Correction Examen 1123 — 2018/2019

Questions de cours (2) :

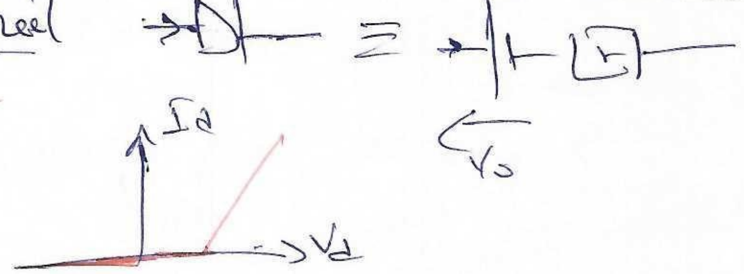
1 — 1 – Lois de Kirchhoff : | Lois des noeuds (0,5) | Lois des mailles (0,5)

2 – Modèls de la diode

passante	0,25 bloquée

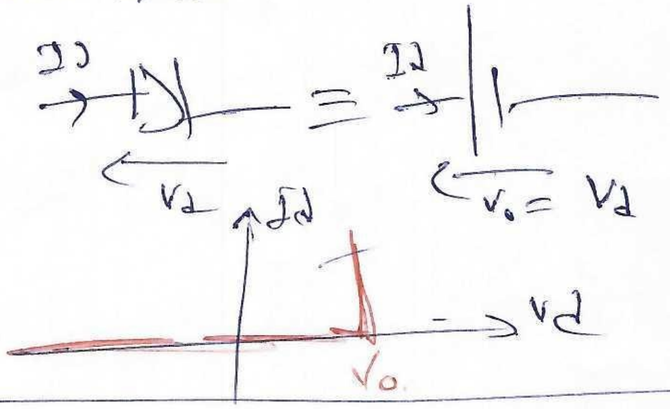
Mode réel

0,25



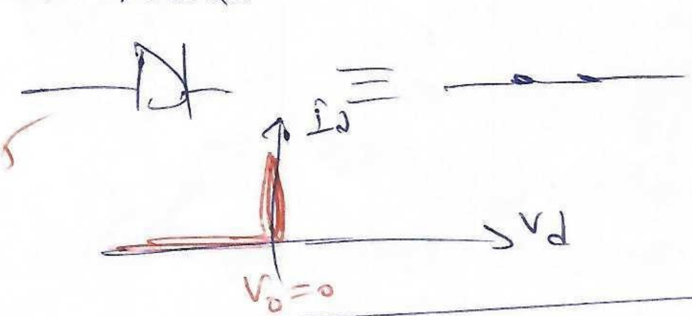
Mode semi-réel.

0,25



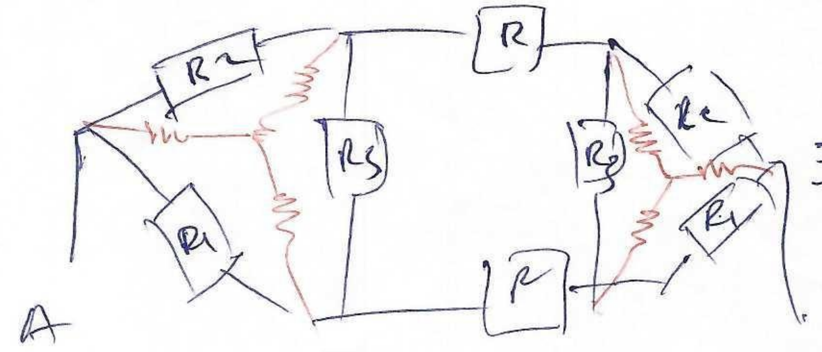
Mode idéal

0,25



Exo 1 (2)

a- Résistance équivalente R_{AB}



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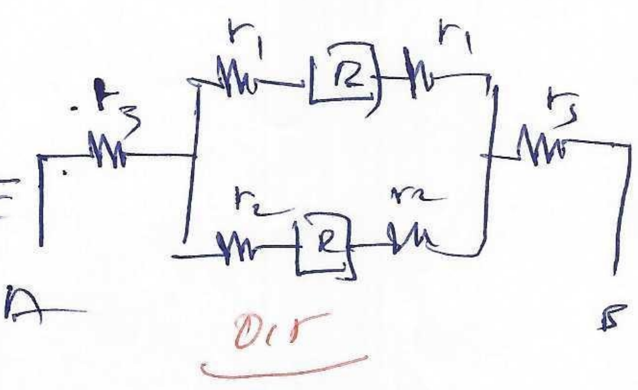


