EXO 1:

Théorème d'Ampère:

1/ $\oint \vec{H} \cdot d\vec{l} = \sum_{i=1}^{n} I_i \Rightarrow \boxed{Hl = ni}$

2/ $Hl = ni \rightarrow ni = \left(\frac{B}{\mu}\right) l = \left(\frac{l}{\mu \cdot S}\right) \phi = \mathcal{R} \cdot \phi$.

$\left\{ B = \mu \cdot H \text{ et } \phi = B \cdot S \right)$.

$$\mathcal{R} = \frac{l}{\mu S} = \frac{20 \cdot 10^{-2}}{(10^{-3} \cdot 4 \cdot 10^{-4})} = 5 \cdot 10^{5} \cdot H^{-1}$$

L'inductance de la bobine:

$$L = \frac{n}{i} \phi = \frac{n}{i} \frac{ni}{\mathcal{R}} = \frac{n^2}{\mathcal{R}} \rightarrow L = \frac{100^2}{5 \cdot 10^5} = 20 \text{ mH}.$$

3/ $ni = \mathcal{R}\phi \Rightarrow \phi = \frac{ni}{\mathcal{R}}$

$\Rightarrow \phi = 0{,}02 \text{ mWb}$.

$$B = \frac{\phi}{S} \Rightarrow B = \frac{2 \cdot 10^{-5}}{4 \cdot 10^{-4}} = 0{,}05 \text{ T}$$

4/ $W = \frac{1}{2} L I^2 = 10^{-4}$ joule.

5/ Avec culasse:

F.m.m = $ni = (R_f + R_e)\phi$

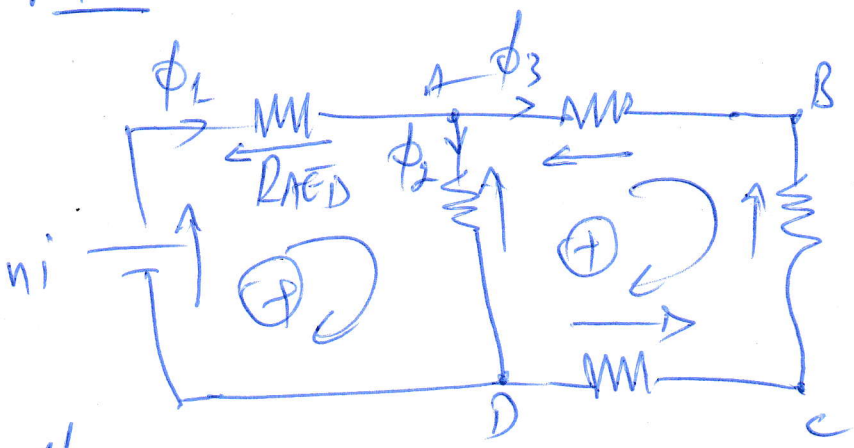
$R_f = 5 \cdot 10^{-5}\ H^{-1}$ ($l_f \simeq l = 20\ cm$) (Dans le fer)

$R_e = \frac{e}{\mu_0 \cdot S} = \frac{10^{-3}}{4\pi \cdot 10^{-7} \cdot 4 \cdot 10^{-4}} = 19{,}9\ 10^5\ H^{-1}$ (pour le n'de).

le Courant:

$$i = \frac{(R_f + R_e)\phi}{n} \Rightarrow \boxed{i = 0{,}5\ A}$$

EX02:



1/

$$R_{AB} = \frac{l_{AB}}{\mu_0 \mu_r S_{AB}} = 3{,}37 \cdot 10^4 \ H^{-1}$$

$$R_{BC} = R_e = \frac{e}{\mu_0 \cdot S_e} = 38{,}80 \cdot 10^4 \ H^{-1}$$

$$R_{CD} = R_{AB} = 3{,}37 \cdot 10^4 \ H^{-1}$$

$$R_{AED} = \frac{l_{AED}}{\mu_0 \mu_r S_{AED}} = 6{,}76 \cdot 10^4 \ H^{-1}$$

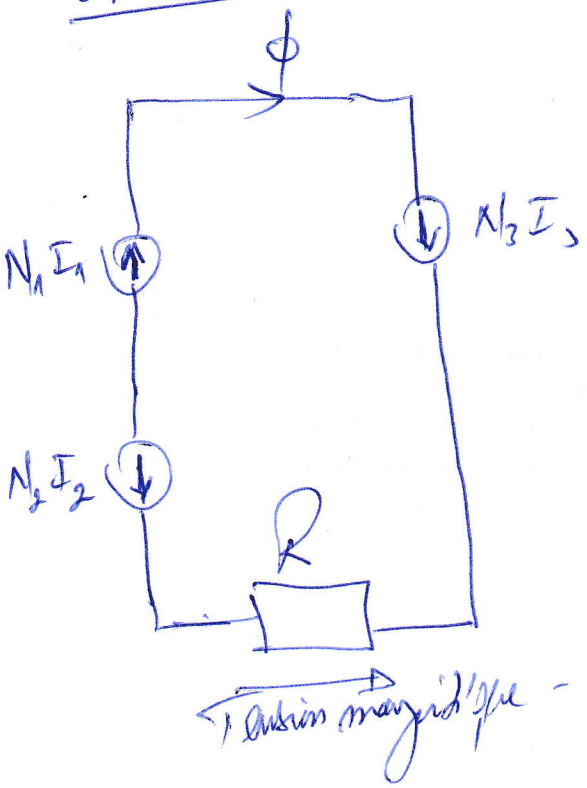
2/

$$\begin{cases} Ni = R_{AED}\,\phi_1 + R_{AD}\,\phi_2 \\ R_{AD}\,\phi_2 - (R_{AB} + 2_e + R_{BC})\,\phi_3 = 0. \end{cases}$$

$$\phi_1 = \phi_2 + \phi_3.$$

$$\phi_3 = 1.4 \cdot 10^{-3} \ Wb.$$

Exo 3:



$$N_3 I_3 - Hl - N_2 I_2 + N_1 I_1 = 0$$

$$I_3 = \frac{Hl + N_2 I_2 - N_1 I_1}{N_3}$$

$\Phi = 1{,}5$ mWb $\longrightarrow$ $B = ?$

$$B = \frac{\Phi}{S} = 1{,}5\ T$$

Du tableau :

$B = 1{,}5\ T \longrightarrow H = 3000$ A/cm.

$$\Rightarrow I_3 = \frac{3000 \times 50 \cdot 10^{-2} + 4000 \times 1{,}0 - 2000 \times 0{,}5}{1000} = 4{,}5\ A$$