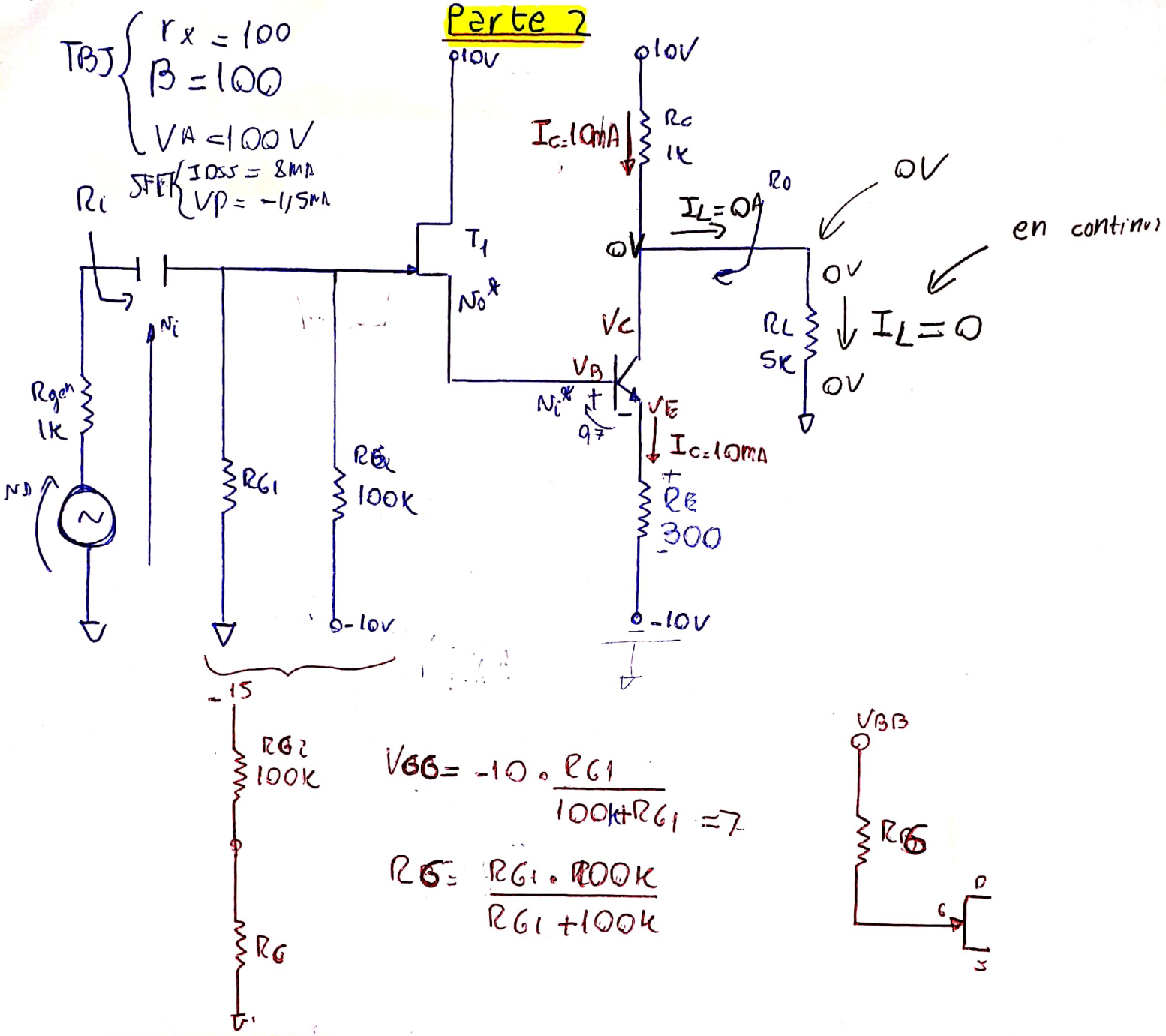
Parte 2

TBJ { $r_x = 100$, $\beta = 100$, $V_A < 100\,V$

SFET { $I_{DSS} = 8mA$, $V_P = -1,5mA$



$$V_{GG} = -10 \cdot \frac{R_{G1}}{100k + R_{G1}} = ?$$

$$R_G = \frac{R_{G1} \cdot 100k}{R_{G1} + 100k}$$

- $I_C = \frac{10V}{1K} = 10mA$
- $V_E = 0$
- $V_E = -10V + I_C \cdot 300 = -7V$
- $V_B = V_E + 0,7 = -6,3V$

- $I_B = \frac{I_C}{\beta} = \frac{10mA}{100} = 0,1mA = 100\mu A$
- $I_B = I_D$
- $V_B = V_S$