B

Transformation triangle - Etoile

0,5 $r_1 = \dfrac{R_2 R_3}{R_1 + R_2 + R_3}$, $r_2 = \dfrac{R_1 R_3}{R_1 + R_2 + R_3}$, $r_3 = \dfrac{R_1 R_2}{R_1 + R_2 + R_3}$

0,5 $R_{AB} = 2 r_3 + \dfrac{R_{S_1} \cdot R_{S_2}}{R_{S_1} + R_{S_2}}$

$R_{S_1} = 2 r_1 + R$

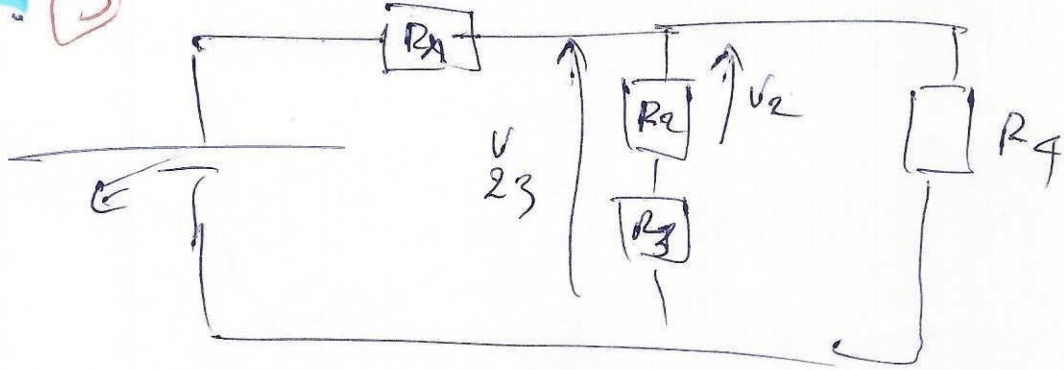
$R_{S_2} = 2 r_2 + R$

b- Cas où $R = R_1 = R_2 = R_3 =$

0,5 $R_{AB} = \dfrac{3}{2} R$

(2)

Exo 3 : (3)



a - $V_{23} = f(R_1, R_2, R_3, R_4, E)$

D'après le th de Millman.

1 $$\boxed{V_{23} = \frac{R_4(R_2+R_3)E}{R_1R_4 + R_1R_2 + R_1R_3 + R_2R_4 + R_3R_4}}$$

b - $V_2 = f(R_2, R_3, V_{23})$

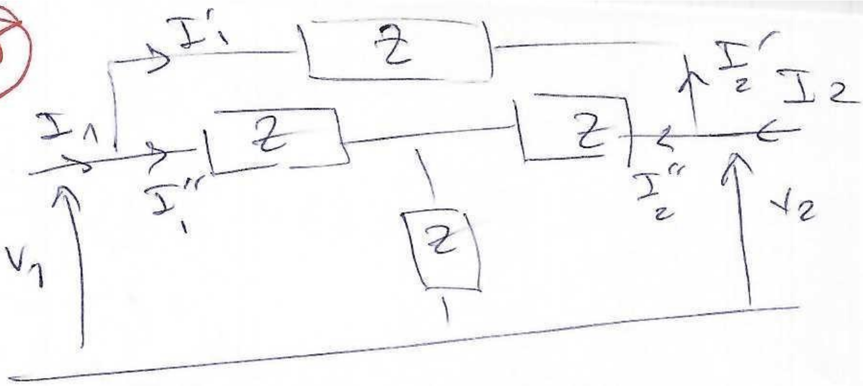
D'après le Diviseur de tension.

1 $$\boxed{V_2 = \frac{R_2}{R_2+R_3} V_{23}}$$

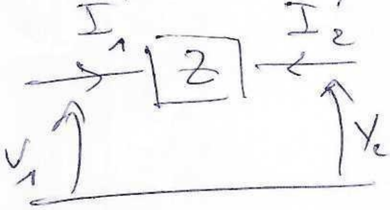
c - $V_2 = f(R_1, R_2, R_3, R_4, E)$

1 $$\boxed{V_2 = \frac{R_2 R_4 \quad E}{R_1R_4 + R_1R_2 + R_1R_3 + R_2R_4 + R_3R_4}}$$

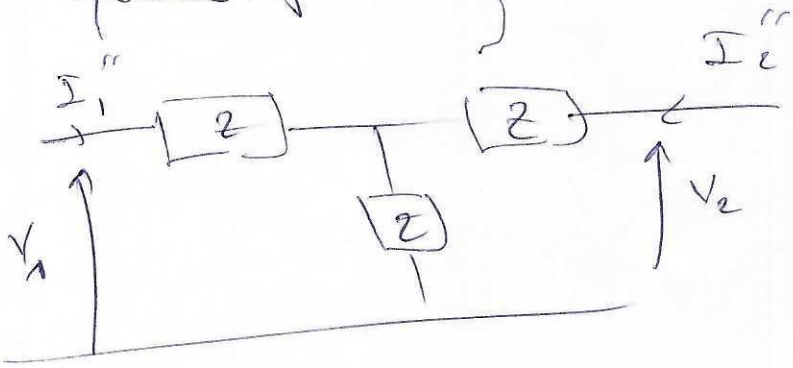
Exo3 (3,5)



a – 0,5 Q_1 : quadripôle série



0,5 Q_2 quadripôle en T



b – Matrice admittance de Q_1

1 $$Y_1 = \begin{bmatrix} \frac{1}{Z} & -\frac{1}{Z} \\ -\frac{1}{Z} & \frac{1}{Z} \end{bmatrix}$$

Matrice admittance de Q_2

1 $$Y_2 = \begin{bmatrix} \frac{Z_2+Z_3}{Z_1Z_2+Z_1Z_3+Z_2Z_3} & -\frac{Z_3}{Z_1Z_2+Z_1Z_3+Z_2Z_3} \\ -\frac{Z_3}{Z_1Z_2+Z_1Z_3+Z_2Z_3} & \frac{1}{Z_2+Z_3} + \frac{Z_3^2}{(Z_2+Z_3)\times[Z_3(Z_1+Z_2)+Z_1Z_2]} \end{bmatrix}$$

c – Matrice admittance Q.

0,5 $$Y = Y_1 + Y_2$$

Exo 4 : 3

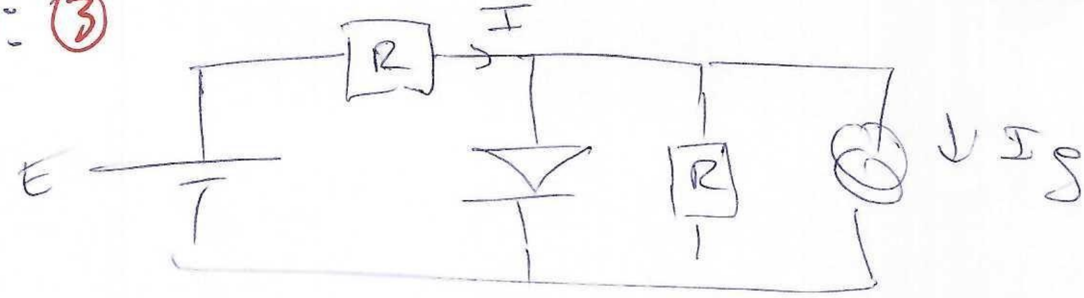
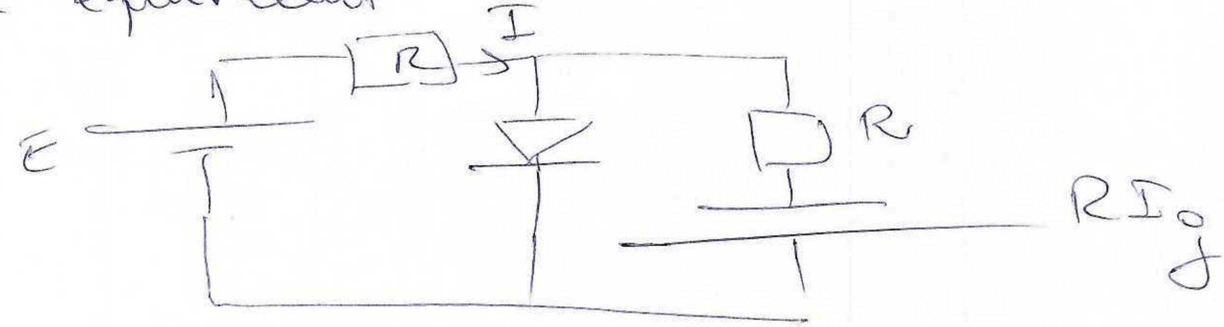
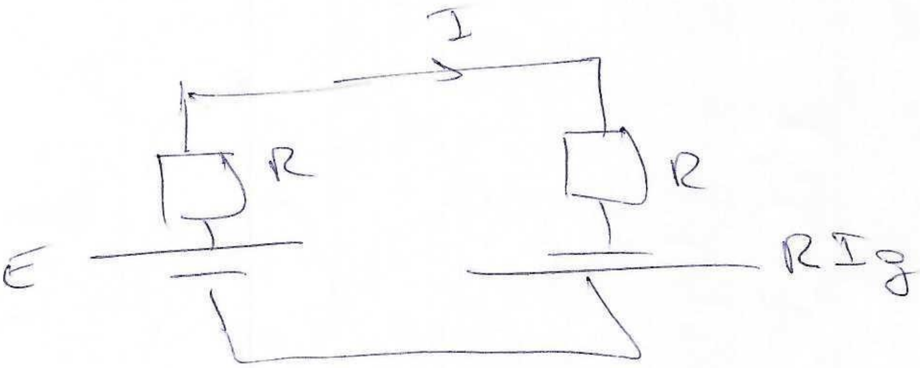


