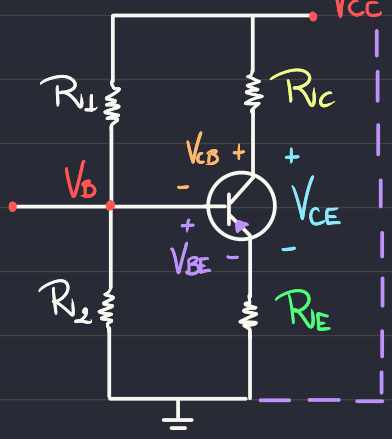
Lista 5 ⇒

1)

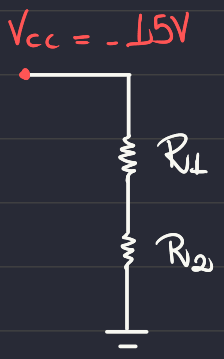


$V_{CC} = -15V$ $\quad R_C = 1{,}2\,k\Omega$

$R_E = 330\,\Omega$ $\quad R_1 = 10\,k\Omega$

$R_2 = 3{,}3\,k\Omega$ $\quad \beta = 100$

- Determine V_B, V_E, V_C e I_C (em mA):



$$V_B = V_{CC} \cdot \frac{R_2}{R_1 + R_2} \Rightarrow$$

$$V_B = -15 \cdot \frac{3{,}3 \cdot 10^3}{10 \cdot 10^3 + 3{,}3 \cdot 10^3} = -3{,}702\,V$$

→ Como $I_E \simeq I_C$, então: Transistor de Si

$$I_C \simeq I_E \simeq \frac{V_B - V_{BE}}{R_E} = \frac{-3{,}702 - (-0{,}7)}{330} \Rightarrow$$

$$I_C = -9{,}158\,mA$$

→ Utilizando a análise aproxima, temos que:

$$V_{CE} = V_{CC} - I_C (R_C + R_E) \rightarrow$$

$$V_{CE} = -15 - (-9,158m)(1,2K + 330) \rightarrow$$

$$V_{CE} = -15 + 14,0117 = 0,988V$$

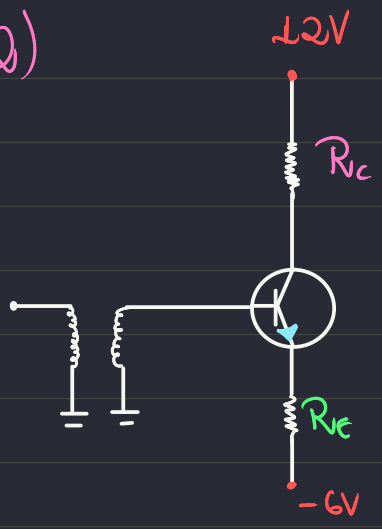
→ Por fim, encontrando V_C:

$$V_C = V_{CE} + V_E = -0,988 - 3,722 - (-0,7V)$$

$$V_C = -4,01V$$

$$V_E = -3,722 - (0,7) = -4,422$$

2)



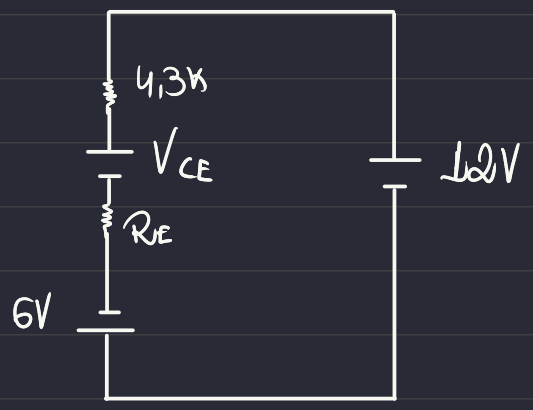
$R_C = 4{,}3K\Omega \qquad V_{BE} = 0{,}7V$

$\beta = 50 \qquad V_{CE} = 4V$

- Considerando $I_E = I_B + I_C$.

$V_{RE} = 6 - V_{BE} = 5{,}3\,V$

a)



$-6 - 12 + 4{,}3K I_C + V_{CE} + 5{,}3 = 0 \rightarrow$

$4{,}3K I_C = 6 + 12 - 4 - 5{,}3 \rightarrow$

$4{,}3K I_C = 8{,}7 \rightarrow$

$$I_C = \frac{8{,}7}{4{,}3K} = 2{,}023\,mA$$

→ Utilizando o ganho para encontrar o I_B:

$$I_C = \beta \cdot I_B \rightarrow I_B = \frac{2{,}023m}{50} = 40{,}46\,\mu A$$

$$I_E = I_B + I_C = 40{,}46 \cdot 10^{-6} + 2{,}023 \cdot 10^{-3}$$

$$I_E = 2{,}063\,mA$$

$$R_E = \frac{V_{RE}}{I_E} = \frac{5{,}3}{2{,}063m} \rightarrow R_E = 2{,}569K\Omega$$

b) Considerando que $\frac{\partial I_B}{\partial I_C} = 0$:

$$S = \frac{1+\beta}{1-\beta \frac{\partial I_B}{\partial I_C}} = 1+\beta = 1+50 \rightarrow$$

($\frac{\partial I_B}{\partial I_C} \rightarrow 0$)

$$S = 51$$