$V_{DS} = V_D - V_S$

$V_{DS} = 10 + 6,3 = 16,3V$

$$I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2 (1 + \lambda V_{DS})$$

sin considerar λ

$V_{GS} = 1,5$

considerando λ:

$$V_{GS} = \left(1 - \sqrt{\frac{I_D}{(1+\lambda V_{DS}) I_{DSS}}}\right) V_P$$

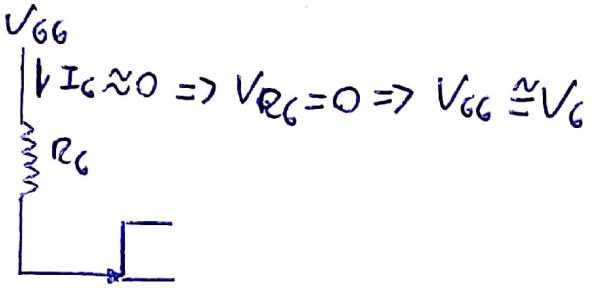
$V_{GS} = -1,5\,V$

$V_G - V_S = V_{GS}$

$V_G = V_{GS} + V_S = -1,5V - 6,3V$

$V_G = -7,8V$

Ahora

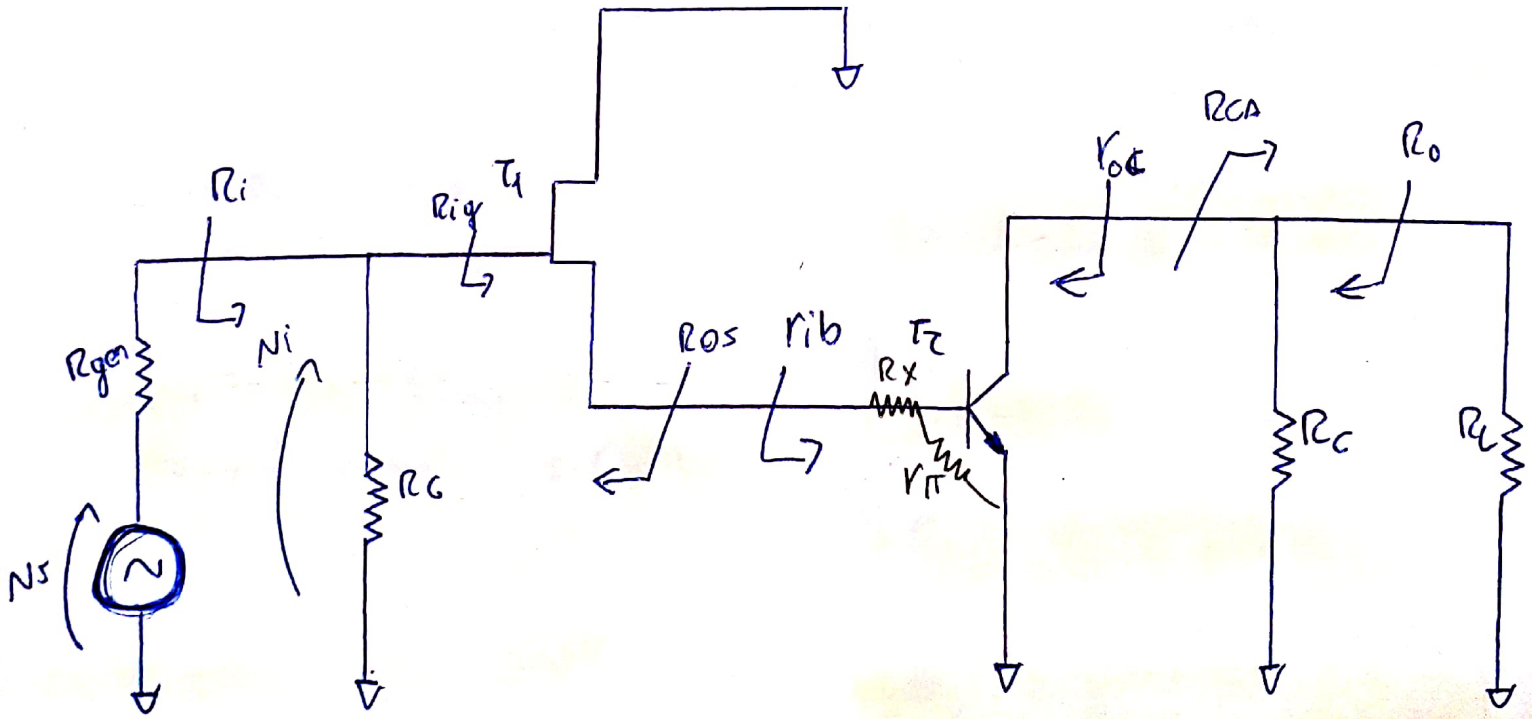


$$-7,8 = -10 \cdot \frac{R_{G1}}{100K + R_{G1}}$$

$$-7,8 \cdot 100K - 7,8 \cdot R_{G1} = 10 R_{G1}$$

$$-7,8 \cdot 100K = R_{G1}(-7,8)$$

$$R_{G1} = 354545\,\Omega$$



Transistor 1

$$g_{m1} = \frac{2}{V_p}(I_{DQ} \cdot I_{DSS})^{1/2} = 1{,}2\,\frac{mA}{V}$$

$$r_{ds} = \frac{1}{\lambda \cdot I_{DQ1}} = \frac{1}{0{,}01V^{-1} \cdot 9mA} = 1M\Omega$$