Schéma équivalent :



a - Diode bloquée

1,5

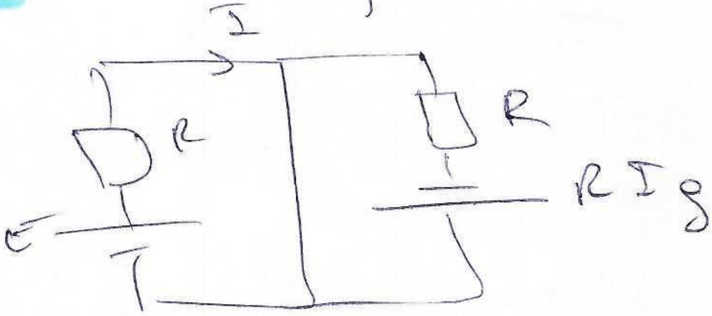


$$\boxed{I = \frac{E + RI_g}{2R}}$$

b - Diode passante

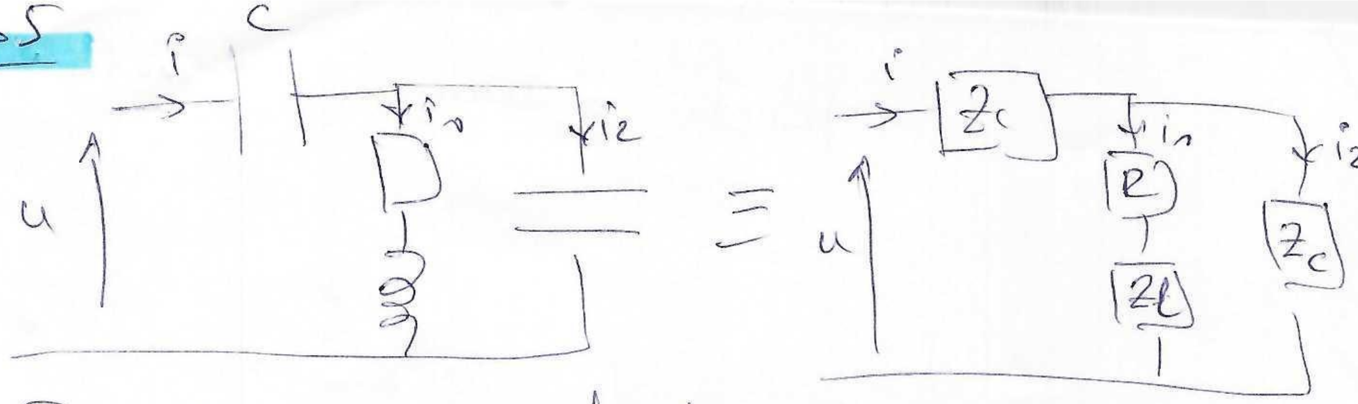
loi des mailles

1,5



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

Ex 5



1 – Impédance équivalente $Z_{eq} = X + jY$

1

$$\left\{\begin{aligned} X(\omega) &= \frac{R}{(1-LC\omega^2)^2 + R^2C^2\omega^2} \\ Y(\omega) &= -\frac{1}{C\omega} - \frac{R^2C\omega}{(1-LC\omega^2)^2 + R^2C^2\omega^2} + \frac{L\omega(1-LC\omega^2)}{(1-LC\omega^2)^2 + R^2C^2\omega^2} \end{aligned}\right.$$

