1. $\frac{1}{C_{AB}} = \frac{1}{C_{AD}} - \frac{1}{C_{DB}} = \left(\frac{1}{C_2} - \frac{1}{C_1}\right) - \frac{1}{C_2 - C_1} = \frac{C_1 - C_2}{C_1 C_2} - \frac{1}{C_2 - C_1} = \frac{C_1^2 - 3C_1 C_2 - C_2^2}{C_1^2 C_2 - C_1 C_2^2}$

$$C_{AB} = \frac{C_1^2 C_2 - C_1 C_2^2}{C_1^2 - 3C_1 C_2 - C_2^2} = \frac{C_2}{2}$$ 0,5

Alors : $C_2 C_1^2 - 3C_1 C_2^2 - C_2^3 = 2C_1^2 C_2 - 2C_1 C_2^2 \Rightarrow C_2^2 - C_1 C_2 - C_1^2 = 0$

Donc $C_2 = \frac{(1+\sqrt{5})}{2} C_1$ 0,5 AN : $C_2 = 5\mu F$ 0,

2. Tension et charge aux bornes de chaque condensateur.

$C_{AB} = \frac{Q_{AB}}{U_{AB}} = \frac{C_2}{2} = Q_{AB} = \frac{C_2 U_{AB}}{2}$ AN $Q_{AB} = 1.25mC$ 0,5

Comme $Q_{AB} = Q_{AD} = Q_{DB} = 1.25mC = Q_{1AD} = Q_{2AD} = 1.25mC$

$U_{1AD} = \frac{Q_{1AB}}{C_1} = 156\ V$ 0,25

Et $U_{2AD} = \frac{Q_{2AB}}{C_2} = 250\ V$ 0,25

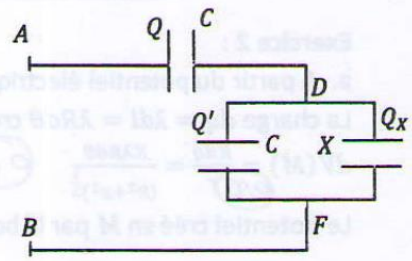
$U_{DB} = U_{AB} - U_{1AD} - U_{2AD} = 94\ V$ 0,25

$Q_{1DB} = U_{DB} C_1 = 0.752mC$ 0,25

Et

$Q_{2DB} = U_{DB} C_2 = 0.47mC$ 0,25

Exercice 4 :



1. Valeur de X :

$\frac{1}{C_{eq}} = \frac{1}{C} + \frac{1}{C+X} = \frac{1}{X} \Rightarrow$ (0,5)

$X^2 + CX - C^2 = 0 \Rightarrow$

$X = \frac{-C+\sqrt{5}C}{2} \quad \Rightarrow X = 1.85\mu F$ (0,5)

2. Charges et tensions.

On a $Q = Q_{eq}$ et $Q_{eq} = C_{eq}V = X\,V = 7.4\,10^{-4}C$ *donc* $Q = 7.4\,10^{-4}C$ (0,5)

(0,5)

On a $V_A - V_D = \frac{Q}{C} = \frac{Q_{eq}}{C} = \frac{X}{C}V \Rightarrow V_A - V_D = 247\,V$ (0,5)

$V_D - V_F = V - (V_A - V_D) \Rightarrow V_D - V_F = 153\,V$ (0,5)

$Q' = C(V_D - V_F) \Rightarrow Q' = 4.6\,10^{-4}C$ (0,5)

$Q_X = X(V_D - V_F) \Rightarrow Q_X = 2.8\,10^{-4}C$ (0,5)

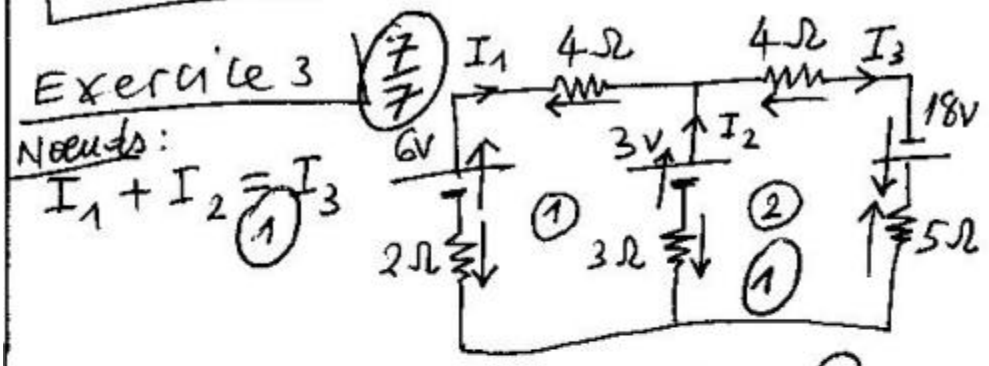
Exercice 5 :

1. $\frac{1}{R_{eq}} = \frac{1}{R_1+R_2} + \frac{1}{R_3}$ (0,5) $R_{eq} = 50\,\Omega$

$e = R_{eq}I$, (1) $\quad I = \frac{e}{R_{eq}} = 1A$

2. $V_A - V_B = e = 50V.$ (0,5)

Exercice 3 (7/7)



Noeuds : $I_1 + I_2 = I_3$ (1)

Mailles : ① $6 + 3I_2 = 4I_1 + 3 + 2I_1$ (1)

② $3 + 18 = 3I_2 + 4I_3 + 5I_3$ (1)

$$\begin{cases} 6I_1 - 3I_2 = 3 \\ 9I_1 + 12I_2 = 21 \end{cases} \Rightarrow \begin{cases} 2I_1 - I_2 = 1 \\ 3I_1 + 4I_2 = 7 \end{cases}$$

Tout calcul fait, on obtient :

$\boxed{I_1 = 1A}$ (1), $\boxed{I_2 = 1A}$ (1), $\boxed{I_3 = 2A}$ (1)

Module