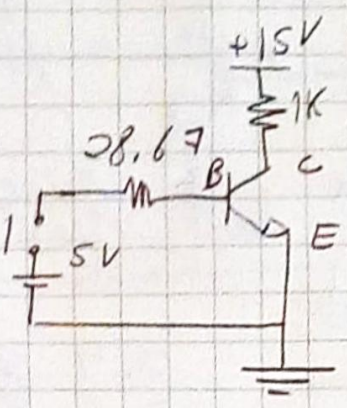
4.- 1.1 V_c switch abierto
1.2 V_c switch cerrado
1.3 $\beta = 225$ $V_{BE} = 0.7V$ en estado I_C.



NPN

1.1 $V_c = 15V$
1.2 $V_c = 15V$

$V_{CC} = 15V$

$V_{BB} = 5V$

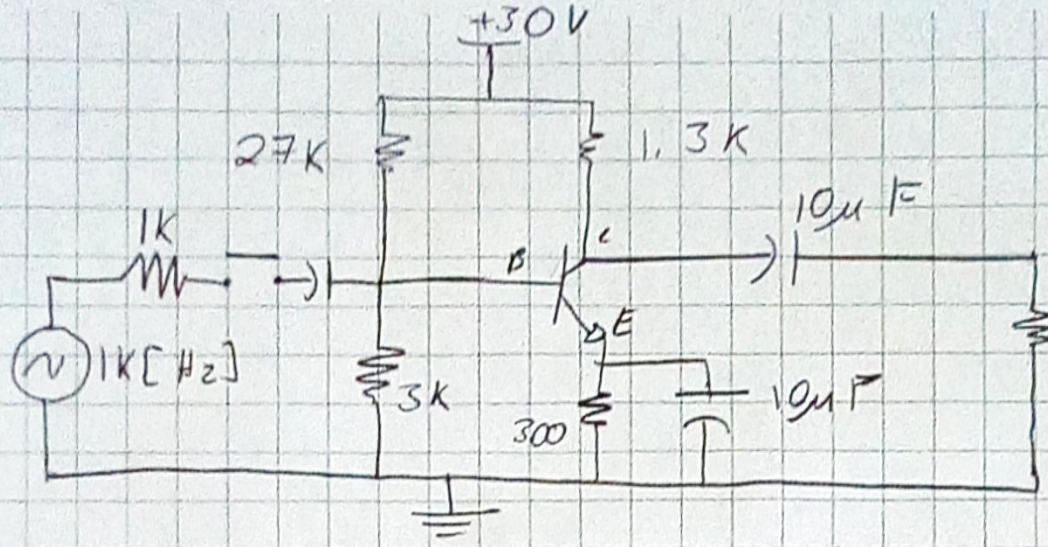
$$I_C = \frac{\beta (V_{BB} - V_{BE})}{R_B + \beta R_E}$$

$$I_C = \frac{225 (5V - (0.7V))}{28.67 + 225(0)}$$

$$I_C = 0.033[A]$$

$$I_C = 33.74[mA]$$

2.) Para el Siguiente Circuito ($\beta = 100$) ($V_{BE} = 0.65$)



2.1 V_{CE} Q, I_{CQ}
2.2 Recta de carga
2.2.1 DC
2.2.2 AC
2.3 V_{SS}
2.4 Modelo en señal pequeña
2.5 A_V, A_i
2.6 V_L / V_f
2.7 I_L / I_f

$$V_{BB} = \frac{(30[V])(3000)}{(27000+3000)} = 3[V]$$

$$R_B = \frac{(27000)(3000)}{(27000+3000)} = 2700$$

a) $$I_{CQ} = \beta * \left(\frac{V_{BB} - V_{BE}}{R_B + \beta R_E}\right) = 100\left(\frac{3 - 0.65}{2700 + 100(300)}\right) =$$

