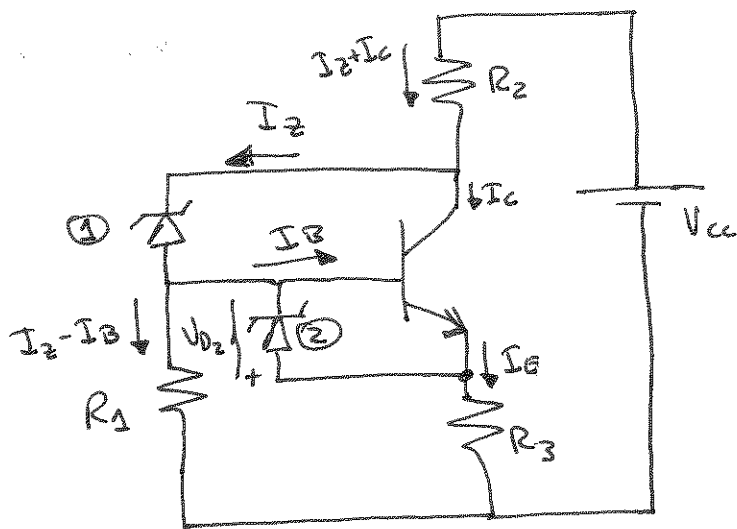


Solución ejercicio refuerzo Bipolar:

a) Circuito en DC



Supongo activa para BJT:

$$I_C = \beta I_B \quad I_E = (\beta + 1) I_B$$

$$V_{BE} = 0.7V$$

$$V_{D2} = -0.7V \Rightarrow \begin{cases} < V_Z = 0.8V \\ > -|V_Z| = -3.6V \end{cases}$$

$\Rightarrow D_2$ en corte

Supongo D_1 en Zener

$$\Rightarrow V_{CB} = 3.6V = V_Z$$

$$\Rightarrow V_{CE} = V_{CB} + V_{BE} = 4.3V > 0.2V \quad \text{OK ACTIVA}$$

MDUA B-E:

$$V_{CC} = (I_2 + I_C) R_2 + V_Z + V_{BE} + I_E R_3$$

EXT:

$$V_{CC} = (I_2 + I_C) R_2 + V_Z + (I_2 - I_B) R_1$$

$$\left\{ \begin{aligned} (I_2 - I_B) R_1 &= V_{BE} + I_E R_3 \\ I_2 &= \frac{V_{BE} + I_E R_3 + I_B R_1}{R_1} \end{aligned} \right.$$

$$V_{CC} = \left(\frac{V_{BE} + I_E R_3 + I_B R_1}{R_1} + I_C \right) R_2 + V_Z + V_{BE} + I_E R_3$$

$$V_{CC} - V_Z - V_{BE} - \frac{R_2}{R_1} V_{BE} = \frac{R_2 R_3}{R_1} (\beta + 1) I_B + I_B R_2 + \beta I_B R_2 + (\beta + 1) I_B R_3$$

$$V_{CC} - \frac{R_2}{R_1} V_{BE}$$

$$= 27.67 \mu A$$

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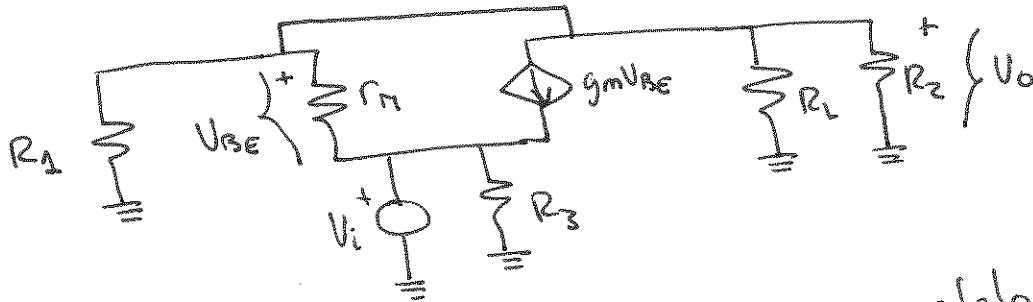
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Cartagena99

$$b) I_2 = \frac{V_{BE} + I_E R_3 + I_B R_1}{R_1} = 8 \text{ mA} \quad I_{2, \text{max}} = \frac{V_{CC} - V_Z}{R_2} = 27.67 \mu A$$

c) D1: ZENER $\equiv \frac{1}{V_Z} V_Z \rightarrow$ en ac

D2: CORTE \equiv en ac

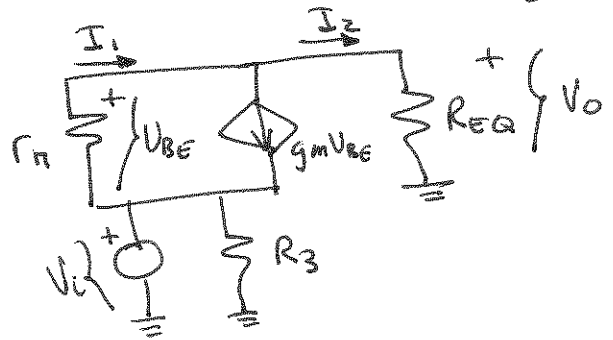


R_1, R_2 y R_L en paralelo $\equiv R_{EQ} \parallel 340'9 \Omega$

d) $V_o = V_{BE} + V_i$

$I_1 = g_m V_{BE} + I_2$

$\frac{V_i - V_o}{r_\pi} = g_m (V_o - V_i) + \frac{V_o}{R_{EQ}}$



$g_m = \frac{I_C}{V_T} = 214'34 \frac{mA}{V}$

$r_\pi = \frac{\beta}{g_m} = 933'09 \Omega$

$\frac{V_i}{r_\pi} + g_m V_i = \frac{V_o}{r_\pi} + g_m V_o + \frac{V_o}{R_{EQ}}$

$\frac{V_o}{V_i} = \frac{\frac{1}{r_\pi} + g_m}{\frac{1}{r_\pi} + g_m + \frac{1}{R_{EQ}}} = 0'9865$

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