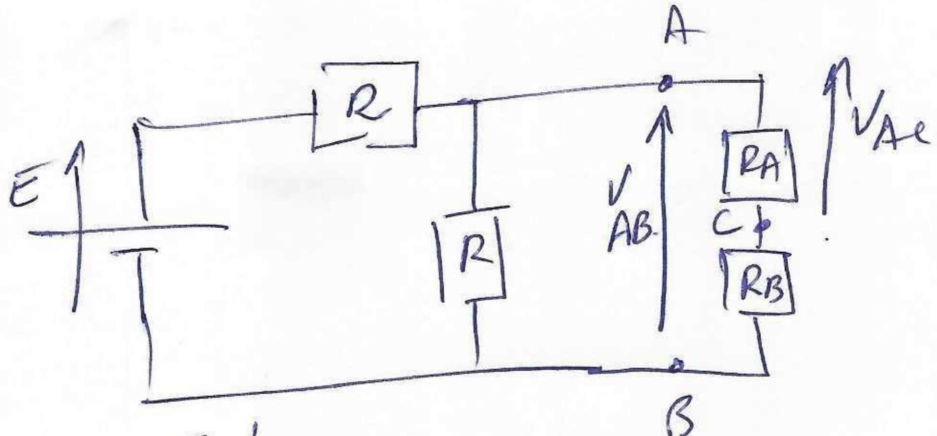
Examen Ralt. - P123
2018/2019

Exo 1

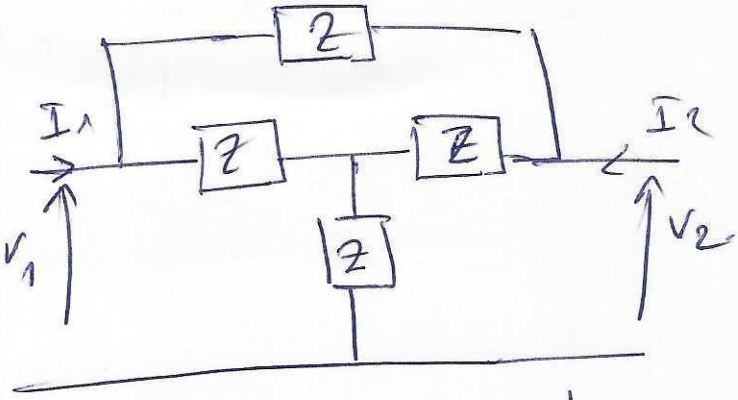


a - $$V_{AB} = \frac{E/R}{1/R + 1/R + 1/(R_A+R_B)}$$ (Th. Millman)

b - $$V_{AC} = \frac{R_A}{(R_A+R_B)} V_{AB}$$ (pont diviseur de tension)

c - $$V_{AC} = \frac{R_A}{(R_A+R_B)} V_{AB}$$

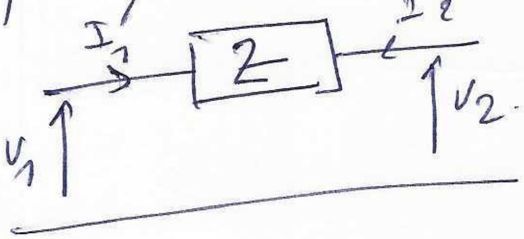
$$= \frac{R_A}{(R_A+R_B)} \cdot \frac{E/R}{2/R + 1/(R_A+R_B)}$$



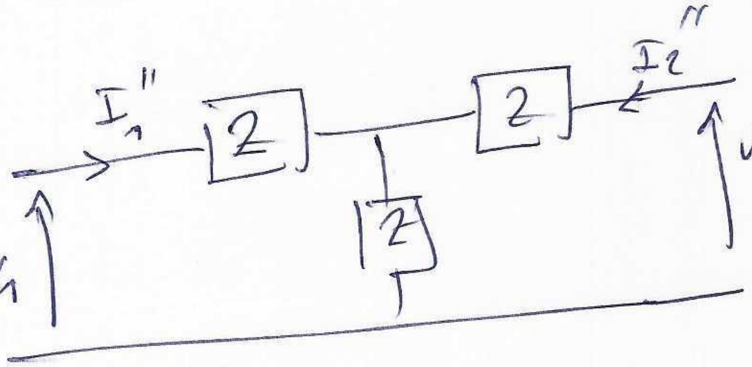
Exo 2 :

1- Le quadripôle est équivalent à deux quadripôles associés en parallèle :

- Le 1er



- Le 2ème



$$\begin{cases} I_1 = I_1' + I_2'' \\ I_2 = I_2' + I_2'' \end{cases}$$ et même tension.