$$\boxed{I_{CQ} = 7.18\,[mA]}$$

$$V_{CEQ} = V_{CC} - I_{CQ}(R_C + R_E) = 30 - 7.18\times10^{-3}(1300+300)$$

$$\boxed{V_{CEQ} = 18.512\,[V]}$$

b) Recta de carga

$$R_{AC} = (R_C \| R_L) = 56.21\,\Omega$$

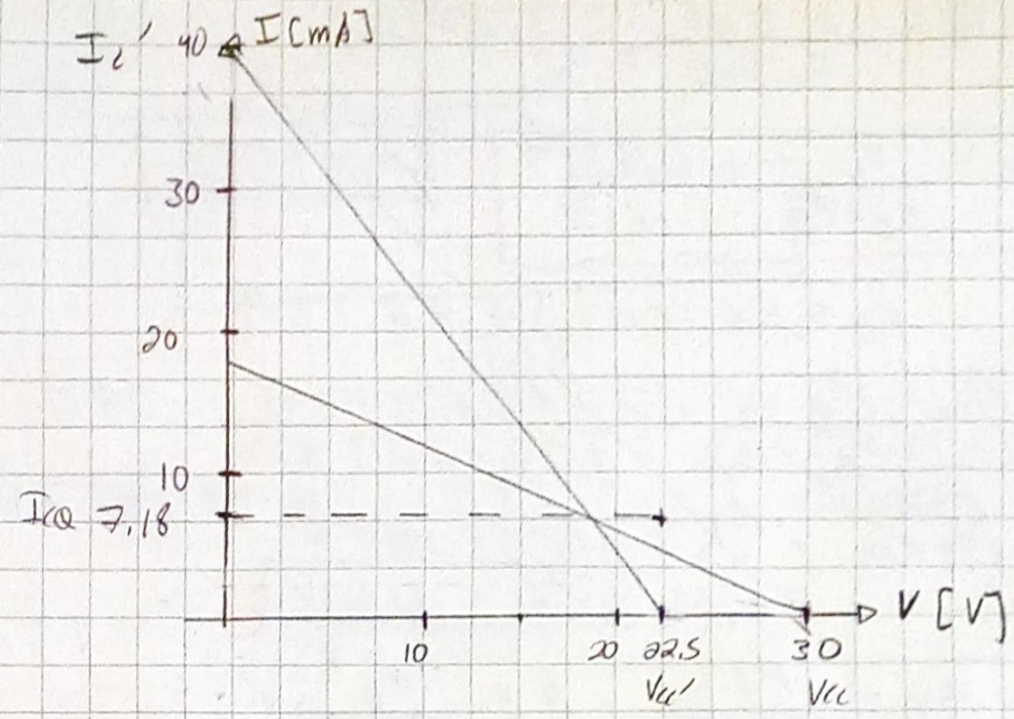
$$V_{CC}' = (R_{AC})(I_{CQ}) + V_{CEQ} = (56.21\Omega)(7.18\times10^{-3}) + 18.512[V]$$

$$\boxed{V_{CC}' = 22.57\,[V]}$$

→ Continuación 2 (2.2)

$$I_{c'} = \frac{V_{CEQ}}{R_{AC}} + I_{cQ} = \frac{18,512[V]}{565,21[\Omega]} + 7,18[mA]$$

$$I_{c'} = 0,0399 = 39,93\ mA$$



Continuación 2

2.5) $r_l = \frac{R_E R_L}{R_E + R_L} = \frac{(300)(1000)}{(300+1000)} = 230.769\,\Omega$

$r_e = \frac{0.026}{7.18 \times 10^{-3}} = 3.62\,\Omega$

$A_v = \frac{r_L}{r_e + r_L} = 0.984$ $\quad$ $A_i = 100$

2.6) $r_n = \beta(r_e + r_L) = 23439$

$R_{in} = \frac{R_B r_n}{R_B + r_n} = \frac{(2700)(23439)}{2700 + 223439} = 280$

$\frac{V_L}{V_t} = \frac{R_{in}}{R_1 + R_{in}} \cdot A_v = \frac{280}{1000+280} \cdot 0.984 = 0.21\,[V]$

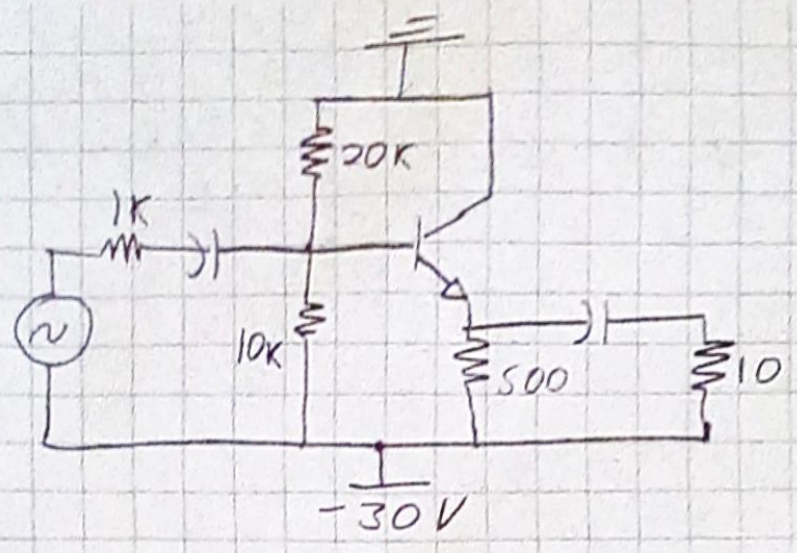
$V_L / V_t = 0.21V$

2.7) $\frac{I_L}{I_t} = \frac{R_t}{R_{in} + R_t} \cdot A_i \cdot \frac{R_E}{R_L + R_E}$

$\frac{I_L}{I_t} = 100 \quad \frac{1000}{280+1000} \cdot \frac{300}{1000+300} = 18.02\,[A]$

