Université Amar Telidji - Laghouat — Année universitaire 2017/2018 – S3

Faculté de Technologie — Département ST

Section : **A(G)** — Electronique fondamentale -1-

Correction EMD
Electronique fondamentale-1-

Exercice 01 (7 points) :

1. Calcul du courant total I :

On doit d'abord calculer la résistance équivalente du réseau électrique(voir fig-1-a- jusqu'au fig-1-g-).

$$X = Y = Z = \frac{RR}{R+R+R} = \frac{R^2}{3R} = \frac{1}{3}R = \frac{10}{3}\Omega ,$$

$$X' = Y' = Z' = \frac{RR}{R+R+R} = \frac{R^2}{3R} = \frac{1}{3}R = \frac{10}{3}\Omega ,$$

$$R_0 = X + R + X' = \frac{10}{3} + 10 + \frac{10}{3} = \frac{50}{3}\Omega$$

$$R_0' = Z + R + Z' = \frac{10}{3} + 10 + \frac{10}{3} = \frac{50}{3}\Omega$$

$$\frac{1}{R_{eq}} = \frac{1}{R_0} + \frac{1}{R_0'} = \frac{1}{\frac{50}{3}} + \frac{1}{\frac{50}{3}} = \frac{6}{50}$$

$$\Rightarrow R_{eq} = \frac{50}{6} = \frac{25}{3}\Omega,$$

$$R_{eq}' = Y + R_{eq} + Y' = \frac{10}{3} + \frac{25}{3} + \frac{10}{3} = \frac{45}{3} = 15\Omega$$

$$R_{tot} = (R_{eq}' // R) = \frac{R_{eq}' * R}{R_{eq}' + R} = \frac{15*10}{15+10} = \frac{150}{25} = 6\Omega$$

$$E - rI - R_{tot} I = 0 \Rightarrow I = \frac{E}{r + R_{tot}'} = \frac{12}{10+6} = 0.75A$$

