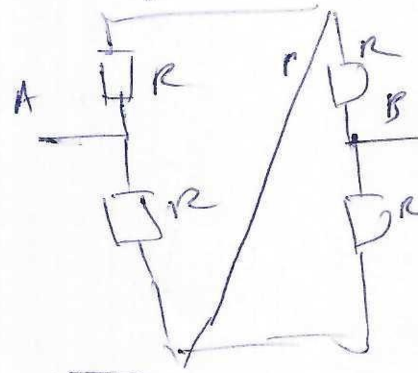
Examen rattrapage 2016/2017

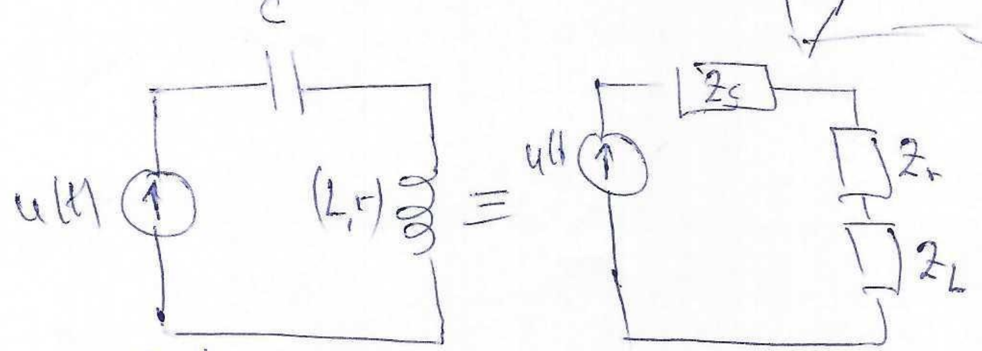
• **Exo 1** :

$R_{AB} = R$



• **Exo 2** :

le circuit



1. Impédance équivalente :

$$\boxed{Z_{eq} = r + j\left(L\omega - \frac{1}{C\omega}\right)}$$

$$\begin{cases} X(\omega) = r \\ Y(\omega) = L\omega - \frac{1}{C\omega} \end{cases}$$

2. $u = Z_{eq}\, i \Rightarrow \arg u = \arg Z_{eq} + \arg i$

$$0 = \operatorname{arctg} \frac{\operatorname{Im}(Z_{eq})}{\operatorname{Re}(Z_{eq})} + \varphi$$

d'où $\boxed{\varphi = -\operatorname{arctg} \frac{Y}{X}} = -\operatorname{arctg} \frac{L\omega - 1/C\omega}{r}$

3. $\omega = \omega_0$ Z_{eq} pure

$\operatorname{Im}(Z_{eq}) = Y(\omega_0) = 0 \Rightarrow LC\omega_0^2 = 1$

$\boxed{\omega_0 = \frac{1}{\sqrt{LC}}}$ • $\boxed{\text{En phase } \varphi = 0}$

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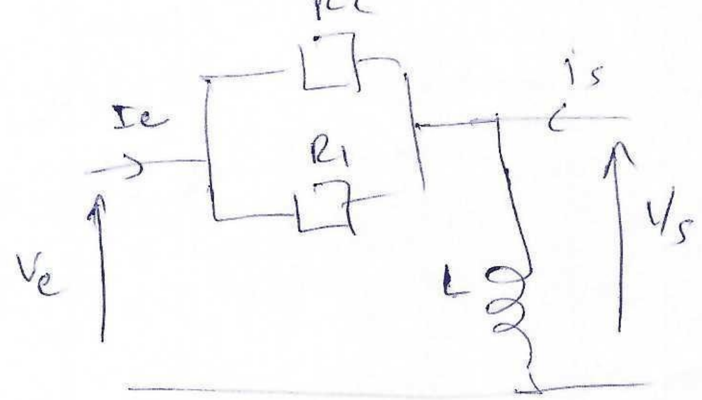
4. $\omega = \omega_0$

$$\boxed{i_L = \frac{U}{r}}$$

Exo3 :



