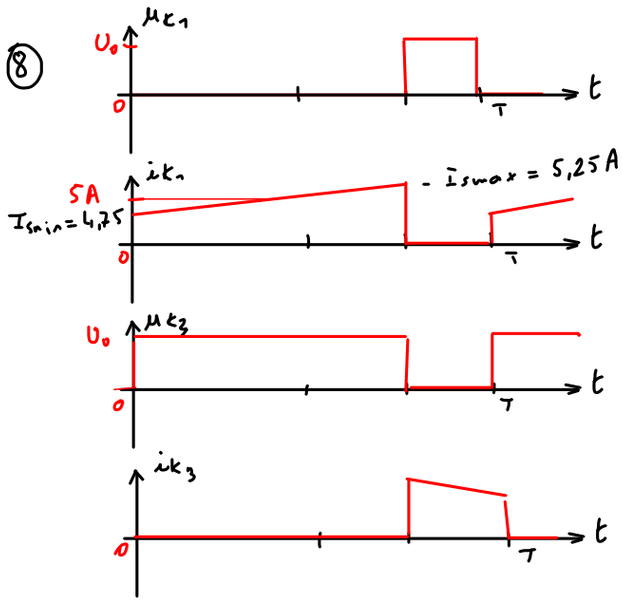
⑥ $\langle u_m \rangle = \frac{1}{T}\int_0^T u_m(t)\,dt = \frac{1}{T}\int_0^{\alpha T} U_0\,dt$

$= \frac{1}{T}\left(U_0 \cdot \alpha T\right)$

$\boxed{\langle u_m \rangle = \alpha U_0}$

⑦ $\boxed{\alpha = \frac{\langle u_m \rangle}{U_0}}$ $\quad \alpha = \frac{18}{24}$ $\quad \underline{\alpha = 0{,}75}$

10h50

⑧ 

10h56

⑨ $I_{K_1} = \sqrt{\frac{1}{T}\int_0^T i_{K_1}^2(t)\,dt} = \sqrt{\frac{1}{T}\int_0^{\alpha T}\left(I_{smin} + \frac{\Delta i_S}{\alpha T}t\right)^2 dt}$

$= \sqrt{\frac{1}{T}\int_0^{\alpha T}\left(I_{smin}^2 + 2\frac{I_{smin}\Delta i_S}{\alpha T}t + \frac{\Delta i_S^2}{\alpha^2 T^2}t^2\right)dt}$

$= \sqrt{\frac{1}{T}\left[I_{smin}^2 t + \frac{I_{smin}\Delta i_S}{\alpha T}t^2 + \frac{\Delta i_S^2}{\alpha^2 T^2}\frac{t^3}{3}\right]_0^{\alpha T}}$

$= \sqrt{\frac{1}{T}\left(I_{smin}^2 \alpha T + \frac{I_{smin}\Delta i_S}{\alpha T}(\alpha T)^2 + \frac{\Delta i_S^2}{\alpha^2 T^2}\frac{(\alpha T)^3}{3}\right)}$

$\boxed{I_{K_1} = \sqrt{\alpha\left(I_{smin}^2 + I_{smin}\Delta i_S + \Delta i_S^2\right)}}$

$I_{K_1} = \sqrt{0{,}75\left(4{,}75^2 + 4{,}75 \times 0{,}5 + 0{,}5^2\right)}$

$I_{K_1} = 5{,}02\,A$

Choix du transistor 11h10

$I_{K_1} = 5\,A \;<\; I_D = 18\,A$

$V_{K_1,max} = U_0 = 24\,V \;<\; V_{DS} = 125\,V$

$f = 20\,kHz \;<<\; f = 108\,MHz$

effectif — constructeur

Le transistor convient et pourrait travailler à plus haute fréquence

Choix de la diode (constructeur)

