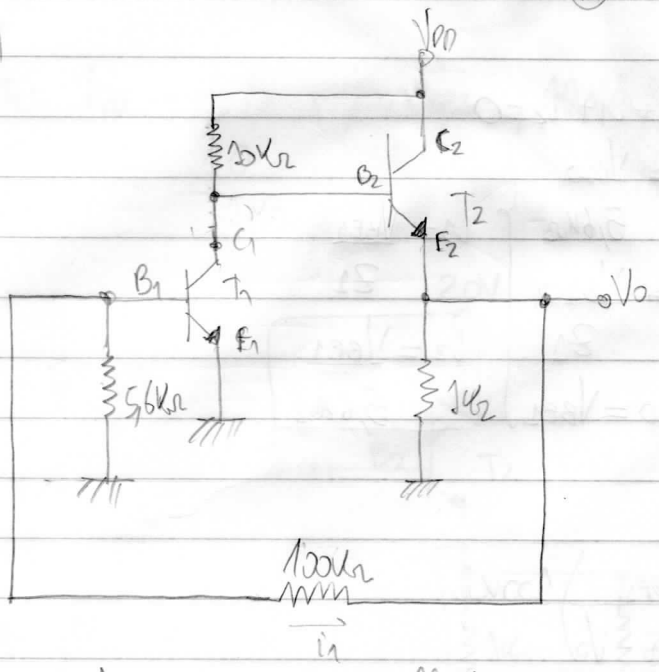
Ejercicio 3 Practico 1.

(H) T_1 y T_2 estan Z.A.

a)



aplico teorema de Miller

$$K = \frac{V_o}{V_{BB}} \qquad i_1 = \frac{V_{BB} - V_o}{Z} \Rightarrow i_1 = \frac{V_{BB} - KV_{BB}}{Z} = \frac{(1-K)V_{BB}}{Z}$$

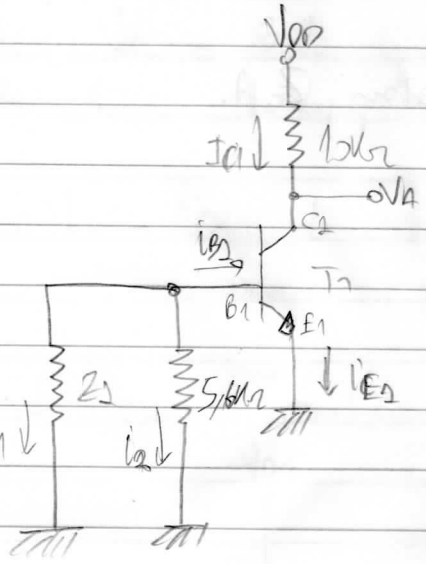
$$Z = 100\,k\Omega \qquad i_1 = \frac{V_1}{\frac{Z}{1-K}} = \frac{V_1}{Z_1} \;;\; \text{con } Z_1 = \frac{Z}{1-K}$$

y $Z_2 = \frac{K}{K-1} Z$

$$Z_1 = \frac{100k\Omega}{1 - \frac{V_o}{V_{BB}}} \;;\; Z_2 = \frac{V_o/V_{BB}}{\frac{V_o}{V_{BB}} - 1} 100k\Omega$$

$$Z_1 = \frac{100k\Omega}{\frac{V_{BB} - V_o}{V_{BB}}} \;;\; Z_2 = \frac{V_o/V_{BB}}{V_o - V_{BB}} \cdot 100k\Omega \Rightarrow \boxed{Z_1 = \left(\frac{V_{BB}}{V_{BB} - V_o}\right) 100k\Omega}$$

$$\boxed{Z_2 = \frac{V_o}{V_o - V_{BB}} 100k\Omega}$$



$$i_{B1} + i_1 + i_2 = 0$$

$$i_2 = \frac{V_{BE1}}{5{,}6k\Omega} \qquad i_1 = \frac{V_{BE1}}{Z_1}$$

$$i_1 = \frac{V_{BE1}}{Z_1} \qquad \boxed{i_2 = \frac{V_{BE1}}{5{,}6k\Omega}}$$

$$V_{BE1} = V_{BE1}$$

$$Z_1 = \left(\frac{V_{BE1}}{V_{BE1} - V_0}\right) 100k\Omega \Rightarrow \boxed{Z_1 = \left(\frac{V_{BE1}}{V_{BE1} - V_0}\right) 100k\Omega}$$

$$i_1 = \frac{V_{BE1} - V_0}{(100k\Omega)\, V_{BE1}} V_{BE1} \Rightarrow \boxed{i_1 = \frac{V_{BE1} - V_0}{100k\Omega}}$$

$$i_{B1} = -i_1 - i_2 \Rightarrow i_{B1} = -\frac{(V_{BE1} - V_0)}{100k\Omega} - \frac{V_{BE1}}{5{,}6k\Omega}$$

