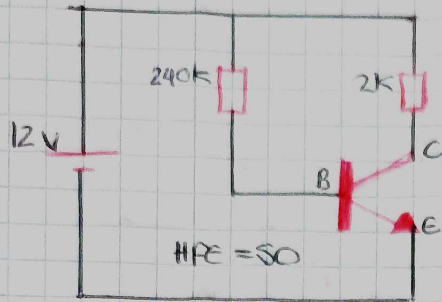


Polarización fija

$$I_C = I_E$$



$V_{CC} = 12V$
 $R_B = 240K$
 $R_C = 2K$
 $HFE = 50$

Formulas

$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = HFE \times I_B$$

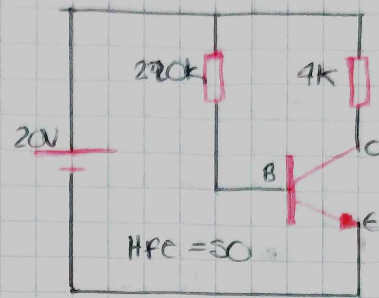
$$V_{CE} = V_{CC} - (R_C \times I_C)$$

$$I_B = \frac{12V - 0.7V}{240} = 47.08 \mu A$$

$$I_C = 50 \times 47.08 \mu A = 2.35 mA$$

$$V_{CE} = 12V - (2K \times 2.35 mA)$$

$$V_{CE} = 7.29V$$



$V_{CC} = 20V$
 $R_B = 220K$
 $R_C = 4K$
 $HFE = 50$

$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = HFE \times I_B$$

$$V_{CE} = V_{CC} - (R_C \times I_C)$$

$$I_B = \frac{20V - 0.7V}{220K} = 87.73 \mu A$$

$$I_C = 50 \times 87.73 \mu A$$

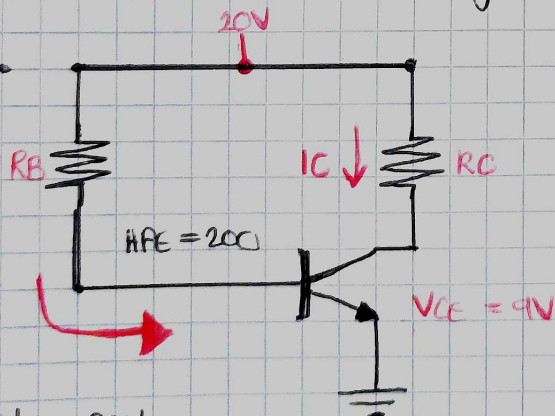
$$I_C = 4.38 mA$$

$$V_{CE} = 20 - (4K \times 4.38 mA)$$

$$V_{CE} = 2.46V$$

EJERCICIO:

Encontrar los valores R_B y R_C



$V_{CC} = 20V$
 $V_{CE} = 9V$
 $I_B = 25 \mu A$
 $HFE = 200$

$$R_C = \frac{V_{CC} - V_{CE}}{I_C}$$

$$R_B = \frac{V_{CC} - V_{BE}}{I_B}$$

SOLUCIÓN:

$$I_C = 200 \times 25 \mu A$$

$$I_C = 5 mA$$

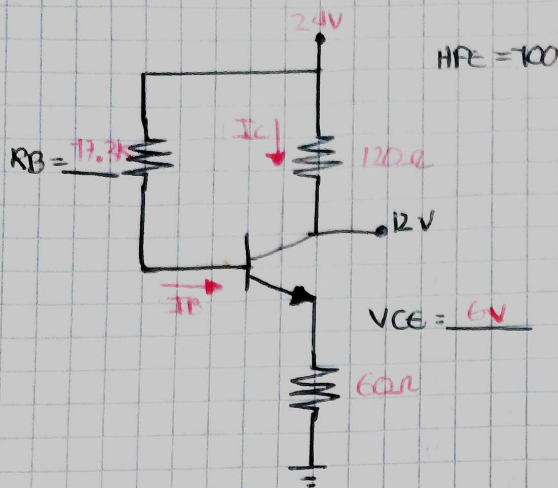
$$R_C = \frac{20V - 9V}{5mA} = 2.2 K\Omega$$

