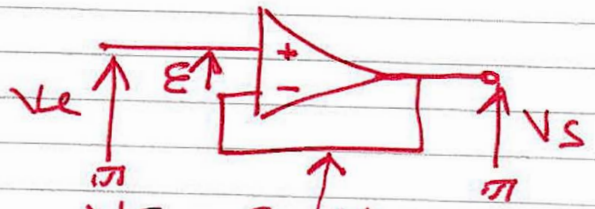
Correction TD : AOP

Exercice 1 :



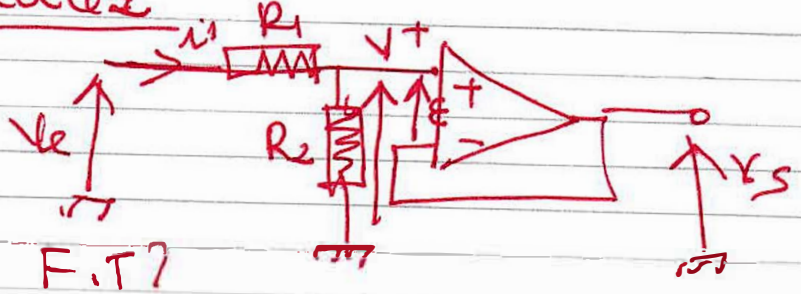
1.1. $V_e - \varepsilon + V_s = 0$ $\quad \varepsilon = 0\,V$ car AOP est en régime linéaire (présence d'une CR⁻)

Conséquence ($\varepsilon = 0\,V$) $\Rightarrow$ $\boxed{V_s = V_e}$

$$\boxed{T = \frac{V_s}{V_e} = 1}$$

1.2 $Z_e = \frac{V_e}{i_+} = \frac{V_e}{0} = +\infty$.

Exercice 2



2.1 F.T ?

$T = \frac{V_s}{V_e}$ $\qquad V^+ = V_e \frac{R_2}{R_1+R_2}$ $\quad (i^+ = i^- = 0)$

AL i (AOP) est en régime linéaire

$$\frac{V^+}{V_e} = \frac{R_2}{R_1+R_2}$$

$$T = \frac{V_s}{V_e} = \frac{V_s}{V^+} \times \frac{V^+}{V_e} \quad ; \quad \frac{V_s}{V^+} = 1$$

- car $V_s = V^+$ ($V^+ - \underbrace{\varepsilon}_{\sim 0} - V_s = 0$)

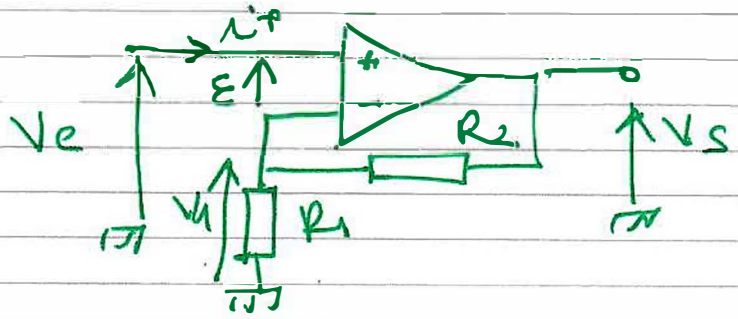
$\Rightarrow$ $\boxed{V_s = V^+}$

donc $T = \frac{V_s}{V^+} \times \frac{V^+}{V_e} = 1 \times \frac{R_2}{R_1+R_2}$

$$\boxed{T = \frac{R_2}{R_1+R_2}}$$

2.2 $Z_e = \frac{V_e}{i_1} = R_1 + R_2$ $\qquad \boxed{Z_e = R_1 + R_2}$

Exercice 3



3.1 $T = \frac{V_s}{V_e}$ on a $V_e - \underbrace{\varepsilon}_{0} - V_1 = 0$ (car CR^-)