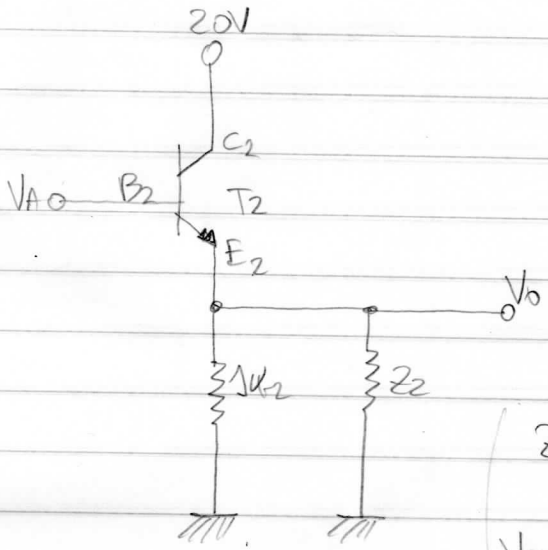
$$i_{B1} = \frac{V_0 - V_{BE1}}{100k\Omega} - \frac{V_{BE1}}{5{,}6k\Omega} \qquad \boxed{i_{C1} = \frac{\beta_1 (V_0 - V_{BE1})}{100k\Omega} - \frac{V_{BE1}\beta_1}{5{,}6k\Omega}}$$

$$i_{C1} = \beta_1 i_{B1}$$

$$i_{C1} = \frac{V_{DD} - V_A}{1k\Omega} \Rightarrow \boxed{\frac{V_{DD} - V_A}{1k\Omega} = \frac{\beta_1 (V_0 - V_{BE1})}{100k\Omega} - \frac{\beta_1 V_{BE1}}{5{,}6k\Omega}}$$

$$\frac{V_{DD}}{1K\Omega} - \frac{\beta_2 V_o}{100K\Omega} + \frac{\beta_2 V_{BE1}}{100K\Omega} + \frac{\beta_2 V_{BE1}}{5,6K\Omega} = \frac{V_A}{10K\Omega}$$

$$V_A = V_{DD} - \frac{\beta_2 V_o}{10} + \frac{\beta_2 V_{BE1}}{10} + \frac{10K\Omega\,\beta_2 V_{BE1}}{5,6K\Omega}$$



$$Z_2 = \frac{V_o}{V_o - V_{BE10}} 100K\Omega$$

$$V_{BE10} = V_{BE1}$$

$$\Rightarrow Z_2 = \frac{V_o}{V_o - V_{BE1}} 100K\Omega$$

$$\Rightarrow V_A - V_o = V_{BE2} \Rightarrow V_A = V_{BE2} + V_o$$

$$V_{BE2} + V_o = V_{DD} - \frac{\beta_2 V_o}{10} + \frac{\beta_2 V_{BE1}}{10} + \frac{10\beta_2 V_{BE1}}{5,6}$$

$$V_o + \frac{\beta_2 V_o}{10} = V_{DD} - V_{BE2} + \frac{\beta_2 V_{BE1}}{10} + \frac{10\beta_2 V_{BE1}}{5,6}$$

$$\Rightarrow \left(\frac{10+\beta_2}{10}\right) V_o = V_{DD} - V_{BE2} + \frac{\beta_2 V_{BE1}}{10} + \frac{10\beta_2 V_{BE1}}{5,6}$$

$$V_o = \frac{10 V_{DD}}{10+\beta_1} - \frac{10 V_{BE2}}{10+\beta_1} + \frac{10}{10+\beta_2}\frac{\beta_2}{10} V_{BE1} + \frac{100}{10+\beta_2}\frac{\beta_1}{5,6} V_{BE1}$$

$$V_o = \frac{\beta_1}{10+\beta_1}\left(V_{BE2} + \frac{100}{5,6} V_{BE1}\right) + \frac{10}{10+\beta_1}\left(V_{DD} - V_{BE2}\right)$$