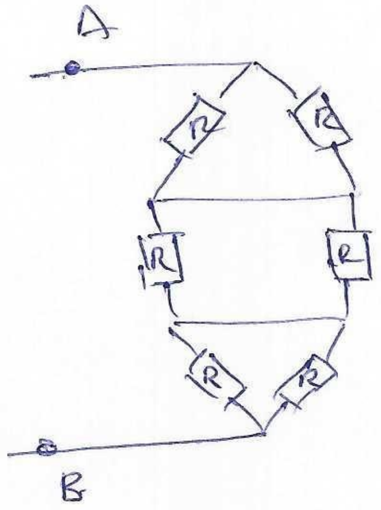
1//

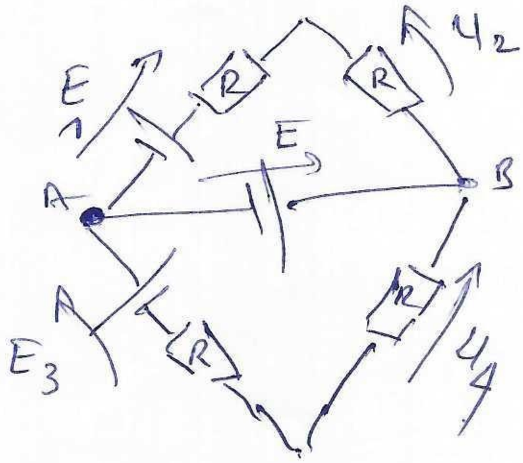
Exam RAT 2017/2018 $L123$

Exo 1 : Calcul de R_{AB}



$$\boxed{R_{AB} = \frac{3}{2} R}$$

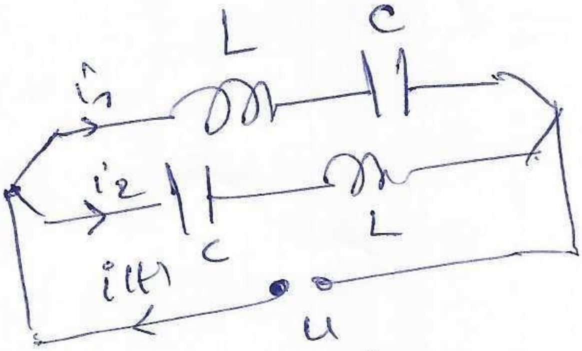
Exo 2 :



$$U_2 = \frac{E_1 - E}{2}$$

$$U_4 = \frac{E + E_3}{2}$$

Exo 3



$u(t) = U_m \sin \omega t$

$i(t) = I_m \sin(\omega t + \varphi)$

1/ $Z_{ep} = ?$

$$Z_{ep} = j\frac{1}{2}\left(L\omega - \frac{1}{C\omega}\right) \Rightarrow \begin{cases} X(\omega) = 0 \\ Y(\omega) = \frac{1}{2}\left(L\omega - \frac{1}{C\omega}\right) \end{cases}$$

2/ Déphasage φ

$$\bar{u} = Z_{ep}\,\bar{i} \Rightarrow \arg \bar{u} = \arg Z_{ep} + \arg \bar{i}$$

$$0 = \arg Z_{ep} + \varphi$$

$$\boxed{\varphi = -\arg Z_{ep}} \Rightarrow \boxed{\varphi = -\frac{\pi}{2}}$$

2//

3- $\omega_0 = ?$ $\quad Im(Z_{eq}) = 0$

$$L\omega_0 - \frac{1}{C\omega_0} = 0 \Rightarrow \boxed{\omega_0 = \frac{1}{\sqrt{LC}}}$$

4- $U = Z_{eq}\, i$

$$U_m e^{j\omega t} = Z_{eq} I_m e^{j(\omega t + \varphi)}$$

$$\boxed{I_m = \frac{U_m}{\| Z_{eq} \|} = \frac{U_m}{L\omega - \frac{1}{C\omega}}}$$