2. Déduction de I_1 :
   En utilisant le diviseur de tension (voir fig-1-g-), on obtient :

$$I_1 = I\frac{R_{eq}'.}{R_{eq}' + R} = 0.75\frac{15}{15+10} = 0.45A$$

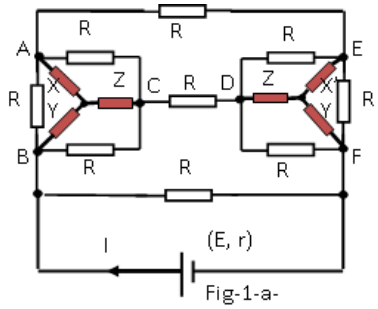


Fig-1-a-

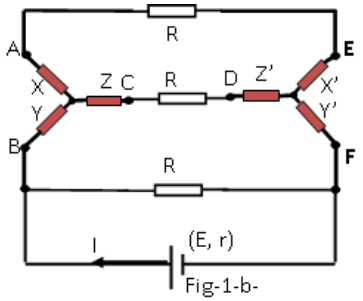


Fig-1-b-

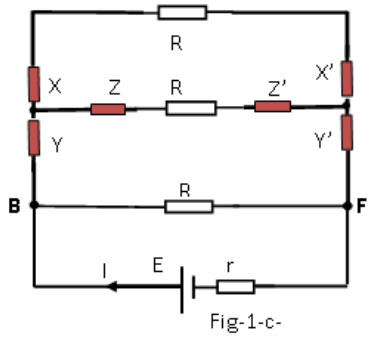


Fig-1-c-

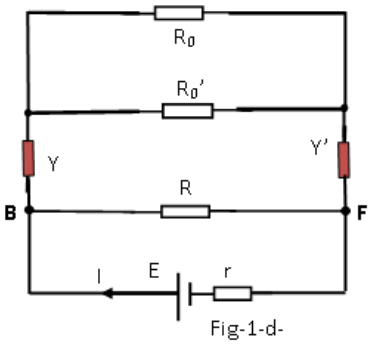


Fig-1-d-

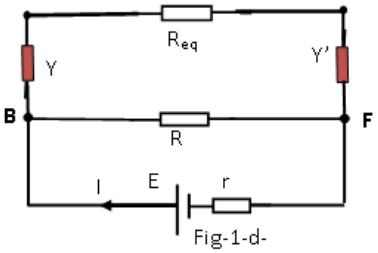


Fig-1-d-

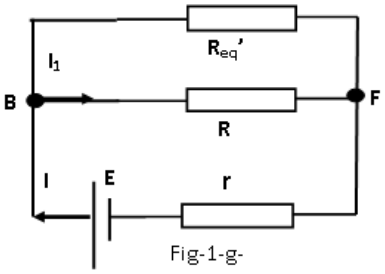


Fig-1-g-

Exercice 2(7points):

1. Calcul des points de repos (I_B, I_C et V_{CE})

$$V_{BB} - R_B I_B - V_{BE} - R_E I_E = 0, V_{BB} - R_B I_B - V_{BE} - R_E (I_c + I_B) = 0$$
$$V_{BB} - R_B I_B - V_{BE} - R_E (\beta I_B + I_B) = 0, V_{BB} - R_B I_B - V_{BE} - R_E (\beta + 1) I_B = 0$$
$$\Rightarrow V_{BB} - V_{BE} = [(R_B + R_E(\beta + 1)] I_B \Rightarrow I_B = \frac{V_{BB} - V_{BE}}{[(R_B + R_E(\beta + 1)]} = \frac{5 - 06}{10 + 0.1(181)}$$
$$= \frac{4.4}{20.1} \approx 0.16\,mA, I_C = \beta I_B = 180 * 0.16 = 28.18mA$$
$$V_{CC} - R_C I_C - V_{CE} - R_E I_E = 0,$$
$$V_{CC} - V_{CE} = R_C I_C + R_E I_C \; avec : (I_E \approx I_C)$$
$$V_{CE} = V_{CC} - (R_C + R_E) I_C = 10 - (0.1 + 0.1) 28.18 = 4.36V$$