1. Matrice de transfert :

$$T = \begin{bmatrix} 1 & R_{ep} = R_1 \parallel R_2 \\ \frac{1}{Z_L} & 1 + \frac{R_{ep}}{Z_L} \end{bmatrix}$$

2. $i_s = 0$

Pont diviseur de tension

$$V_s = \frac{Z_L}{R_{ep} + Z_L} V_e \Rightarrow H(j\omega) = \frac{V_s}{V_e}$$

$$H(j\omega) = \cancel{\frac{jL\omega / R_1 + R_2}{1 + j\frac{L\omega}{R_1 + R_2}}}$$

$$= \frac{jL\omega(R_1+R_2)/R_1R_2}{1 + jL\omega\frac{(R_1+R_2)}{R_1R_2}} \Rightarrow \boxed{H(jx) = \frac{jx}{1+jx} \quad \text{avec } x = \frac{L\omega(R_1+R_2)}{R_1R_2}}$$

3 - Gain $G(\omega)$ et G_{dB}

- $\boxed{G(\omega) = |H(j\omega)| = \dfrac{x}{\sqrt{1+x^2}}}$

- $G_{dB} = 20 \log G(\omega) = 20 \log x - 10 \log(1+x^2)$

$$\boxed{G_{dB} = 20 \log x - 10 \log(1+x^2)}$$

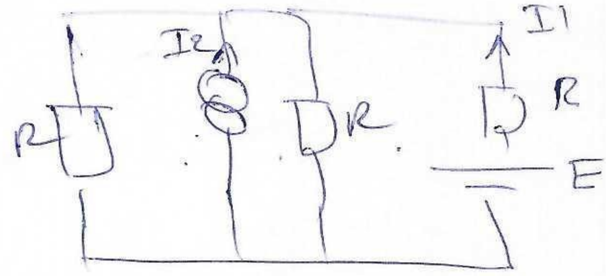
4 - La phase : $\phi(x) = \arg H(jx)$

$\arg H(jx) = \arg jx - \arg(1+jx)$

$= \arctg \dfrac{x}{0} - \arctg \dfrac{x}{1}$

d'où $\boxed{\phi = \dfrac{\pi}{2} - \arctg x}$

Exo 4.

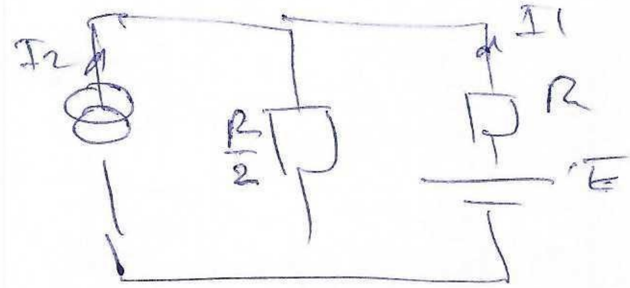


1. Circuit comporte :

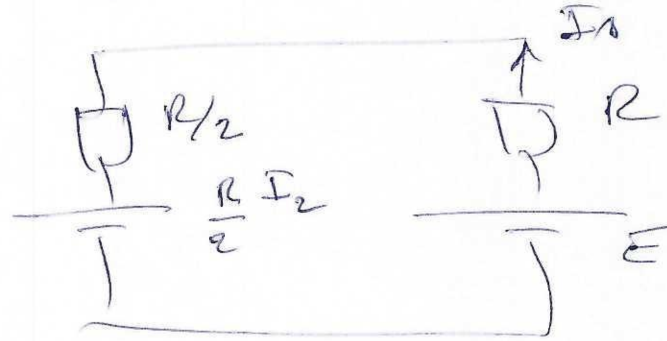
- 5 dipôle
- 4 branches
- 6 mailles
- 2 ou 4 noeuds