$|V_{K_2}|_{max} = 24\,V \;<<\; V_{RM} = 600\,V$

$\langle i \rangle = 5\,A \;<<\; I_0 = 30\,A$

$I_{K_2\,max} = 5{,}25\,A \;<<\; I_{FSM} = 140\,A$

$T = \frac{1}{f} = 50\,\mu s \;<<\; t_{rr} = 0{,}1\,\mu s$

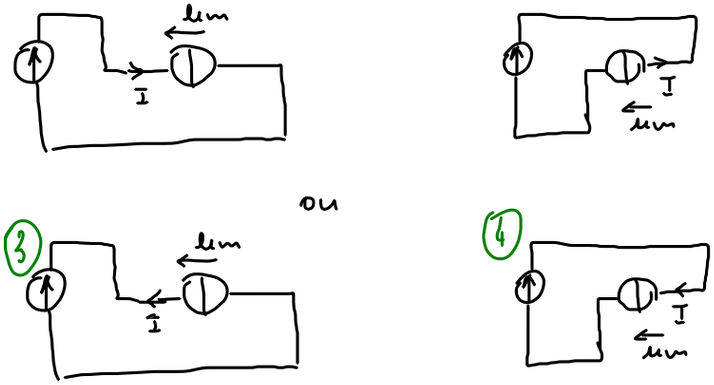
La diode est largement dimensionné pour cette applicatio-

11h18

(10)

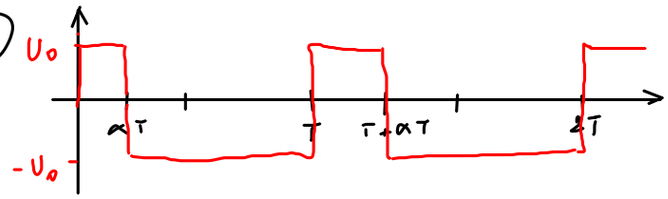
11h20

(11) ① $0 < t < \alpha T$ ② $\alpha T < t < T$ 11h20



ou

(12)



11h25

(13) $\langle u_m \rangle = \frac{1}{T}\int_0^T u_m(t) = \frac{1}{T}\left(\int_0^{\alpha T} U_0\,dt + \int_{\alpha T}^{T} -U_0\,dt\right)$

$= \frac{1}{T}\left(U_0 \alpha T - U_0(T - \alpha T)\right) = \frac{1}{T}\left(U_0(2\alpha T - T)\right)$

$$\boxed{\langle u_m \rangle = (2\alpha - 1)\,U_0}$$

$\langle u_m \rangle = (2 \cdot 0{,}25 - 1)\,24$

$\langle u_m \rangle = -12\,V$

(14) Au maximum $\langle v_m \rangle = U_0 \Rightarrow 2\alpha_m - 1 = 1$

$\alpha_M = 1$

Inversement au minimum $\langle u_m \rangle = -U_0 \Rightarrow 2\alpha - 1 = -1$

$\Rightarrow \alpha_m = 0$

Donc $\boxed{0 \leq \alpha \leq 1}$

(15) $\langle u_m \rangle = (2\alpha - 1) U_0$

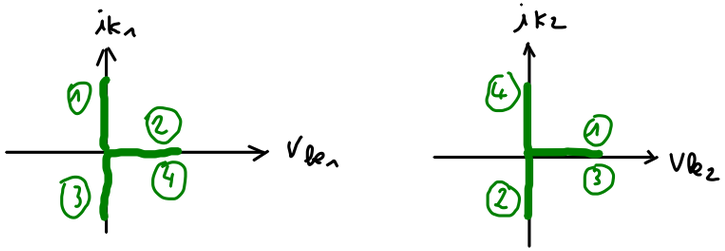
$\Rightarrow \boxed{\alpha = \frac{1}{2}\left(\frac{\langle u_m \rangle}{U_0} + 1\right)}$

$\alpha = \frac{1}{2}\left(\frac{18}{24} + 1\right)$

$\alpha = 0{,}875$

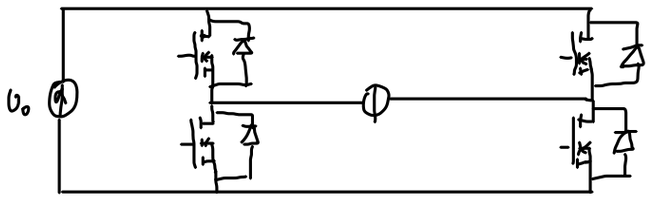
(16) Les 2 commandes sont incompatibles puisque pour obtenir la même tension moyenne au moteur il faut des rapports cycliques différents.

(17)



(18) Diode inverse et transistor.

(19)



11h39