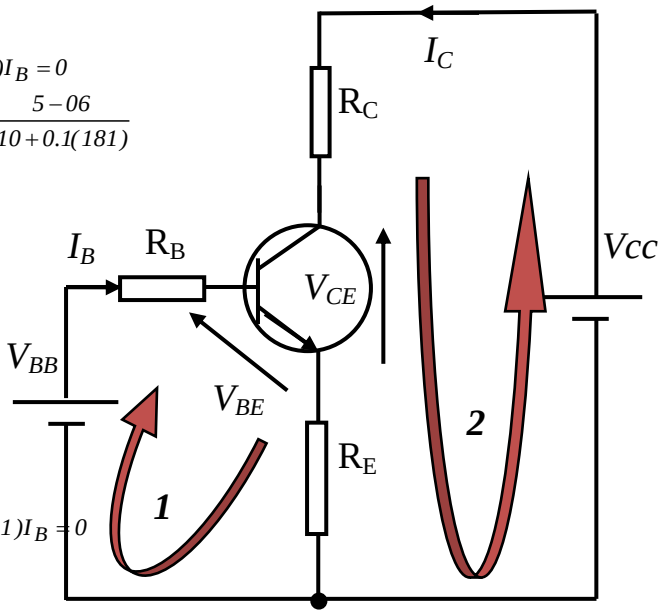
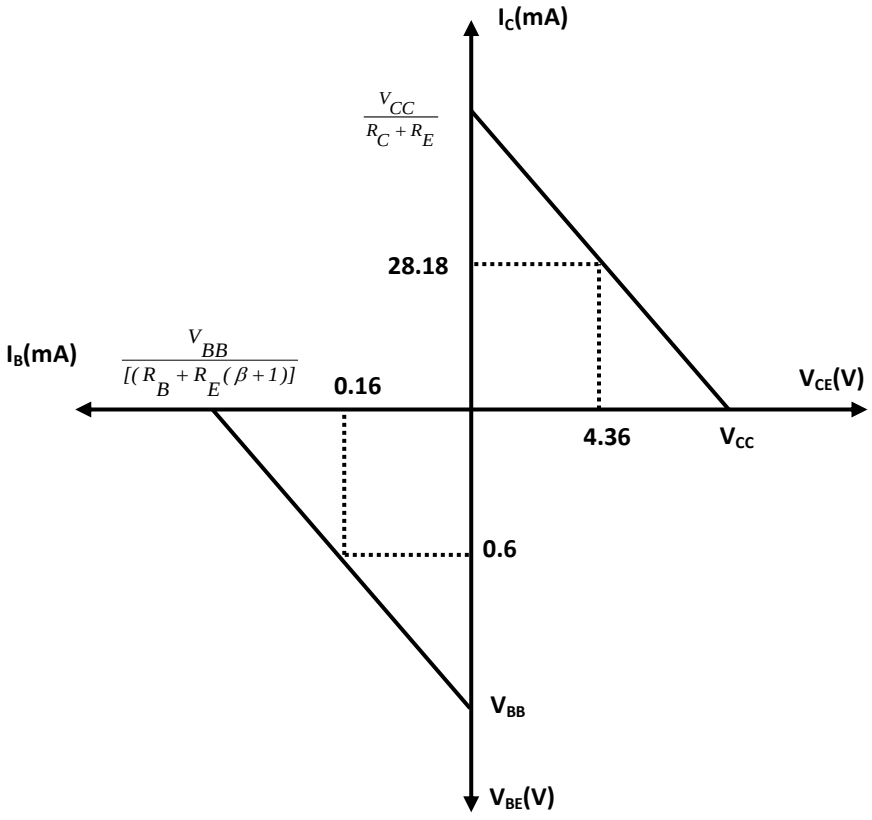


Fig-2-

2. $V_{BE} = f(I_B) et I_C = f(V_{CE})$.

$$V_{BB} - R_B I_B - V_{BE} - R_E I_E = 0, V_{BB} - R_B I_B - V_{BE} - R_E (I_c + I_B) = 0$$
$$= V_{BB} - R_B I_B - V_{BE} - R_E (\beta I_B + I_B) = 0, V_{BB} - R_B I_B - V_{BE} - R_E (\beta + 1) I_B = 0$$
$$\Rightarrow V_{BE} = V_{BB} - [(R_B + R_E(\beta + 1)] I_B$$
$$V_{CC} - R_C I_C - V_{CE} - R_E I_E = 0,$$
$$V_{CC} - V_{CE} = R_C I_C + R_E I_C \; avec : (I_E \approx I_C)$$
$$I_C = \frac{V_{CC} - V_{CE}}{R_C + R_E}$$

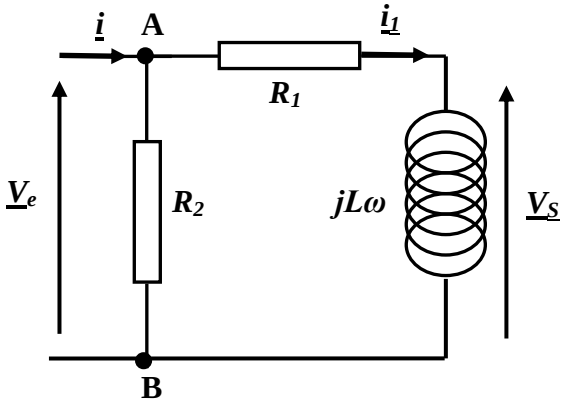
3. Representation des points de repos sur leurs droites.



