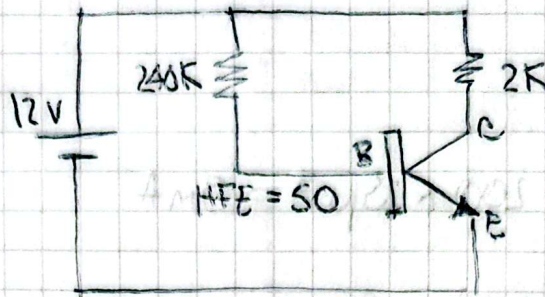


Polarización fija

Primer circuito

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



Calcular I_B

$$I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{12 - 0.7}{240000} = \frac{11.3}{240000} = 47.08 \times 10^{-5} A$$

Calcular I_C

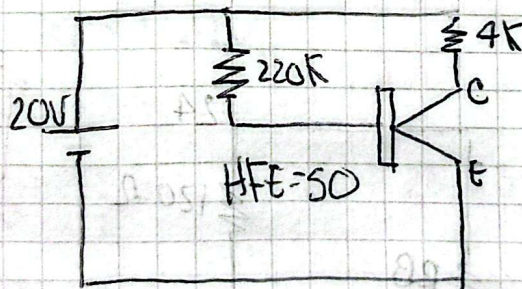
$$I_C = HFE \cdot I_B = 50 \cdot 47.08 \times 10^{-5} = 0.00235 A$$

Calcular V_{CE}

$$V_{CE} = V_{CC} - (R_C \cdot I_C) = 12 - (2000 \cdot 0.00235) = 12 - 4.7 = 7.2 V$$

Segundo circuito

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



Calcular I_B

$$I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{20 - 0.7}{220000} = \frac{19.3}{220000} = 8.77 \times 10^{-5} A$$

Calcular I_C

$$I_C = 50 \times 8.77 \times 10^{-5} = 0.00439 A$$

Calcular V_{CE}

$$V_{CE} = V_{CC} - (R_C \cdot I_C) = 20 - (4000 \cdot 0.00439) = 20 - 17.56 = 2.44 V$$

2-

- $V_{CC} = 20V$
- $V_{CE} = 9V$
- $I_B = 25\mu A$
- $HFE = 200$
- $I_C = HFE \cdot I_B = 200 \times 25\mu A = 5mA$

$$V_{CC} = I_C \cdot R_C + V_{CE}$$

$$R_C = \frac{V_{CC} - V_{CE}}{I_C} = \frac{20 - 9}{0.005} = 2.2k\Omega$$

$$R_B = \frac{V_{CC} - V_{BE}}{I_B} = \frac{20 - 0.7}{0.000025} = 772k\Omega$$

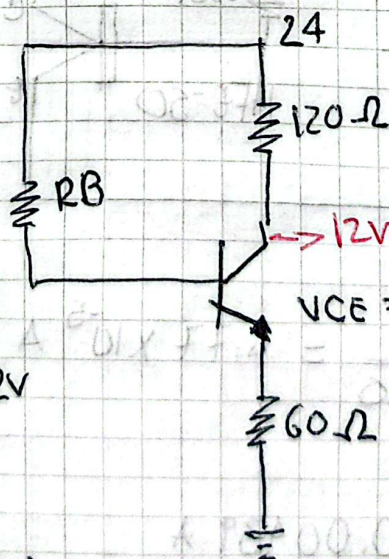
3-

- $V_{CE} = 6V$
- $V_{CC} = 9V$
- $V_{EE} = -3V$
- $HFE = 100$

No tenemos ninguna corriente, por lo tanto
habría que asumir algunos valores

4-

- $V_{CC} = 24V$
- $V_C = 12V$
- $R_E = 60\Omega$
- $R_C = 120\Omega$
- $HFE = 100$
- $V_E = 0V$
- $V_{CE} = ?$