2- Matrice admittance des deux quadripôles.

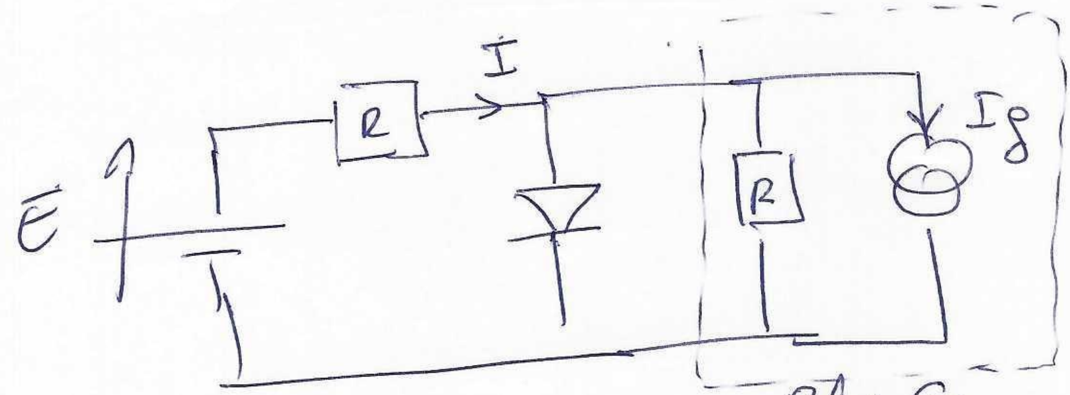
Pour Q_1 : $$Y_1 = \begin{bmatrix} -1/Z & \frac{1}{Z} \\ 1/Z & -1/Z \end{bmatrix}$$

Pour Q_2 : $$Y_2 = \begin{bmatrix} -\frac{1}{3Z} & 2/3Z \\ \frac{2}{3Z} & -\frac{1}{3Z} \end{bmatrix}$$

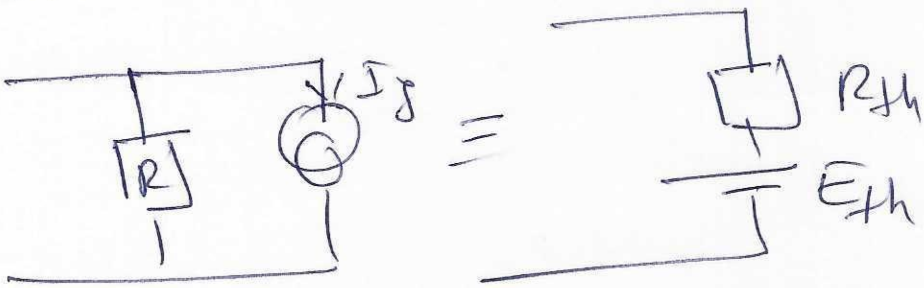
3- Matrice admittance du quadripôle Q.

$$Y = Y_1 + Y_2$$

Exo3 :



1- Equivalence Norton - Thévenin :
Détermination des éléments de générateurs de Thévenin du bloc G.

