



ESCOLA POLITÉCNICA DA UNIVERSIDADE DE SÃO PAULO

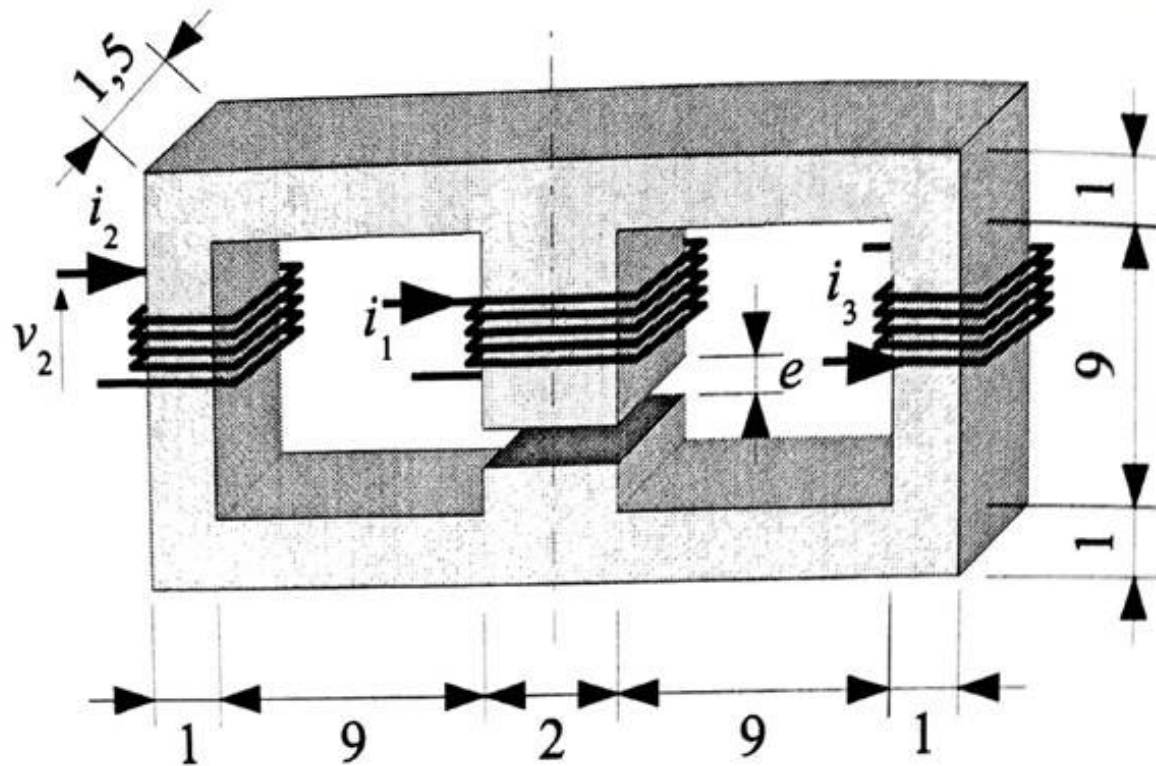
Materiais

Magnéticos

Histerese



Exercício 30 (pg. 424)