Exercice 3 (6 points):

1. l'expression de la fonction de transfert $\underline{G(j\omega)} = \frac{\underline{V_s}}{\underline{V_e}}$

   en fonction de R_1, L et ω.



$$\underline{G(j\omega)} = \frac{\underline{V_s}}{\underline{V_e}} = \frac{(\mathrm{jL\omega})\underline{i_1}}{(\mathrm{R_1} + \mathrm{jL\omega})\underline{i_1}} = \frac{(\mathrm{jL\omega})}{(\mathrm{R_1} + \mathrm{jL\omega})}$$

$$= \frac{1}{\left(\frac{\mathrm{R_1}}{\mathrm{jL\omega}} + 1\right)} = \frac{1}{\left(1 - \mathrm{j}\frac{\mathrm{R_1}}{\mathrm{L\omega}}\right)}$$

$$\underline{|G(j\omega)|} = \left|\frac{\underline{V_s}}{\underline{V_e}}\right| = \frac{1}{\sqrt{\left(1 + \left(-\frac{R_1}{L\omega}\right)^2\right)}}$$

2. à la fréquence de coupure ω_C on à :

$$|G(j\omega_C)| = \frac{|G(j\omega)|_{max}}{\sqrt{2}} \; avec \; |G(j\omega)|_{max} = 1 \; quand(\omega \to \infty)$$

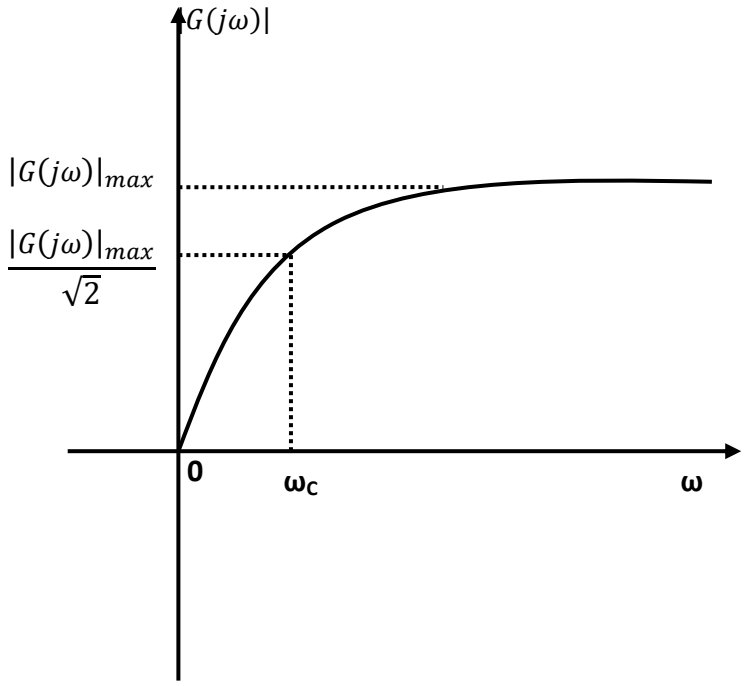
$$\frac{1}{\sqrt{\left(1 + \left(\frac{R_1}{L\omega_C}\right)^2\right)}} = \frac{1}{\sqrt{2}} \; d'ou: \left(1 + \left(\frac{R_1}{L\omega_C}\right)^2 = \sqrt{2},\right.$$

$$\omega_C = \frac{R_1}{L} = \frac{820}{2 * 10^{-3}} = 410 * 10^3 rd/s$$

3. Tracer le diagramme $\left|\underline{G(j\omega)}\right| = f(\omega)$

4. La nature du filtre.

Filtre passe Haut



Exercice 4(6 points):

Diodes parfaite
Representation des different possibilité des commutateurs des diodes