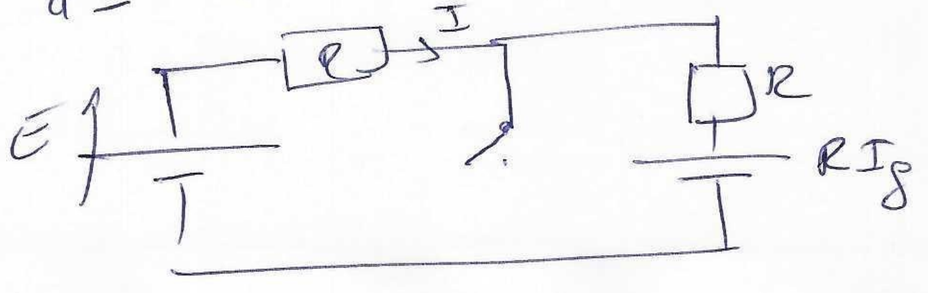


$$E_{th} = R \cdot I_g$$

$$R_{th} = R.$$

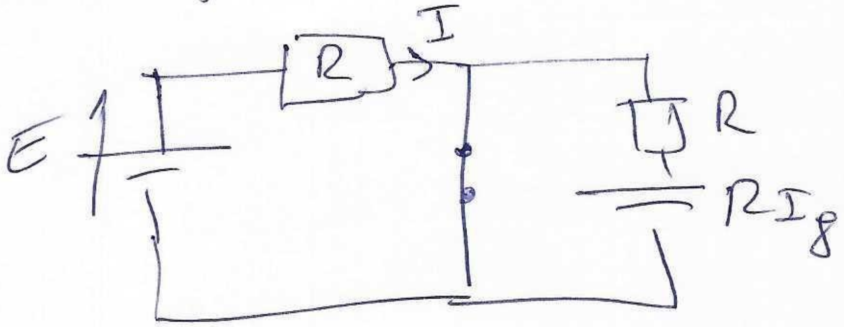
2- Modèle idéal de la diode : I = ?

a- Diode bloquée



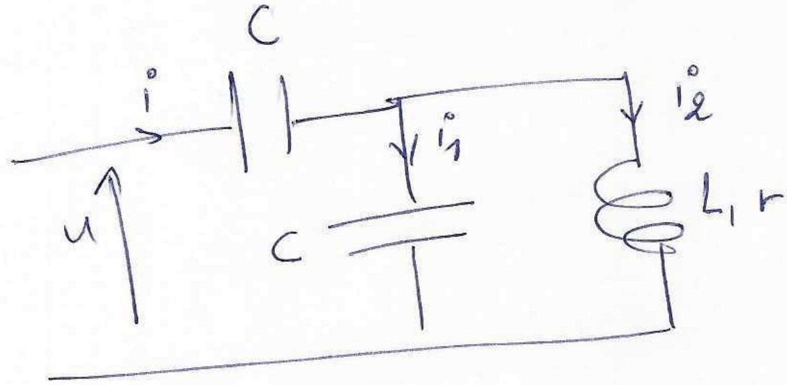
$$\boxed{I = -\frac{I_g}{2} + \frac{E}{2R}}$$

b – Diode passante



$$\boxed{I = + \frac{E}{R}}$$

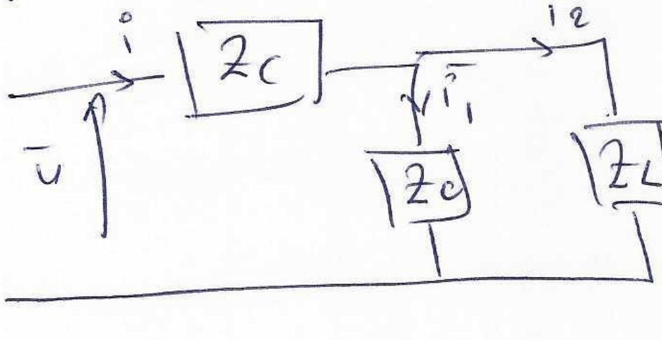
Exo 4 :



$u(t) = U \sin(\omega t - \varphi)$

$i(t) = I \sin(\omega t)$

Notation complexe



1- Impédance complexe équivalente

$$Z_{ep}(\omega) = X(\omega) + jY(\omega)$$

2. $$X(\omega) = \frac{1}{1 - LC\omega^2 + r^2C^2\omega^2}$$

$$Y(\omega) = \frac{L\omega(1 - LC\omega^2) - r^2C\omega}{(1 - LC\omega^2) + r^2C^2\omega^2} - \frac{1}{C\omega}$$

2- Pour $\omega = \omega_0 = \frac{1}{\sqrt{LC}} \Rightarrow LC\omega_0^2 = 1$

$$Z_{ep} = \frac{L}{rC} + \frac{2j}{C\omega}$$

3- Déphasage

$$\frac{\bar{u}}{\bar{i}} = Z_{ep}$$

$$\arg \bar{u} - \arg \bar{i} = \arg Z_{eq}$$

$$-\varphi = \arg Z_{ep}$$

$$\arg Z_{ep} = \operatorname{arctg}\left(\frac{2/C\omega}{L/rC}\right)$$

$$= \operatorname{arctg} \frac{2R}{L\omega}$$

$$\omega = \frac{1}{\sqrt{LC}}$$

$$\arg Z_{eq} = \operatorname{arctg} \frac{2\cancel{R}}{L} \times \sqrt{LC}$$

$$= \operatorname{arctg} 2 \cdot r \sqrt{\frac{C}{L}}$$

d'où $\boxed{\varphi = -\operatorname{arctg} 2r \sqrt{\frac{C}{L}}}$

4 - Diviseur de ~~tension~~ courant.