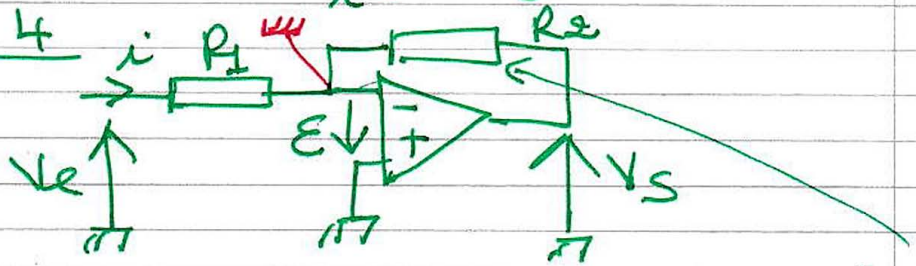
$\Rightarrow V_e = V_1 = V_s \frac{R_1}{R_1+R_2}$ ($i^- = i^+ = 0$)

$\Rightarrow \frac{V_s}{V_e} = \frac{R_1+R_2}{R_1} = 1 + \frac{R_2}{R_1}$

FT : $\boxed{T = 1 + \frac{R_2}{R_1}}$

3.2 $Ze = \frac{V_e}{i^+} = \frac{V_e}{0} = +\infty$, $\boxed{Ze = +\infty}$

Exo 4

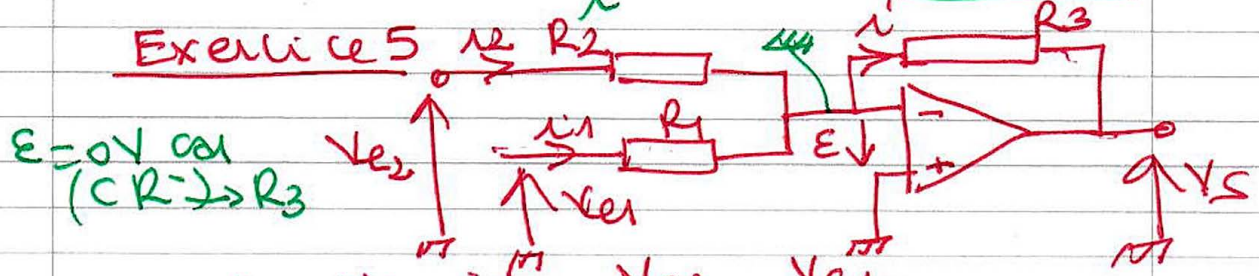


4.1 $T = \frac{V_s}{V_e} =$ $\varepsilon = 0V$ car (CR^-)

$i = \frac{V_e}{R_1} = -\frac{V_s}{R_2} \Rightarrow \boxed{\frac{V_s}{V_e} = T = -\frac{R_2}{R_1}}$

4.2 $Ze = \frac{V_e}{i} = R_1$ $\boxed{Ze = R_1}$

Exercice 5

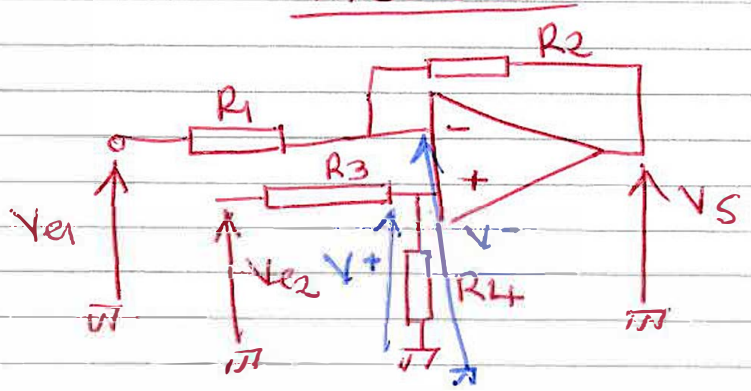


5.1 $i = i_1 + i_2 = \frac{V_{e2}}{R_2} + \frac{V_{e1}}{R_1} =$

$-\frac{V_s}{R_3} = \frac{V_{e1}}{R_1} + \frac{V_{e2}}{R_3} \Rightarrow V_s = -R_3\left(\frac{V_{e1}}{R_1} + \frac{V_{e2}}{R_2}\right)$

5.2 Si $R_1 = R_2 = R_3 \Rightarrow \boxed{V_s = -(V_{e1} + V_{e2})}$

Exercice 6



6.1 FT ? $V_s = f(V_{e1}, V_{e2})$

AL i est en régime linéaire $\Rightarrow$ car il y a une contre réaction négative : (R_2)

conséquences!