On pose $\omega = \omega_0 = \frac{1}{\sqrt{LC}} \Rightarrow 1 - LC\omega^2 = 0$

2 – Nouvelle expression de Z_{eq}

1 $$\boxed{Z_{eq} = \frac{L}{RC} - 2j\sqrt{\frac{L}{C}}}$$

3 – Déphasage u et i

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

1 $$\boxed{\varphi = \arg Z_{eq} = -\arctan 2R\sqrt{\frac{C}{L}}}$$

4- $i_1 = f(i)$

Pont diviseur du courant

0,5 $\boxed{i_1 = \dfrac{i}{1 - LC\omega^2 + jRC\omega}}$

0,5 le déphasage $\varphi_{i_1/i} = -\arctg \dfrac{RC\omega}{1 - LC\omega^2}$

A pour $\omega = \omega_0 = \dfrac{1}{\sqrt{LC}}$

0,5 $\boxed{\varphi_{i_1/i} = -\pi/2}$ Quadrature de phase

5- $i_2 = f(i)$

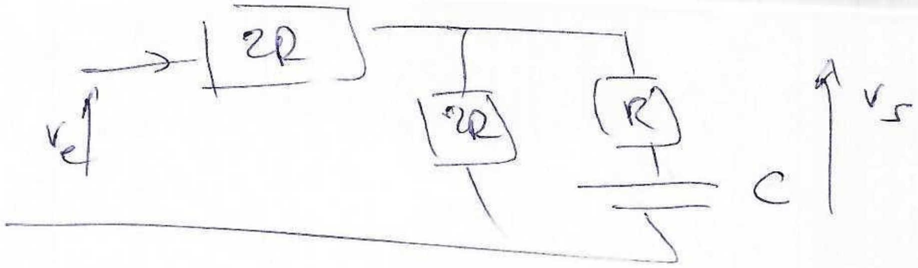
D'après le pont diviseur de courant

$$i_2 = \frac{i}{2} = \frac{1/Z_C}{\frac{1}{Z_C} + \frac{1}{R + Z_L}} = \frac{R + Z_L}{R + Z_L + Z_C}$$

0,5 $\boxed{i_2 = \dfrac{-LC\omega^2 + jRC\omega}{1 - LC\omega^2 + jRC\omega}}$

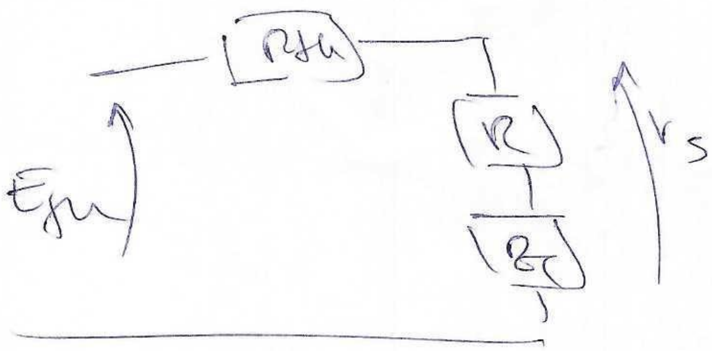
0,5 $\boxed{\varphi_{i_2/i} = -\arctg R\sqrt{\dfrac{C}{L}} - \pi/2}$

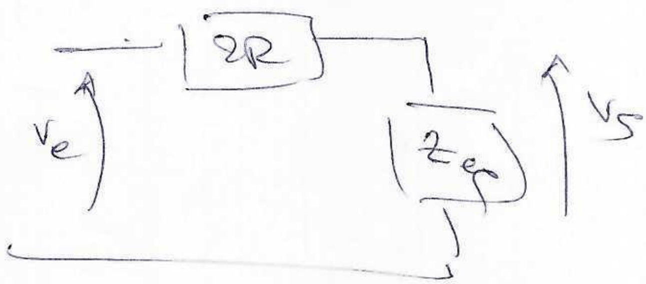
Exo 6 :



1 -

Th de Thévenin ou 2 impédances en //





$E_{th} = \frac{V_e}{2}$, $R_{th} = R$

1 . Pont diviseur de tension

1 $$\boxed{H(j\omega) = \frac{1}{2}\,\frac{1 + jRC\omega}{1 + j2RC\omega} = a\,\frac{1 + jx}{1 + jbx}}$$

avec $\boxed{a = \frac{1}{2} \ , \ b = 2}$

2 - Gain $G(\omega) = a\,\frac{\sqrt{1 + x^2}}{\sqrt{1 + b^2x^2}}$

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

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

$= \arg a + \arg(1 + jx) - \arg(1 + jbx)$

1 $$\boxed{\phi = \text{arctg}\, x - \text{arctg}\, bx}$$