- $i_1 = \dfrac{1/Z_C}{1/Z_C + 1/(r+Z_L)} \, I$

- $\varphi_{i_1/i} = \arg \dfrac{i_1}{i}$

Pour $\omega = \omega_0$ -

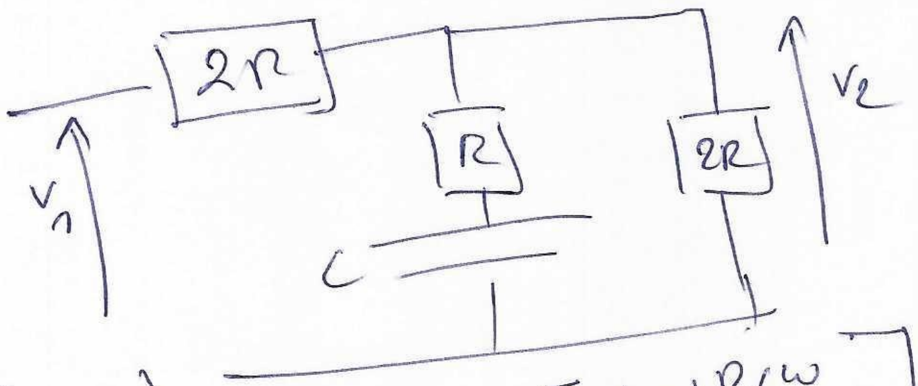
5— Divisem du courant. $i_2 = f(i)$

• $i_2 = \dfrac{1/(r+Z_L)}{1/(r+Z_L) + \frac{1}{Z_C}} \, i$

• $\varphi_{i_2/i} = \arg \dfrac{i_2}{i}$

Il faut développer l'expression du $i_2/i = Re + j\,Im$

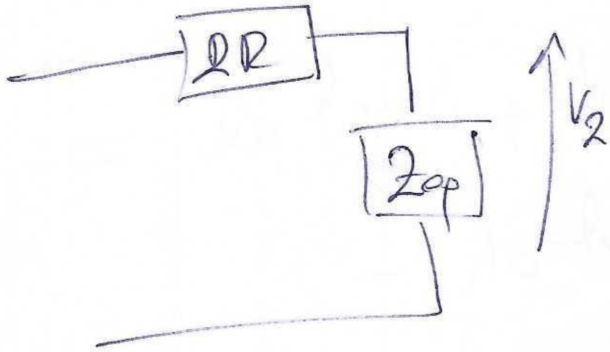
__Exo 5 :__



1— Fonction de transfert $H(j\omega) = a\left[\dfrac{1+jRC\omega}{1+jbRC\omega}\right]$?

$H(j\omega) = \dfrac{V_2}{V_1}$

Pont diviseur de tension:



$$Z_q = 2R \,//\, [R + Z_c]$$

$$\boxed{V_2 = \frac{Z_{ep}}{Z_{ep} + 2R} V_1}$$

$$H(j\omega) = \frac{V_2}{V_1} = \frac{Z_{ep}}{Z_{ep} + 2R}$$

après développement :

$$\boxed{H(j\omega) = \frac{1}{2}\left[\frac{1 + jRC\omega}{1 + j2RC\omega}\right]}$$

2. $G(\omega) = |H(j\omega)|$

$$= a\sqrt{\frac{1 + (RC\omega)^2}{1 + 4(RC\omega)^2}}$$

$$G_{dB} = 20 \log G(\omega)$$

$$= 20 \log a + 10 \log 1 + (RC\omega)^2$$

$$- 10 \log 1 + 4(RC\omega)^2$$

3_ Expression de la phase $\phi(\omega)$

$$\phi(\omega) = \arg H(j\omega)$$

$$= \arg \left[a \left(\frac{1 + jRC\omega}{1 + jbRC\omega} \right) \right]$$

$$\boxed{\phi = \operatorname{arctg} RC\omega - \operatorname{arctg} bRC\omega}$$