5- $i_1 = i_2$

Parceque les 2 branches contients les mêmes composants

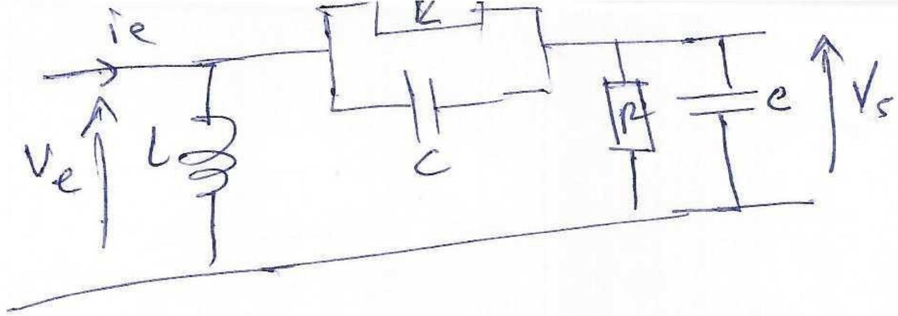
6- D'aprés la loi des noeuds

$i_1 + i_2 = i$ avec $i_1 = i_2$

d'où $\boxed{i_1 = i_2 = \frac{i}{2}}$

1

Exo 4 :



1 - $\boxed{H(j\omega) = \frac{1}{2}}$

2 - On suppose que $H(j\omega) = \frac{K}{1+j\frac{\omega}{\omega_c}}$

$$G(\omega) = \frac{K}{\sqrt{1+\left(\frac{\omega}{\omega_c}\right)^2}}$$

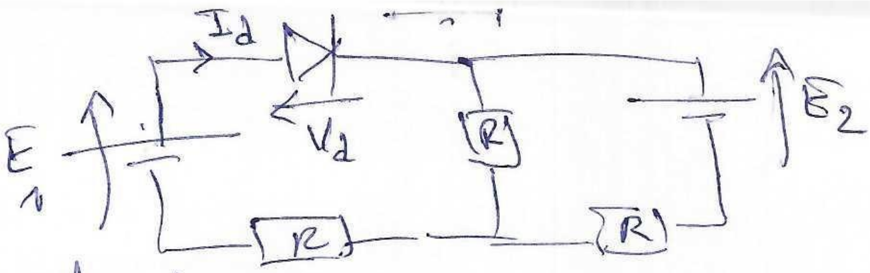
$$G_{dB} = 20\log k - 10 \log 1+\left(\frac{\omega}{\omega_c}\right)^2$$

4 - $\phi(\omega) = ?$

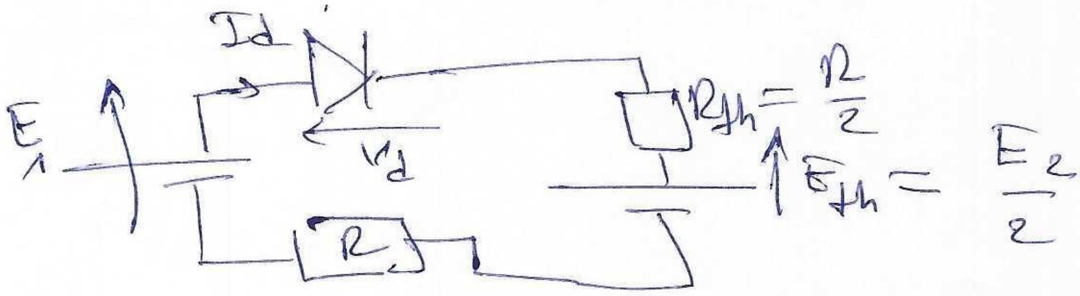
$$\phi(\omega) = \arg H(j\omega) = -\mathrm{arctg}\,\frac{\omega}{\omega_c}$$

$$\boxed{\phi(\omega) = -\mathrm{arctg}\,\frac{\omega}{\omega_c}}$$

4/ Exo 5 :



1 – Appliquant le Th de Thévenin.



La loi des mailles : $E_1 - V_d - \frac{R}{2} I_d - \frac{E_2}{2} - \frac{R}{\cancel{2}} I_d = 0$

$$E_1 - \frac{E_2}{2} - V_d - \frac{3}{2} R I_d = 0$$

d'où $$\boxed{I_d = \frac{2E_1 - E_2}{3R} - \frac{2V_d}{3R}}$$

2 – Deux points particulier.