$$l_1 = 90 + 10 - 0,8 = 99,2 \text{ mm} = 0,0992 \text{ m}$$

$$l_2 = l_3 = 90 + 10 + 2(90 + 15) = 0,31 \text{ m}$$

$$e = 0,8 \text{ mm}$$

$$S_1 = 3,0 \times 10^{-4} \text{ m}^2$$

$$S_2 = S_3 = 1,5 \times 10^{-4} \text{ m}^2$$

$$S_e = (20 + 0,8)(15 + 0,8) \\ = 3,2864 \times 10^{-4} \text{ m}^2$$

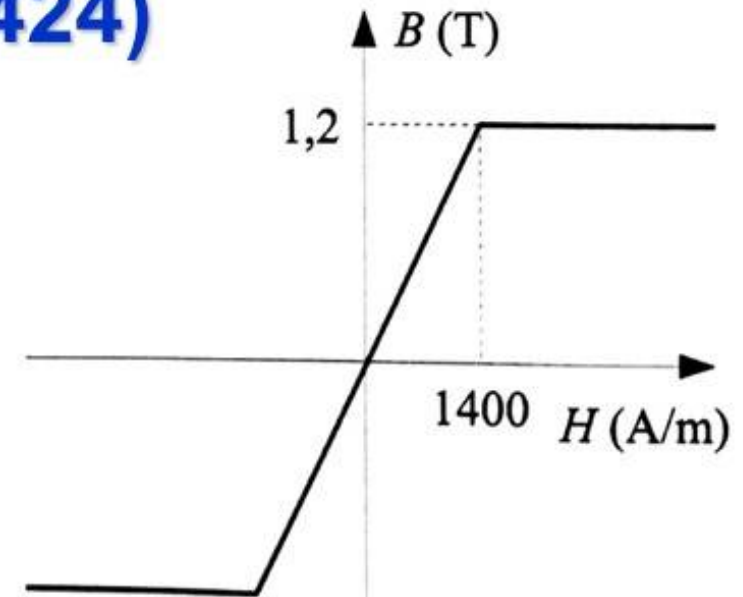
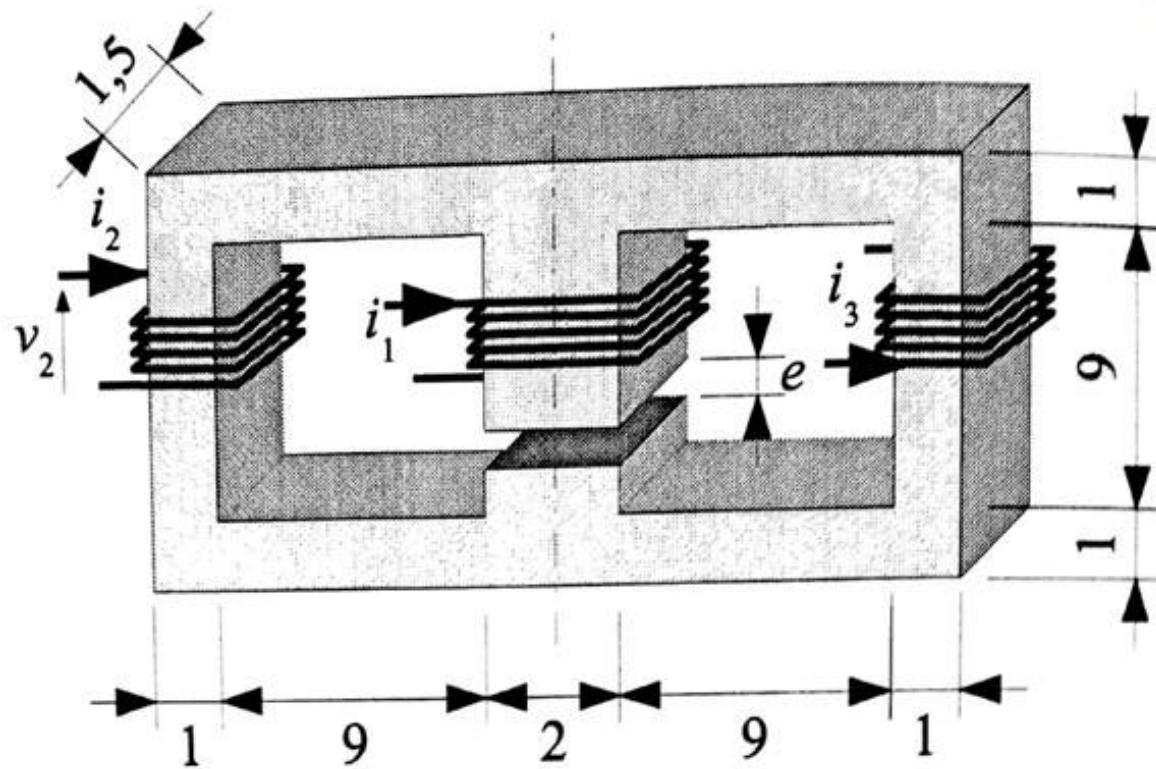
$$\psi_e \approx \psi_1$$

$$\psi_2 = \psi_3$$

$$\psi_1 = 2\psi_2$$



Exercício 30 (pg. 424)