$$V_E = I_E \cdot R_E = 0.1 \cdot 60 = 6.06V$$

$$V_B = V_E + V_{BE} = 6.06 + 0.7 = 6.76V$$

$$R_B = \frac{V_{CC} - V_B}{I_B} = \frac{24 - 6.76}{0.001} = 17.24k\Omega$$

$$V_{CE} = V_C - V_E = 12 - 6.06 = 5.94V$$

$$V_{CC} = I_C \cdot R_C + V_{CE} + I_E \cdot R_E$$

$$V_{RC} = V_{CC} - V_C = 24 - 12 = 12V$$

$$I_C = \frac{V_{RC}}{R_C} = \frac{12}{120} = 0.1A$$

$$I_B = \frac{I_C}{HFE} = \frac{0.1}{100} = 0.001A$$

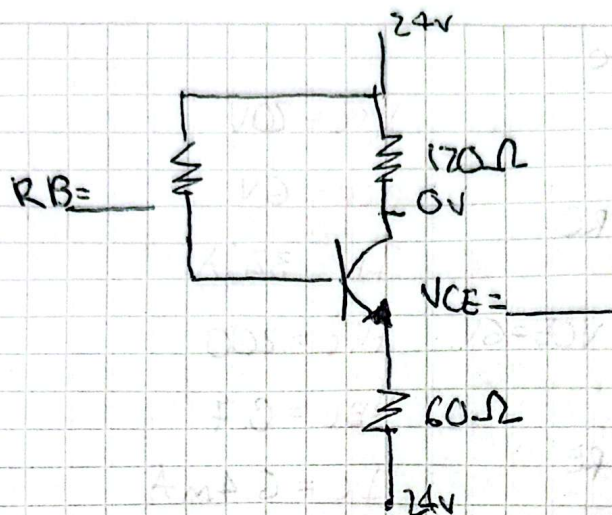
5- $V_{CC} = 24V$

$V_C = 0V$

$V_E = -24V$

$R_C = 120\Omega$

$R_E = 60\Omega$



V_{RC}

$$V_{RC} = V_{CC} - V_C = 24 - 0 = 24$$

$$I_C = \frac{V_{RC}}{R_C} = \frac{24}{120} = 0.2A$$

~~$I_E = I_C + I_B$~~

$$I_B = \frac{I_C}{\beta_{FE}} = \frac{0.2}{100} = 0.002A$$

$$I_E = I_C + I_B = 0.2 + 0.002 = 0.202A$$

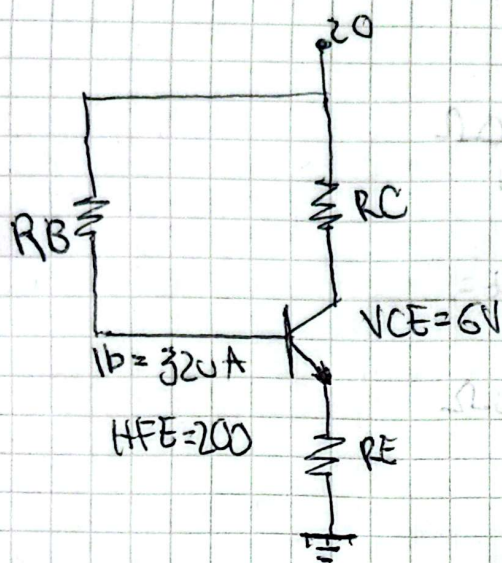
$$V_E = I_E \cdot R_E = 0.202 \cdot 60 = 12.12V$$

$$V_B = V_E + V_{BE} = -24 + 0.7 = -23.3V$$

$$R_B = \frac{V_{CC} - V_B}{I_B} = \frac{24 + 23.3}{0.002} = \frac{47.3}{0.002} = 23.65K\Omega$$

$$V_{CE} = V_C - V_E = 0 + 24 = 24V$$

6-



$$V_{CC} = 20V$$

$$V_{CE} = 6V$$

$$I_B = 32\mu A$$

$$HFE = 200$$

$$V_{BE} = 0.7V$$

$$I_C = 6.4mA$$

$$I_C = HFE \cdot I_B = 200 \cdot 32\mu A = 6.4mA$$

$$I_E = I_C + I_B = 6.4mA + 0.032mA = 6.432mA$$

$$V_E = V_{CE} - V_{CB} = 6 - V_{CB}$$

$$V_B = V_{PB} = V_{CC} - I_B \cdot R_B$$

$$V_{RC} = V_{CC} - V_{CE} - V_E$$

$$V_{RC} = V_{CC} - V_C$$

$$V_C = V_{CE} + V_E \Rightarrow V_{RC} = V_{CC} - (V_{CE} + V_E) = 20 - V_{CE} - V_E$$

$$V_{RC} = V_{CC} - V_C = 20 - (V_E + V_{CB}) = 20 - (V_E + 6)$$

$$V_{RC} = V_{CC} - V_{CE} - V_E \Rightarrow V_{RC} = 20 - 6 - V_E$$

$$V_{RC} = I_C \cdot R_C \Rightarrow R_C = \frac{V_{RC}}{I_C} = \frac{20 - 6 - V_E}{6.4mA} = \frac{14 - V_E}{6.4mA}$$