$\varepsilon = V^+ - V^- = 0 \Rightarrow \boxed{V^+ = V^-}$ (3)

$V^+ = V_{e2} \cdot \frac{R_4}{R_3+R_4}$ (1)

$V^- = \frac{\frac{V_{e1}}{R_1} + \frac{V_s}{R_2}}{\frac{1}{R_1} + \frac{1}{R_2}}$ (2)

on multiplie l'equation (2) au numérateur et au dénominateur par $R_1 R_2$

$V^- = \frac{R_1 R_2 \left(\frac{V_{e1}}{R_1} + \frac{V_s}{R_2}\right)}{R_1 R_2 \left(\frac{1}{R_1} + \frac{1}{R_2}\right)} = \frac{V_{e1} R_2 + V_s R_1}{R_2 + R_1}$

(3) $\Rightarrow V^+ = V^- \Rightarrow \frac{V_{e2} R_4}{R_3+R_4} = \frac{V_{e1} R_2 + V_s R_1}{R_1+R_2}$

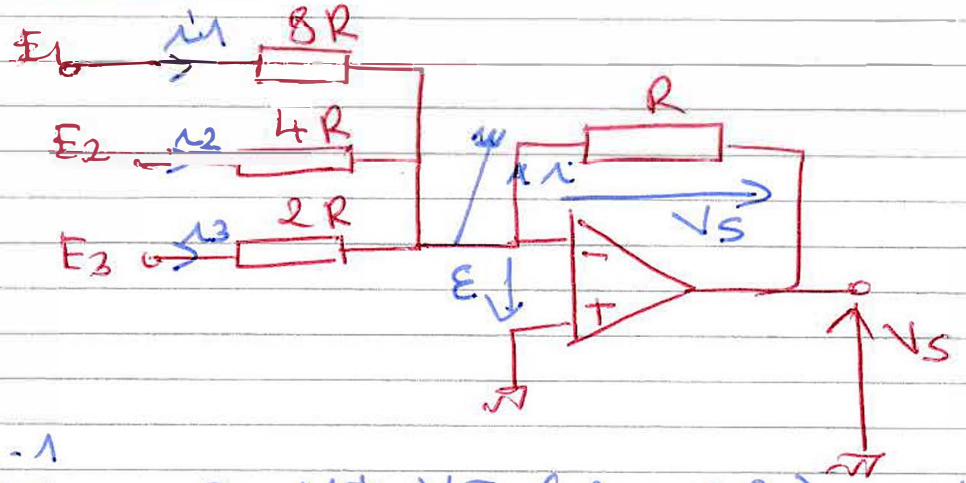
$\Rightarrow \frac{V_s R_1}{R_1+R_2} = \frac{V_{e2} R_4}{R_3+R_4} - \frac{V_{e1} R_2}{R_1+R_2}$

$$\boxed{V_s = \frac{R_1+R_2}{R_2}\left(\frac{V_{e2} R_4}{R_3+R_4} - V_{e1}\frac{R_2}{R_1+R_2}\right)}$$

6.2 Si $R_1 = R_2 = R_3 = R_4$

$\boxed{V_s = V_{e2} - V_{e1}}$ on a un soustracteur

Exercice 7



8-1

$\varepsilon = V^+ - V^-$ (car CR-) $\Rightarrow V^+ = V^-$

$V^+ = 0V \Rightarrow \boxed{V^- = 0V}$

E_1 pers aux bornes de $8R \Rightarrow i_1 = \frac{E_1}{8R}$

E_2 pers aux bornes de $4R \Rightarrow i_2 = \frac{E_2}{4R}$

E_3 " " $2R \Rightarrow i_3 = \frac{E_3}{2R}$

$i = -\frac{V_S}{R} = i_1 + i_2 + i_3$

$\Rightarrow -\frac{V_S}{R} = \frac{E_1}{8R} + \frac{E_2}{4R} + \frac{E_3}{2R}$

$\Rightarrow V_S = -R\left(\frac{E_1}{8R} + \frac{E_2}{4R} + \frac{E_3}{2R}\right)$

$$\boxed{V_S = -\left(\frac{E_1}{8} + \frac{E_2}{4} + \frac{E_3}{2}\right)}$$

2) fonction du montage

sorte de CAN.