$$B_2 = 0,6 \text{ T}$$

$$H_2 = 700 \text{ A/m}$$

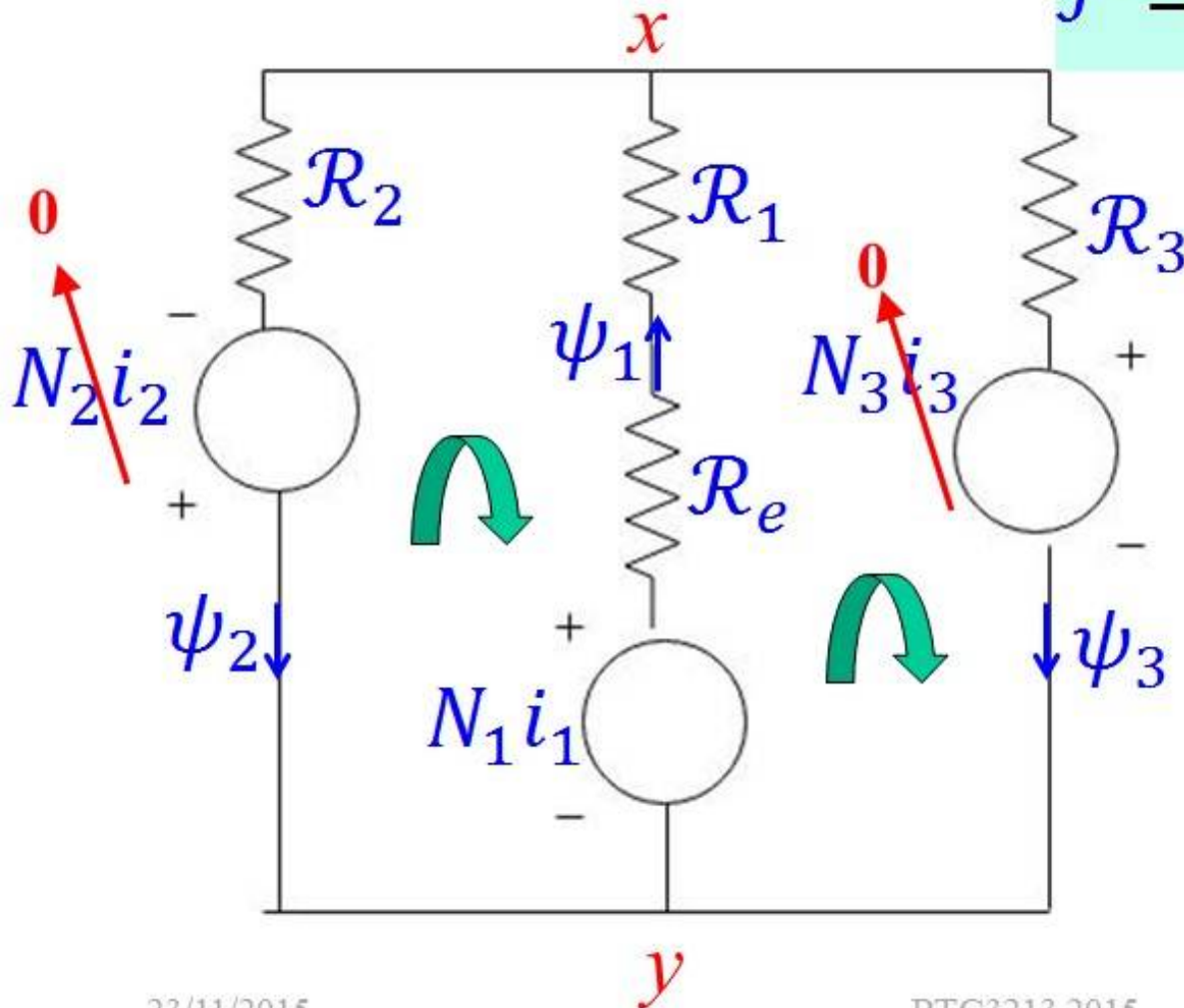
$$\psi_2 = B_2 S_2 = 0,6 \times 1,5 \times 10^{-4}$$

$$\psi_2 = 0,09 \text{ mWb} = \psi_3 \rightarrow \psi_1 = 0,18 \text{ mWb}$$



Exercício 30 (pg. 424)