Pour $I_d = 0$ $\quad V_d = \frac{2E_1 - E_2}{2}$

Pour $V_d = 0$ $\quad I_d = \frac{2E_1 - E_2}{3R}$

d'où $$A\left(0, \frac{2E_1 - E_2}{2}\right)$$

$$B\left(\frac{2E_1 - E_2}{3R}, 0\right)$$

5//

3 – Modèle avec Seuil. $V_d = V_0$

a – Diode Bloquée :

$$\boxed{I = \frac{E_2}{2R}}$$

b – Diode passante

On a $I = I_1 + I_2$

Maille ① $E_1 - V_0 - RI - RI_1 = 0$

d'où $\boxed{I_1 = \frac{E_1 - V_0}{R} - I}$ (*)

Maille ② $E_2 - RI - RI_2 = 0$

d'où $\boxed{I_2 = \frac{E_2}{R} - I}$ (**)

(*) et (**) On a :

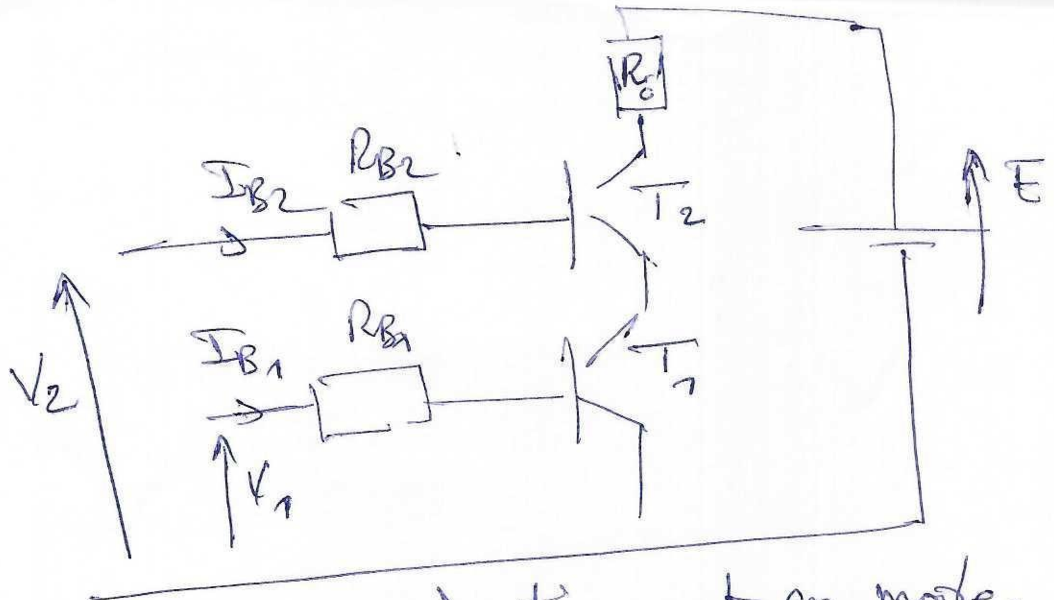
$$I = \frac{E_1 - V_0}{R} - I + \frac{E_2}{R} - I$$

$$3I = \frac{E_1 - V_0 + E_2}{R}$$

donc $\boxed{I = \frac{E_1 + E_2 - V_0}{3R}}$

6/

Exo 6



T_1 et T_2 identiques et fonctionnent en mode normal.

1- T_1 et T_2 : NPN

2- • I_{B_1} et I_{C_1} : la loi des mailles :

$$V_1 - R_{B_1} I_{B_1} - V_{BE} = 0$$

$$\boxed{I_{B_1} = \frac{V_1 - V_{BE}}{R_{B_1}}}$$ A.N $I_{B_1} = 34\ \mu A$

$$\boxed{I_{C_1} = \beta I_{B_1}}$$ A.N $I_{C_1} = 68\ mA$

• I_{C_2}, I_{B_2} : On a $I_{C_1} = I_{E_2} = (\beta+1) I_{B_2}$

d'où $$\boxed{I_{B_2} = \frac{I_{C_1}}{\beta+1}}$$ A.N $I_{B_2} =$

$$\boxed{I_{C_2} = \beta I_{B_2}}$$ A.N $I_{C_2} =$