2- Calcul de I_1 par Thévenin

On a



Equivalence Norton – Thévenin

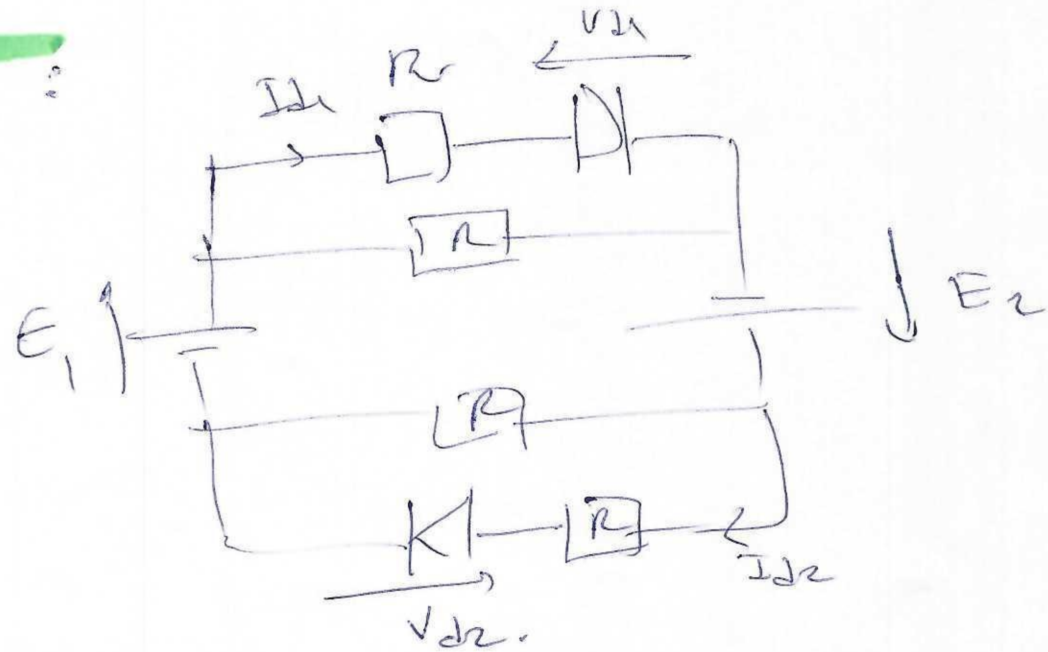


d'où

$$I_1 = \frac{E - \frac{R I_2}{2}}{3R/2} = \frac{2E - R I_2}{3R}$$

$$\boxed{I_1 = \frac{2E - R I_2}{3R}}$$

Exo 5 :



1- L'équation de la droite de charge :

La loi des mailles.

$$E_1 - R I_{d_1} - V_{d_1} + E_2 - R I_{d_2} - V_{d_2} = 0$$

$$E_1 + E_2 - R(I_{d_1} + I_{d_2}) - (V_{d_1} + V_{d_2}) = 0$$

$$E_1 + E_2 - R I_d - V_d = 0$$

d'où $\boxed{I_d = \frac{E_1 + E_2}{R} - \frac{V_d}{R}}$

2- Les deux points particuliers

$$A\left(\frac{E_1+E_2}{R}, 0\right) ; B(0, E_1+E_2)$$

3. D_1 : Bloquée, D_2 Bloquée

$$\boxed{I_1 = \frac{E_1 + E_2}{2R}}$$

D_1 : Bloquée, D_2 passante

$$\boxed{I_1 = \frac{2(E_1 + E_2)}{3R}}$$

D_1 : passante D_2 Bloquée

$$\boxed{I_1 = \frac{2(E_1 + E_2)}{3R}}$$

D_1 : passante D_2 passant

$$\boxed{I_1 = \frac{E_1 + E_2}{R}}$$