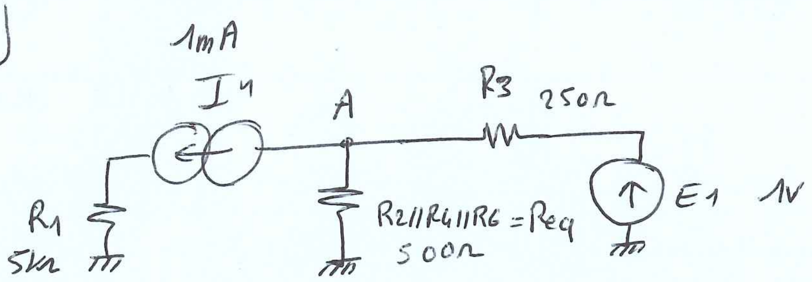
1)



par superposition :

$$I1 = 0 \Rightarrow VA_1 = \frac{E1\ Req}{Req + R3} = \frac{2}{3} V. = 666,7 mV$$

$$E1 = 0 \Rightarrow VA_2 = -I1\ (\underbrace{Req // R3}_{166,7 \Omega}) = -166,7 mV$$

$Vth = VA_1 + VA_2 \simeq 500 mV.$

$Rth = Req // R3 = 166,7 \Omega$

par Milman

$$Vth = \frac{-I1 + \frac{E1}{R3}}{\frac{1}{Req} + \frac{1}{R3}} \simeq 500 mV$$

$Rth = Req // R3 = 166,7 \Omega$

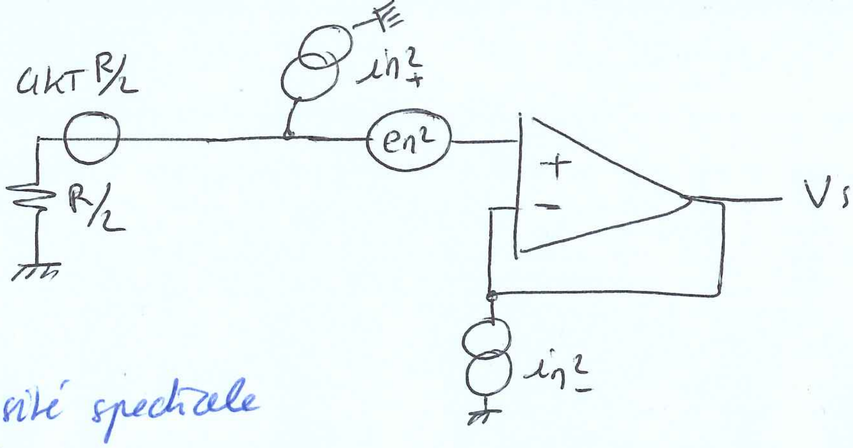
3)

$$Vs = -V1 - V2 + (V3 + V4)\left(\frac{R/2}{R + R/2}\right)\left(1 + \frac{R}{R/2}\right)$$

$$= -(V1 + V2) + (V3 + V4)$$

Vs calculé = −2V   Vs réel = 0 (car alim asymétrique)

4)



$in^2 = 100\ 10^{-24}\ A^2/Hz$

$en^2 = 1\ 10^{-18}\ V^2/Hz$

densité spectrale

$$S_{V_{sn}}^2 = 4kT\frac{R}{2} + in_+^2\left(\frac{R}{2}\right)^2 + en^2 + 0\ in_-^2$$

$$= 8\ 10^{-17} + 100\ 10^{-24}\ 25\ 10^{6} + 1\ 10^{-18}$$

$$= 8\ 10^{-17} + 25\ 10^{-16} + 1\ 10^{-18}$$

$$\boxed{= 25,81\ 10^{-16}\ V^2/Hz}$$

dans BP = 100kHz $\quad V_{sn}^2 = S_{V_{sn}}^2 \times BP$

$V_{sn}^2 = 25,81\ 10^{-11}\ V^2$

$\boxed{V_{sn} = 31\,nV\ rms}$

NOM: PRENOM:

Exercice 2: