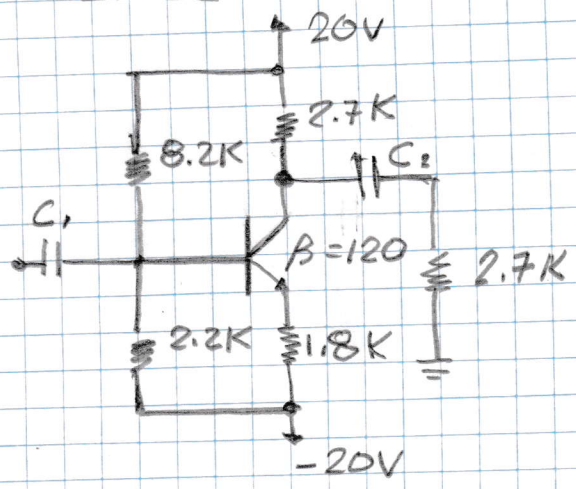
PARCIAL N°3
EL TRANSISTOR BIPOLAR (BJT)

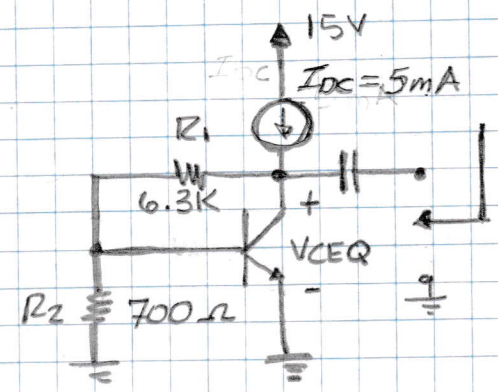
1IE131, 1EE181

PROBLEMA N°1 ENCUENTRE V_C, V_E Y V_B. CUAL ES LA MAXIMA OSCILACIÓN DE VOLTAJE QUE PUEDE MANEJAR EL TRANSISTOR SIN RECORTAR LA SENTAL. GRAFIQUE SU RESPUESTA. 30ptos



PROBLEMA N°2. DETERMINE V_{CE}. INDIQUE EL CIRCUITO EQUIVALENTE AC, ENCUENTRE UNA EXPRECION PARA Z_o. CUANTO VALE Z_o.

$\beta = 100$ $V_{BE} = 0.7$ 30ptos



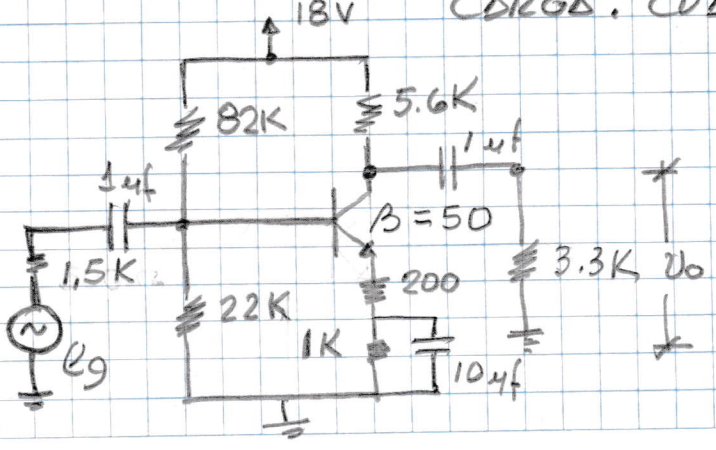
NOTA: PARA CALCULAR Z_o DE LA ETAPA NO SE CONECTA EL GENERADOR, SOLO LA FUENTE DE PRUEBA. NO CORTOCIRCUITE LA ENTRADA.

PROBLEMA N°3 EN CUANTO DISMINUYE A_V CON LA CARGA. CUANTO VALE e_o si:

$e_g = 0.5 \operatorname{sen} \omega t$.