$I_L / I_t = 18.02A$

(3) Para el Siguiente circuito $\beta = 100$, $V_{BE} = 0.65$



$$\frac{V_L}{V_f} = \frac{R_{in}}{R_f + R_1} \cdot A_V$$

$$R_B = \frac{(20000)(10000)}{(20000+10000)}$$

$$R_B = 6667\,\Omega$$

$$V_{BB} = 0$$

$$I_{CQ} = 100\left(\frac{0 - 0.65}{6667 + 100(6667)}\right)$$

$$I_{CQ} = -96.32\,\mu A$$

↓ no conduce

$$r_L = \frac{(500)(10)}{(500+10)} = 9.8\,\Omega$$

$$A_V = \frac{r_L}{r_e + r_L}$$

$$r_e = \frac{0.026}{-96.52\,\mu A} = -269.37$$ → falla

↳ es cero

↳ tiende a infinito

$$\frac{V_L}{V_f} = \frac{R_{in}}{R_f + R_{in}} \cdot A_V = \frac{R_{in}}{R_f + R_{in}} \cdot 0 = 0$$

$$\boxed{\frac{V_L}{V_f} = 0}$$

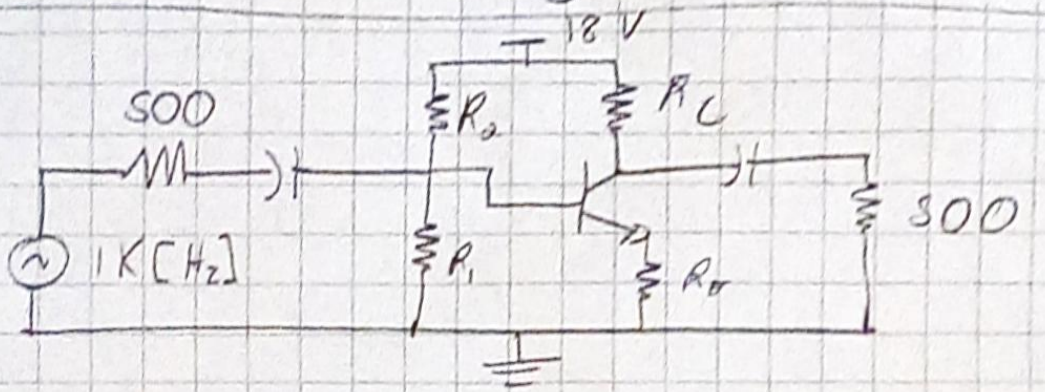
(4) Diseñe un circuito emisor común

$A_V = 5$, $R_L = 500\Omega$

$\beta = 300$ $R_1 = 500\Omega$

$V_{DE} = 0.65$

$V_{CC} = 18\,[V]$



$$r_L = \frac{R_E R_L}{R_E + R_L} = \frac{R_E\,500}{R_E + 500} \qquad R_B = \frac{R_1 R_2}{R_1 + R_2}$$

$$V_{BB} = \frac{(18)(R_1)}{(R_2 + R_1)}$$

$$I_{CQ} = \frac{\left(\frac{18R_1}{R_2 + R_1}\right) - 0.65}{\frac{R_1 R_2}{R_1 + R_2} + 300\,R_E}$$

$$r_e = \frac{0.026}{I_{CQ}} \qquad A_V = \frac{r_L}{r_e + r_L}$$

$$S = \frac{\frac{R_E\,500}{R_E + 500}}{\frac{0.026}{\left(\frac{\left(\frac{18R_1}{R_2+R_1}\right) - 0.65}{\left(\frac{R_1 R_2}{R_1 + R_2} + 300R_E\right)}\right)} + \frac{R_E\,500}{R_E + 500}}$$

(4)

$R_c = \frac{1}{2} R_L$

$R_L = \frac{1}{2}(500) = 250$

$R_c \| R_L = \frac{(250)(500)}{(250+500)} = 166.66$

$R_E' = \frac{R_c \| R_L}{A_v} = \frac{166.66}{5} = 33.33\,\Omega$

$R_{AC} = R_E' + (R_c \| R_L) = 199.99 \rightarrow 200$

$R_{DC} = R_E + R_c' = 33.33 + 250 = 283.33$

$I_{CQ} = \frac{V_{CC}}{R_{DC} + R_{AC}} = \frac{18}{200 + 283.33} = 37.24\,mA$

$r_e = \frac{0.025}{I_{CQ}} = \frac{0.025}{37.24 \times 10^{-3}} = 0.67$

$R_E = R_E' - r_e = 33.33 - 0.67 = 32.65$

$R_B = 0.01 \beta R_E = 0.01(100)(32.65)$

$R_B = 77.16$

$V_{BB} = 0.65 + 1.01(32.65)(37.24 \times 10^{-3})$

$V_{BB} = 1.878\,[V]$

$R_1 = \frac{V_{CC} R_B}{V_{BB}} = \frac{18(77.16)}{1.878} = 739.63$

$R_2 = \frac{R_E}{1 - \frac{V_{BB}}{V_{CC}}} = \frac{32.65}{1 - \frac{1.878}{18}} = 36.453$

$R_2 = 36.453$

$R_1 = 739.63$