$$r_{gs} = \infty$$

Transistor 2

$$g_{m2} = \frac{I_{CQ2}}{V_{th}} = 38{,}6\,\frac{mA}{V}$$

$r_o = 10.000$ ← → r_o

$r_\pi = 259\,\Omega$

$r_x = 100\,\Omega$

↑ hay que usarlo: me olvide de considerar r_o

$R_G \| r_{gs} + \beta_{FET} \cdot r_{ib} = \infty$

La necesito para A_{V1}

$r_{ib} = 359\,\Omega$

$$A_{V1} = \frac{V_o^*}{V_i} = \frac{g_m \cdot V_{gs1} \cdot r_{ib}}{V_i}$$

$$= \frac{g_m \cdot r_{ib}}{V_i} \cdot \frac{V_i \cdot r_{gs}}{r_{gs} + g_m r_{gs} \cdot r_{ib}}$$

(V_{gs}, β_{FET})

$$A_{V1} = g_m \cdot r_{ib} \cdot \frac{1}{1 + g_m r_{ib}}$$

$$A_{V1} = \frac{1{,}2\,\frac{mA}{V} \cdot 359}{1 + 1{,}2\,\frac{mA}{V} \cdot 359} = 0{,}3$$

$r_{ig} = r_{gs} + \beta_{FET} \cdot r_{ib} = \infty$

$r_i = r_{ig} \| R_G \cong R_G = 78K\,\Omega$

$$A_{V2} = \frac{V_o}{V_i^*} = -\frac{g_{m2} \cdot V_{be} \cdot R_C \| r_o}{V_i^*}$$

$$= -\frac{g_{m2} \cdot R_C \| r_o}{V_i^*} \cdot \frac{V_i^*}{R_x + R_\pi}$$

(V_{be}, r_π)

$$= -391\,\frac{mA}{V} \cdot 769\,\Omega \cdot \frac{359}{359}$$

$A_{V2} = -234 \approx -216$

$r_{oc} = 10K$

$R_o = 1K \| 10K = 0{,}909$

$A_V = 0{,}3 \cdot (-234) = -65$

$$Avs = Av \cdot \frac{Ri}{Ri + Rgen} = -65 \cdot \frac{78k}{79k} = -64$$

Parte c

SACO el czp y me fijo que resistencia ve:

$$Req = 1k + 78k = 79k$$

$$\tau = C \cdot R_{eq} = 1\mu F \cdot 79k = 0{,}079\,s$$

$$\boxed{f_{L_1} = 2{,}01\,Hz}$$

Para el czp 2

$$Req = 300\Omega \,//\, \frac{\left(\frac{1}{gm_1} + rx + r\pi\right)}{\beta}$$

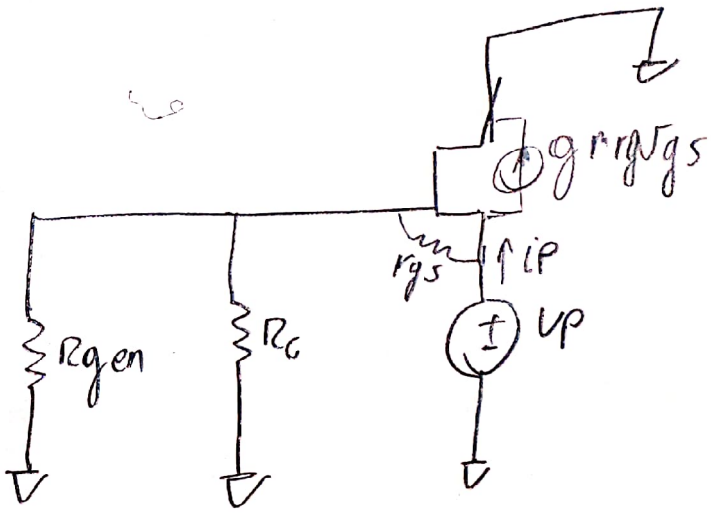
$$Req_2 = 300 \,//\, \frac{1197}{\beta}$$

$$Req = 11{,}54$$

$$\tau = 100\mu \cdot 12n = 1{,}2m$$

$$\boxed{f_L = 132{,}6}$$

es el MAYOR el que FIJA



$$Ros = \frac{Rgen \,//\, Rg + rgs}{\beta FE}$$

$$= \frac{987{,}5 + rgs}{gm \cdot rgs}$$

$$= \frac{987{,}5}{gm\,rgs} \to 0 + \frac{rgs}{rgs\,gm}$$

$$= \frac{1}{gm}$$