$$V_E = I_E \cdot R_E \Rightarrow R_E = \frac{V_E}{I_E} = \frac{V_E}{6.432mA}$$

$$R_E = \frac{2}{6.432mA} = 311\Omega$$

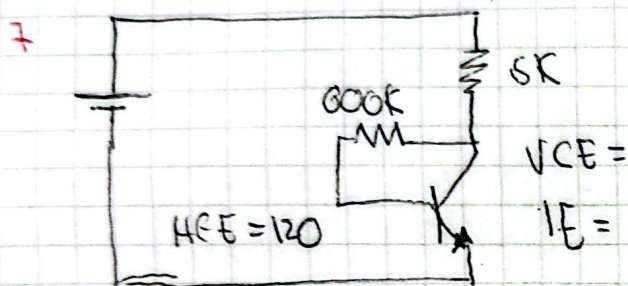
$$V_{RC} = 20 - 6 - 2 = 12$$

$$R_C = \frac{12}{6.4mA} = 1875\Omega$$

$$R_B =$$

$$V_B = V_E + V_{BE} = 2 + 0,7 = 2,7V$$

$$R_B = \frac{V_{CC} - V_B}{I_B} = \frac{20 - 2,7}{32 \mu A} = 540,6 K$$



$$\begin{aligned} V_{CC} &= 20 \\ R_C &= 5K \\ R_B &= 600K \\ HFE &= 120 \\ V_{BE} &= 0,7 \end{aligned}$$

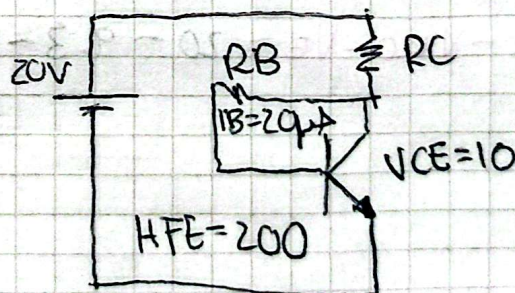
$$I_B = \frac{V_{CC} - V_{BE}}{R_B + HFE \cdot R_C} = \frac{20 - 0,7}{600 + 120 \cdot 5K} = \frac{19,3}{(600 + 600) K} = \frac{19,3}{1,2 M\Omega} = 16,08 \mu A$$

$$I_C = HFE \cdot I_B = 120 \cdot 16,08 \mu A = 1,93 mA$$

$$I_E = I_C + I_B = 1,93 mA + 0,016 mA = 1,946 mA$$

$$V_{CE} = V_{CC} - I_C R_C = 20 - (1,93 mA \cdot 5K) = 20 - 9,65 = 10,35 V$$

$$\begin{aligned} V_{CC} &= 20 \\ V_{CE} &= 10 \\ I_B &= 20 \mu A \\ HFE &= 200 \\ I_C &= HFE \cdot I_B = 4 mA \end{aligned}$$

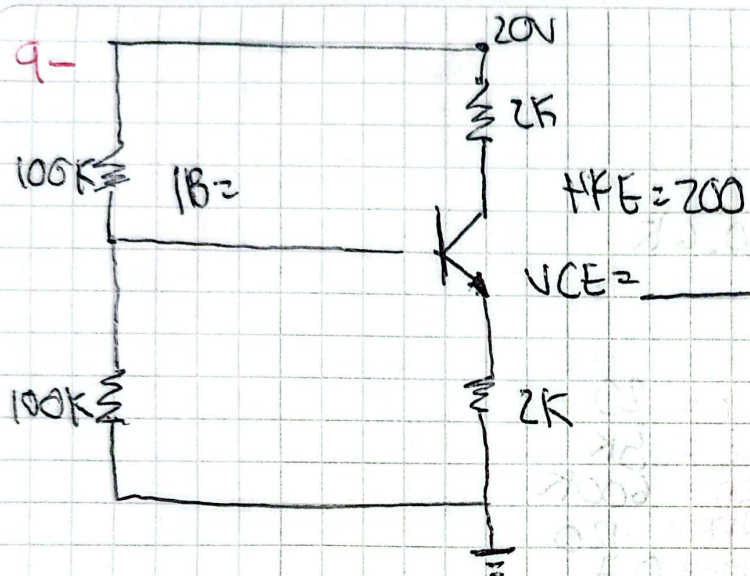


R_C

$$V_{EC} = V_{CC} - V_{CE} = 20 - 10 = 10$$

$$R_C = \frac{V_{EC}}{I_C} = \frac{10}{4 mA} = 2,5 K\Omega$$

$$\begin{aligned} V_{BB} &= V_{CC} - V_{BE} = 20 - 0,7 = 19,3V \\ R_B &= \frac{V_{BB}}{I_B} = \frac{19,3}{20 \mu} = 965 K\Omega \end{aligned}$$



$$V_B = V_{CC} \cdot \frac{R_2}{R_1 + R_2} = 20 \cdot \frac{100k}{200k} = 10V$$

$$V_E = V_B - V_{BE} = 10 - 0.7 = 9.3V$$

$$I_E = \frac{V_E}{R_E} = \frac{9.3V}{2k} = 4.65mA$$

$$I_B = \frac{I_C}{HFE} = \frac{4.65mA}{200} = 23.25\mu A$$

$$V_{RC} = I_C \cdot R_C = 4.65mA \cdot 2k = 9.3V$$

$$V_{CE} = V_{CC} - V_{RC} - V_E = 20 - 9.3 - 9.3 = 1.4V$$