$$R_B = \frac{20V - 0.7V}{25 \mu A} = 772 K\Omega$$

$$R_C = 2.2 K\Omega$$

$$R_B = 772 K\Omega$$

En los siguientes ejercicios encuentre los valores R_B y V_{CE}



$$I_C = \frac{24V - 12V}{120\Omega} = 100mA$$

$$I_C \approx I_E$$

$$V_E = 100mA \cdot 60\Omega$$

$$V_E = 6V$$

$$V_{CE} = V_C - V_E$$

$$V_{CE} = 12V - 6V = 6V$$

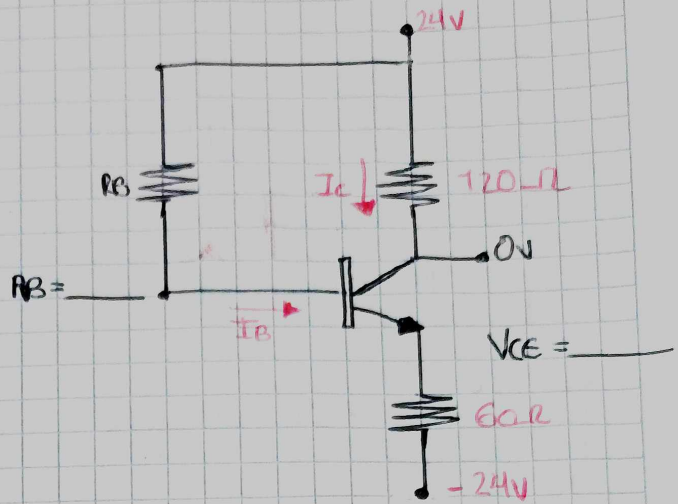
$$I_B = \frac{100mA}{100} = 1mA$$

$$V_B = V_E + V_{BE}$$

$$V_B = 6V + 0.7V = 6.7V$$

$$R_B = \frac{V_{CC} - V_B}{I_B}$$

$$R_B = \frac{24V - 6.7V}{1mA} = 17.3k\Omega$$



$$I_C = \frac{24V - 0V}{120\Omega} = 200mA$$

$$I_C \approx I_E$$

$$V_E = 200mA \cdot 60\Omega$$

$$V_E = 12V$$

$$V_{CE} = 0V - 12V$$

$$V_{CE} = -12V$$

$$I_B = \frac{200mA}{100} = 2mA$$

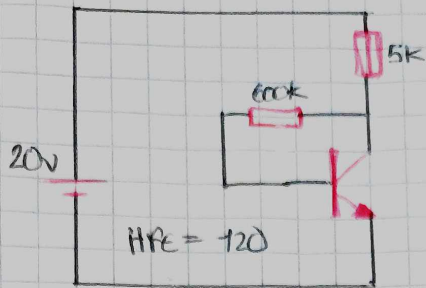
$$V_B = 12V + 0.7V$$

$$V_B = 12.7V$$

$$R_B = \frac{24V - 12.7V}{2mA}$$

$$R_B = 5.65k\Omega$$

Polarización por resistencias del colector



$$V_{CE} = 10.39V$$

$$I_E = 1.938mA$$

$$I_B = \frac{20V - 0.7}{600k\Omega + (121 \cdot 5k)} = \frac{19.3V}{705.000} \approx 16.02\mu A$$

$$I_C = HFE \cdot I_B$$

$$I_C = 120 \cdot 16.02\mu A = 1.922mA$$

$$I_E \approx I_C + I_B = 1.922mA + 0.016mA \approx 1.938mA$$

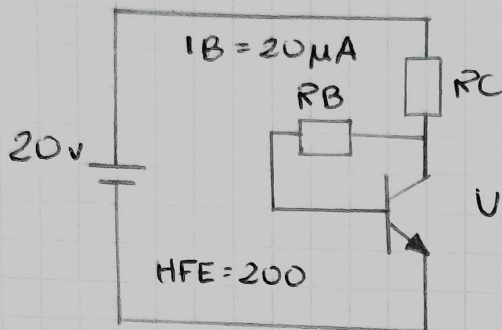
$$V_{RC} = R_C \cdot I_C$$

$$V_{RC} = 5k \cdot 1.922 = 9.61V$$

$$V_{CE} = V_{CC} - V_{RC} = 20V$$

$$V_{CE} = 20V - 9.61V = 10.39V$$

- En el siguiente ejercicio encuentre los valores R_B y R_C para polarizar el transistor en la forma solicitada.