$$\mathcal{F} = N_1 i_1 = U_e + U_1 + U_{xy}$$



$$i_2 = i_3 = 0 \quad i_1 = ?$$

$$U_{xy} = U_3 = U_2$$

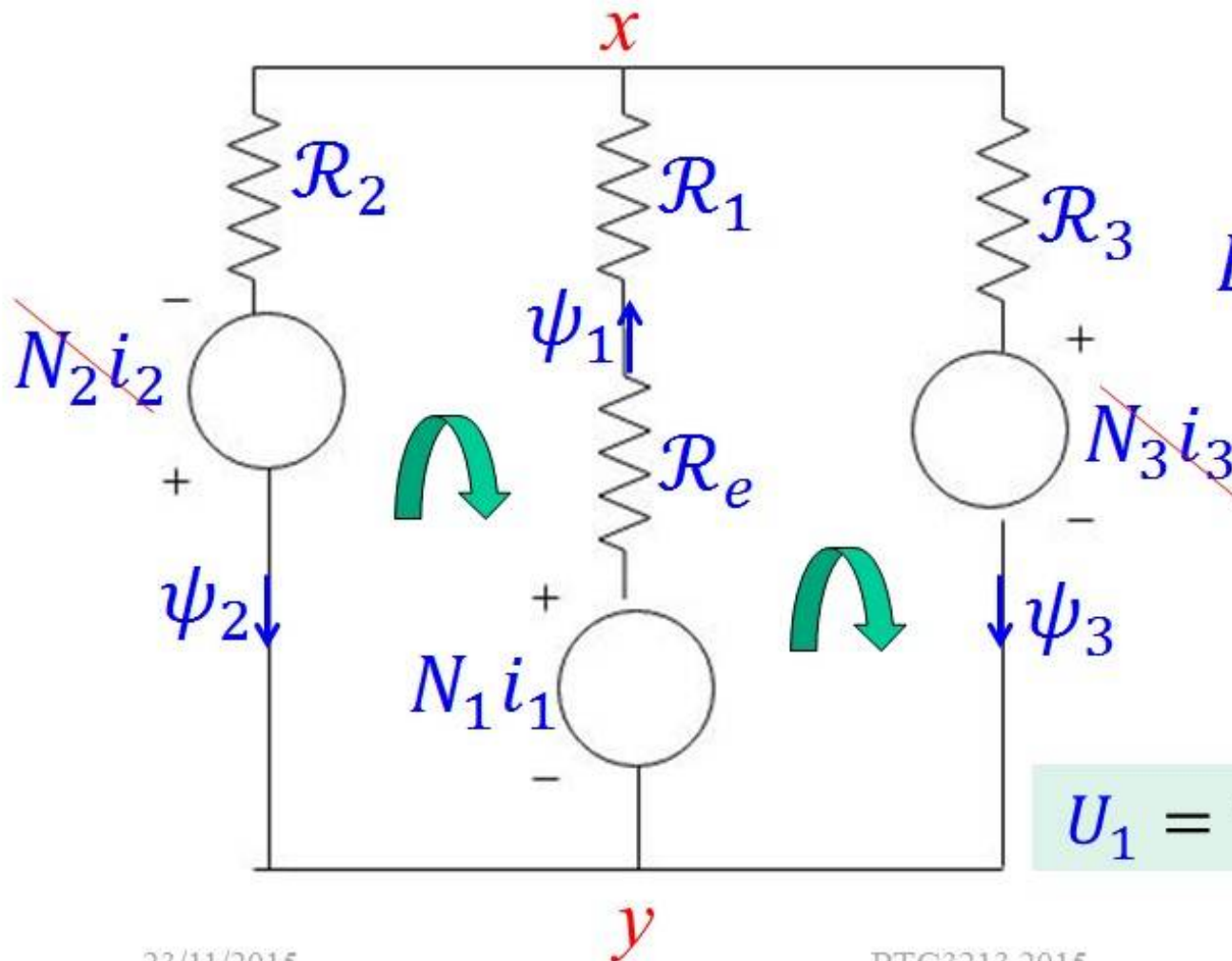
$$U_{xy} = H_2 l_2 =$$

$$U_{xy} = 700 \times 0,31$$

$$U_{xy} = 217 \text{ A}$$



Exercício 30 (pg. 424)