40 ptos

$I_{CQ} = 2mA$



PARCIAL N°3
FUND. DE ELECT. 1IE131, 1EE131

CLAVE.
I/2020

PROBLEMA N°1

$$R_{TH} = \frac{(8.2\times10^3)(2.2\times10^3)}{8.2\times10^3 + 2.2\times10^3}$$

$$= 1.73\,K$$

$$V_{TH} = \frac{V_{CC}+V_{EE}}{R_{B1}+R_{B2}} R_{B2} - V_{EE}$$

$$= -11.53\,V$$

$$I_B = \frac{V_{EE} - V_{TH} - V_{BE}}{R_{TH} + (\beta+1) R_E}$$

$$= 35.34\,\mu A$$

$$I_C = \beta I_B = 120 \times 35.34\,\mu A$$

$$= 4.25\,mA$$

$$V_{CEQ} = V_{CC} - I_C(R_C + R_E) + V_{EE}$$

$$= 20 + 20 - 4.25(2.7 + 1.8)$$

$$= 20.87.$$

$$V_C = V_{CC} - I_C R_C$$

$$= 20 - (4.25\times10^{-3})(2.7\times10^3)$$

$$V_C = 8.53$$

$$V_E = I_C R_C - V_{EEE}$$

$$= 4.25\times1.8 - 20$$

$$= -12.35$$

$$V_B = V_E + 0.7$$

$$= -12.35 + 0.7$$

$$= -11.65\,V$$

M.O.V

$S/P = 2V_{CC} - V_{CEQ} = 19.13$

$S/H = V_{CEQ} - 0.2 = 20.67$

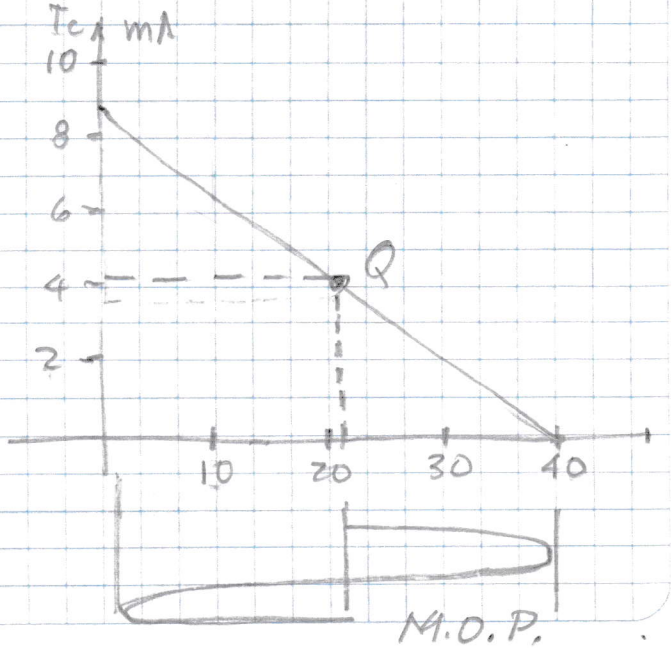
M.O.V ⇒ 19.13V

$$I_{SAT} = \frac{V_{CC}+V_{EE}}{R_C + R_E}$$

$$= \frac{40}{4.5\times10^3}$$

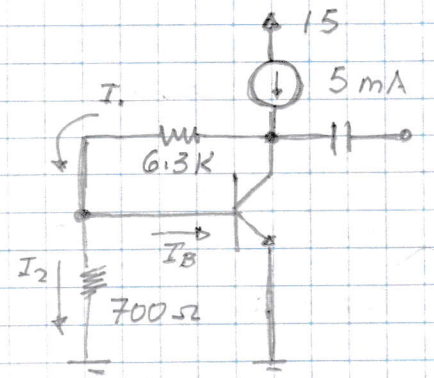
$$= 8.88\,mA$$

$$V_{CE_{CORTE}} = V_{CC} + V_{EE}$$



PROBLEMA N°2

1) CALCULO DE V_{CE}



$I_C = I_1 + I_{CQ}$

$I_1 = I_2 + I_B$

$I_C = I_2 + I_{BQ} + \beta I_{BQ}$

$= I_2 + I_{BQ} + \beta I_{BQ}$

$5 = I_2 + (\beta+1) I_{BQ}$

$I_{BQ} = \dfrac{5 - I_2}{101}$

$I_2 = \dfrac{V_{BE}}{R_2} = \dfrac{0.7}{700}$

$I_2 = 1 \times 10^{-3} = 1mA$

$I_{BQ} = \dfrac{(5 - 1) \times 10^{-3}}{101}$

$I_{BQ} = 39.6 mA$

$I_1 = 1 \times 10^{-3} + 39.6 \times 10^{-6}$

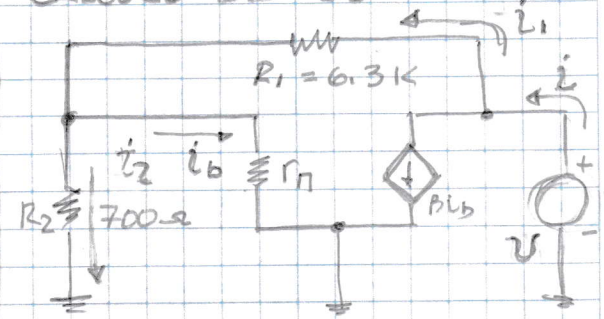
$= 1.04 mA$

$V_{CE} = (1.04 \times 10^{-3})(6.3 \times 10^{3}) + 0.7$

$= 7.25 V$

$I_C = \beta I_B = 3.96 mA \quad r_\pi = \dfrac{\beta V_T}{I_C} = 657 \Omega$

CÁLCULO DE Z_o



$Z_o = \dfrac{v}{i}$