$$I_C = HFE \cdot I_B$$

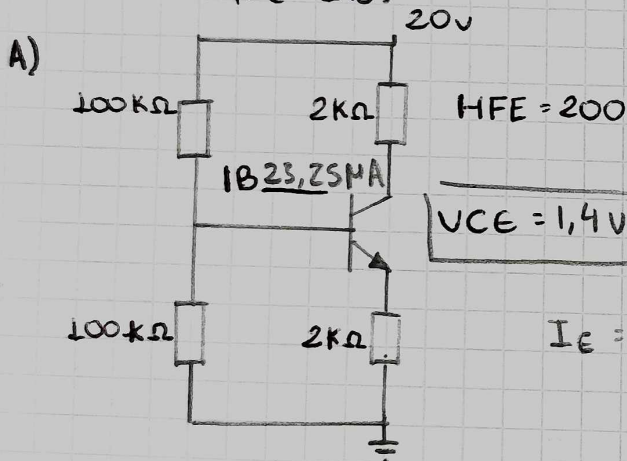
$$I_C = 200 \cdot 20 \mu A$$

$$V_{CE} = 10V. \quad I_C = 4000 \mu A = 4mA$$

$$R_C = \frac{20V - 10V}{4mA} = 2500 \Omega = 2,5K\Omega$$

$$R_B = \frac{20V - 0,7}{20 \mu A} = 965000 \Omega = 965K\Omega$$

- En los siguientes ejercicios encuentre los valores de V_{CE} y la corriente I_B .



$$V_B = 20 \left(\frac{100K\Omega}{100K\Omega + 100K\Omega} \right)$$

$$V_B = 10V$$

$$V_E = V_B - V_{BE} = 10 - 0,7 = 9,3V$$

$$I_E = \frac{9,3V}{2 \times 10^3} = 4,65mA$$

$$V_{RC} = I_C \cdot R_C = 4,65mA \cdot 2K\Omega = 9,3V$$

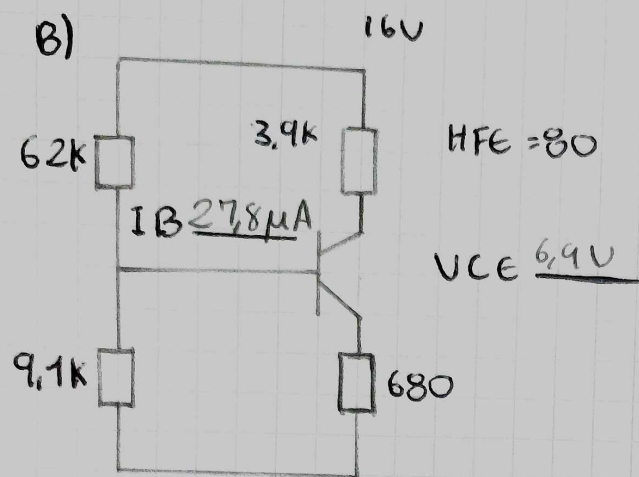
$$V_C = V_{CC} - V_{RC} = 20 - 9,3 = 10,7V$$

$$V_{CE} = V_C - V_E = 10,7 - 9,3 = 1,4V$$

$$I_C \approx I_E$$

$$I_C = HFE \cdot I_B$$

$$I_B = \frac{I_C}{HFE} = \frac{4,65mA}{200} = 23,25 \mu A$$



$$I_E = \frac{V_E}{R_E} = \frac{1.348V}{680} = 1.982mA$$

$$I_C = I_E$$

$$I_C = H_{FE} \cdot I_B$$

$$I_B = \frac{I_E}{H_{FE}} = \frac{1.982mA}{80} = 24.775 \mu A$$

$$V_B = V_{CC} \cdot \frac{R_2}{R_2 + R_1} = 16 \left(\frac{9.1k\Omega}{62k\Omega + 9.1k\Omega} \right)$$

$$V_B = 2.048V \approx 2V$$

$$V_E = V_B - V_{BE} = 2.048 - 0.7$$

$$V_E = 1.348V$$

$$V_{RC} = I_C \cdot R_C = 1.982mA \cdot 3.9k = 7.73V$$

$$V_C = V_{CC} - V_{RC} = 16V - 7.73V = 8.27V$$

$$V_{CE} = V_C - V_E = 8.27 - 1.348 = 6.922V$$

$$V_{CE} \approx 6.9V$$