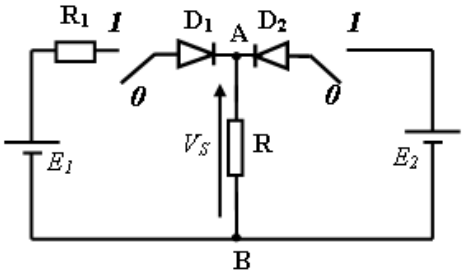


Fig-4-a-

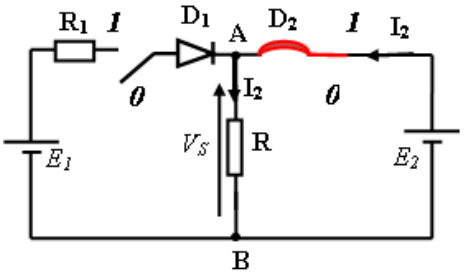


Fig-4-b-

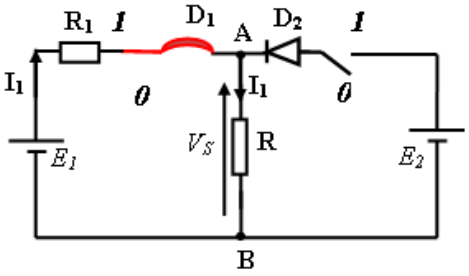


Fig-4-c-

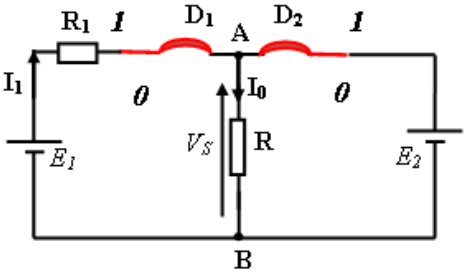


Fig-4-d-

Diodes réelle
Representation des different possibilité des commutateurs des diodes

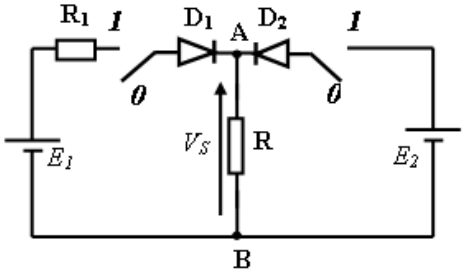


Fig-4-1-

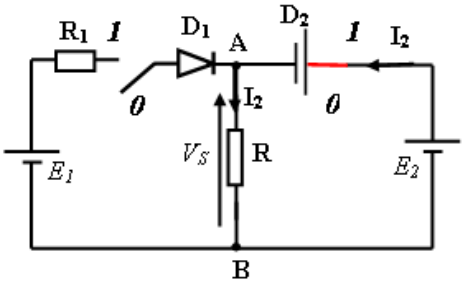


Fig-4-2-

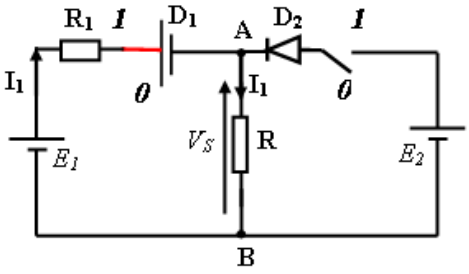


Fig-4-3-

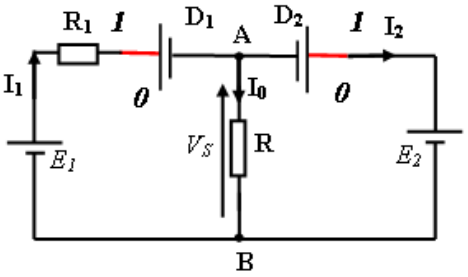


Fig-4-4-

Diodes parfaite		
D1	D2	Vs
0	0	0V
0	1	3V
1	0	6V
1	1	3V

Diodes Diodes réelle		
D1	D2	Vs
0	0	0V
0	1	2.4V
1	0	5.76V
1	1	2.4V