$v = v_{R_1} + v_{r_\pi}$

$i_2 = \dfrac{r_\pi i_b}{R_2}$

$i_1 = i_b + i_2$

$= i_b + \dfrac{r_\pi i_b}{R_2}$

$i = i_1 + \beta i_b$

$= i_b + \dfrac{r_\pi i_b}{R_2} + \beta i_b$

$= i_b \left[(\beta+1) + \dfrac{r_\pi}{R_2} \right]$

$v = \left[i_b + \dfrac{r_\pi i_b}{R_2} \right] R_1 + i_b r_\pi$

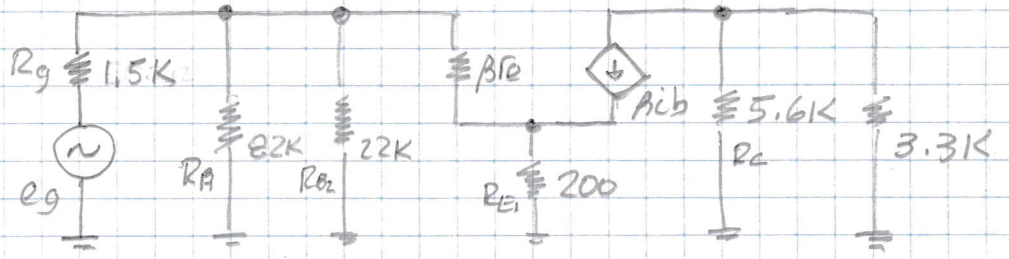
$= i_b \left[\left(1 + \dfrac{r_\pi}{R_2}\right) R_1 + r_\pi \right]$

$Z_o = \dfrac{v}{i} = \dfrac{\left[\left(1 + \dfrac{r_\pi}{R_2}\right) R_1 + r_\pi \right] i_b}{\left[(\beta+1) + \dfrac{r_\pi}{R_2} \right] i_b}$

$$Z_o = \frac{\left(1 + \frac{r_\pi}{R_2}\right) R_1 + r_\pi}{(\beta+1) + \frac{r_\pi}{R_2}}$$

$$= \frac{\left(1 + \frac{657}{700}\right) 6.3 \times 10^{3} + 657}{101 + \frac{657}{700}} = 126 \Omega$$

PROBLEMA N° 3



$I_C = 2mA \quad r_e = \frac{26 \times 10^{-3}}{2 \times 10^{-3}}$

$r_e = 13$

$\beta r_e = 650\Omega$

S/CARGA

$A_V = -\frac{R_c}{r_e + R_E}$

$= -\frac{5.6 \times 10^3}{13 + 200}$

$= -26.29$

C/CARGA

$R_c' = R_c \,//\, R_L$

$= \frac{(5.6 \times 10^3)(3.3 \times 10^3)}{5.6 \times 10^3 + 3.3 \times 10^3}$

$= 2.07K$

$A_{VS} = \frac{2.07 \times 10^3}{13 + 200}$

$= -9.74$

$\Delta V = 26,29 - 9,74$

$= 16,55$

$Z_i = R_{B1} \,//\, R_{B2} \,//\, (r_m + (\beta + 1) R_E)$

$R_{B1} \,//\, R_{B2} = \frac{(82 \times 10^3)(22 \times 10^3)}{82 \times 10^3 + 22 \times 10^3}$

$= 17.35K$

$Z_i = 17.35 \,//\, (650 + 51 \times 200)$

$= 17,35 \times 10^3 \,//\, 10.85K$

$= \frac{(17.35 10^3)(10.85 \times 10^3)}{17.35 \times 10^3 + 10.85 \times 10^3}$

$= 6.67K$

$v_i = \frac{0.5 \times 6.67 \times 10^3}{6.67 \times 10^3 + 1,5 \times 10^3}$

$v_i = 0,41 \; V_{pico}$

$e_o = A_V v_i$

$= -9,74 \times .41$

$= 3.97 \; V_{pico}$