$$U_1 = H_1 l_1$$

$$B_1 = \frac{\psi_1}{S_1} = \frac{1,8 \times 10^{-4}}{3 \times 10^{-4}}$$

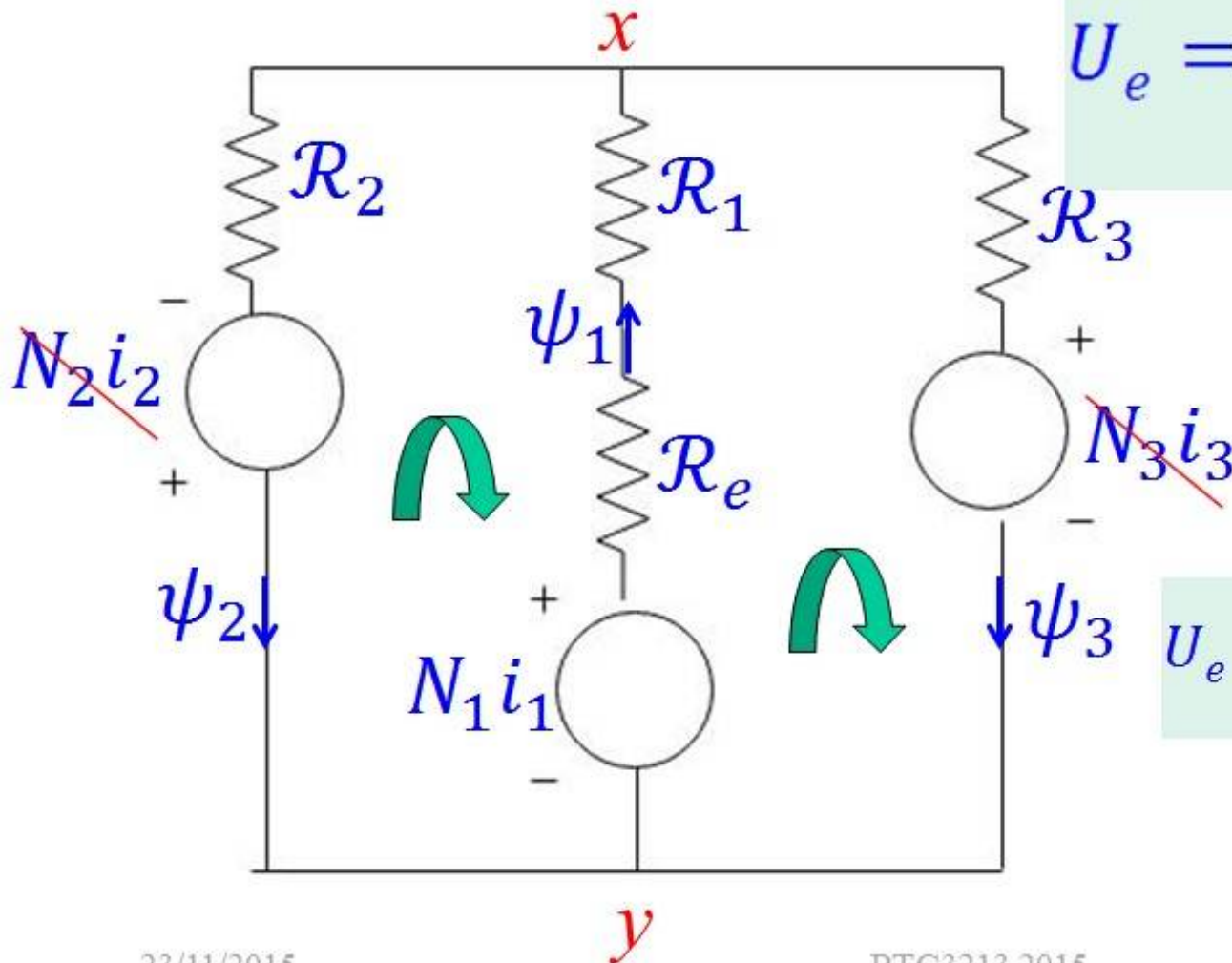
$$B_1 = 0,6 \text{ T}$$

$$H_1 = 700 \text{ A/m}$$

$$U_1 = 700 \times 0,0992 = 69,4 \text{ A}$$



Exercício 30 (pg. 424)



$$U_e = H_e e = \frac{B_e}{\mu_0} e = \frac{\psi_e}{S_e \mu_0} e$$

$$U_e = \frac{1,8}{3,28 \times 4\pi 10^{-7}} 0,8 \times 10^{-3}$$

$$U_e = 348,7 \text{ A}$$



Exercício 30 (pg. 424)

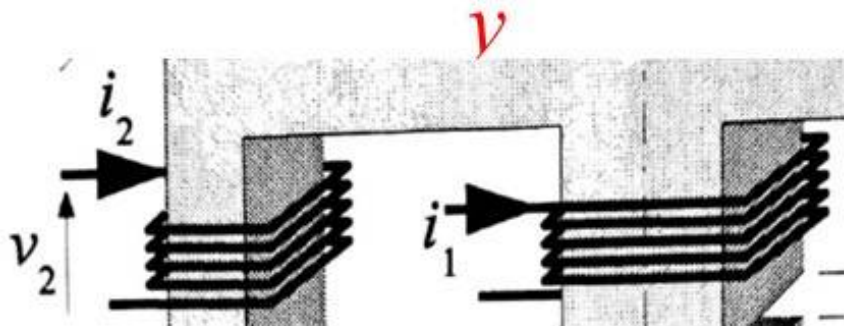
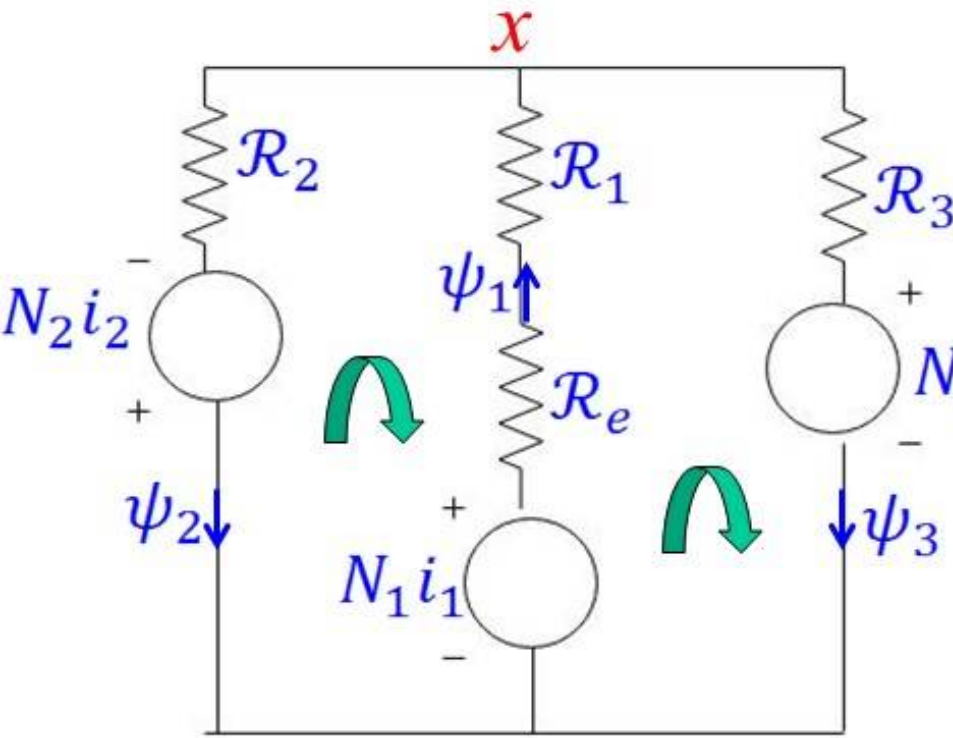
$$\mathcal{F} = N_1 i_1 = U_e + U_1 + U_{xy}$$

$$N_1 i_1 = 348,7 + 69,44 + 217$$

$$i_1 = \frac{635,12}{500} \Rightarrow i_1 = 1,27 \text{ A}$$

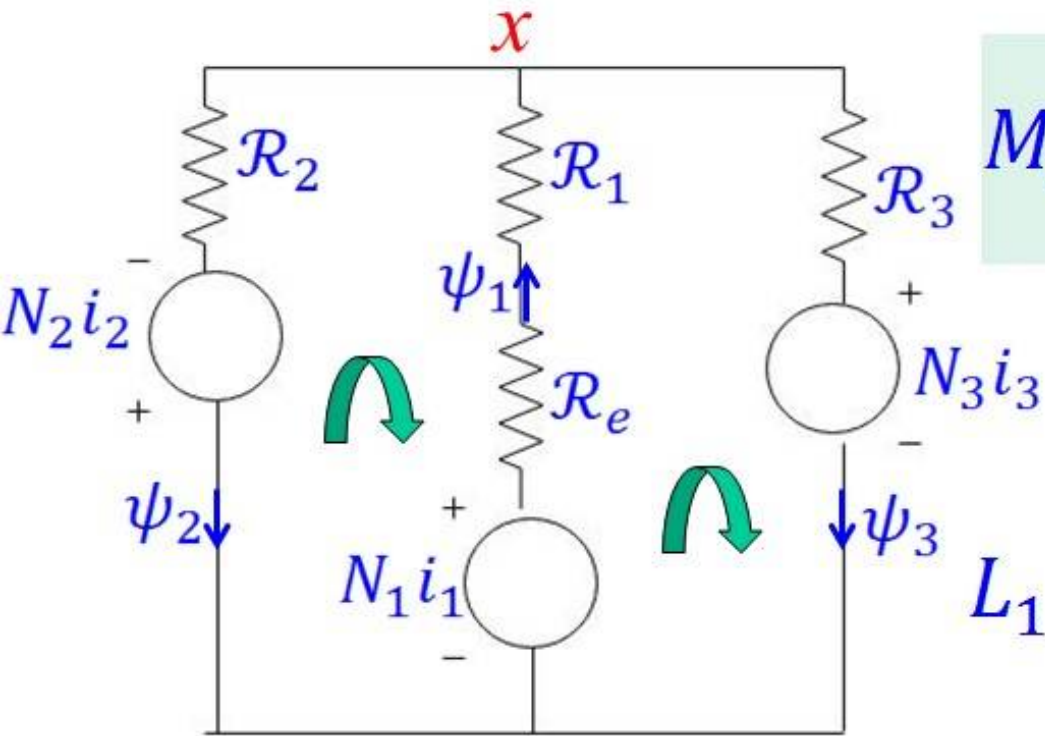
$$M_{12} = \frac{+N_2 \psi_2}{i_1} = \frac{200 \times 0,9}{1,27}$$

$$M_{12} = 14,2 \text{ mWb}$$





Exercício 30 (pg. 424)

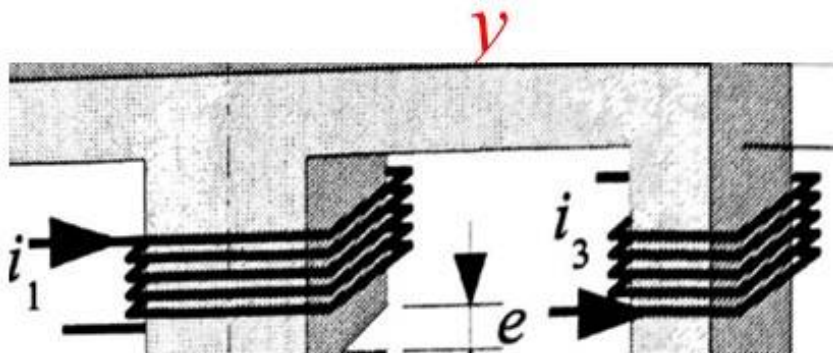


$$M_{13} = -\frac{N_3\psi_3}{i_1} = -\frac{300 \times 0,9}{1,27}$$

$$M_{13} = -21,3 \text{ mWb}$$

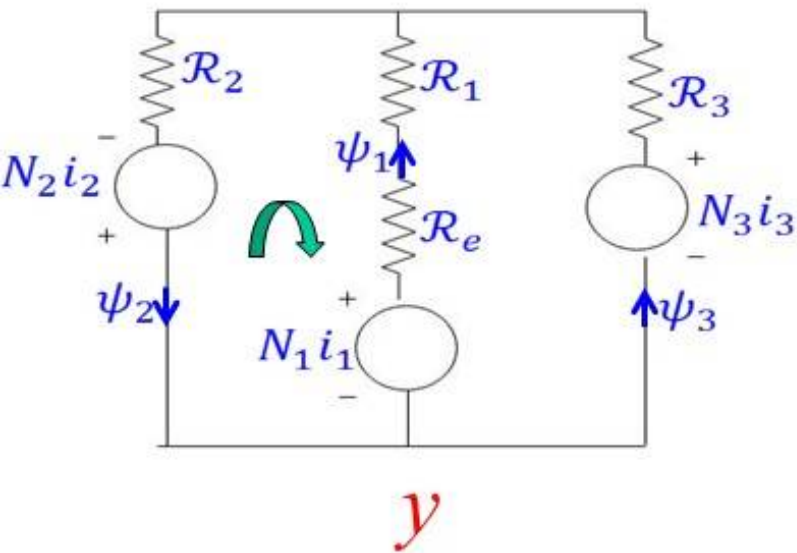
$$L_1 = \frac{N_1\psi_1}{i_1} = \frac{500 \times 1,8}{1,27}$$

$$L_1 = 71 \text{ mWb}$$





Exercício 30 (pg. 424)



$$\psi_1 = \psi_2 = \psi_3 = 0$$

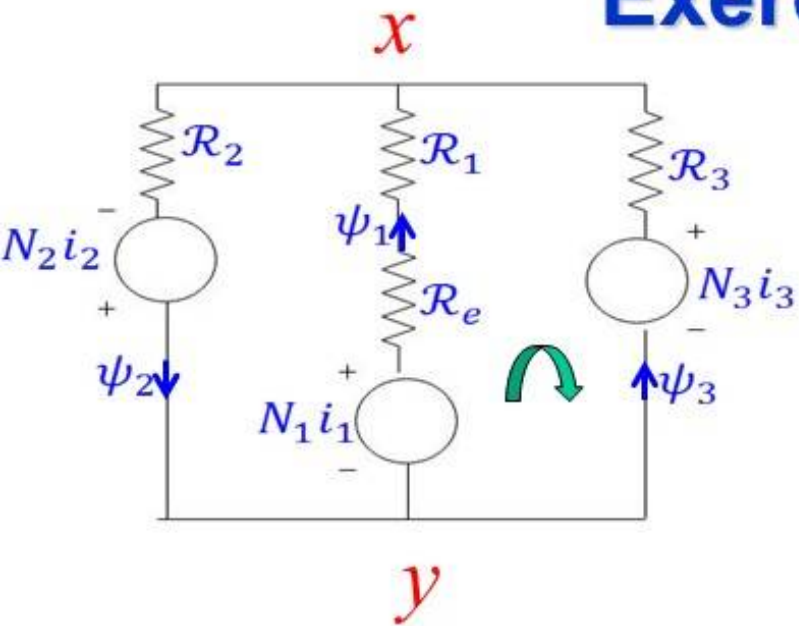
$$i_1 = 1 \text{ A} \quad i_2, i_3 ?$$

$$N_1 i_1 + N_2 i_2 - \cancel{\psi_1 \mathcal{R}_1} - \cancel{\psi_1 \mathcal{R}_e} - \cancel{\psi_2 \mathcal{R}_2} = 0$$

$$i_2 = -\frac{N_1}{N_2} i_1 \Rightarrow i_2 = -\frac{500}{200} 1 = -2,5 \text{ A}$$



Exercício 30 (pg. 424)



$$\psi_1 = \psi_2 = \psi_3 = 0$$

$$i_1 = 1 \text{ A}$$

$$N_1 i_1 - N_3 i_3 - \cancel{\psi_1 R_1} - \cancel{\psi_1 R_e} - \cancel{\psi_3 R_3} = 0$$

$$i_3 = \frac{N_1}{N_3} i_1 = \frac{500}{300} 1 = 1,67 \text{ A}$$