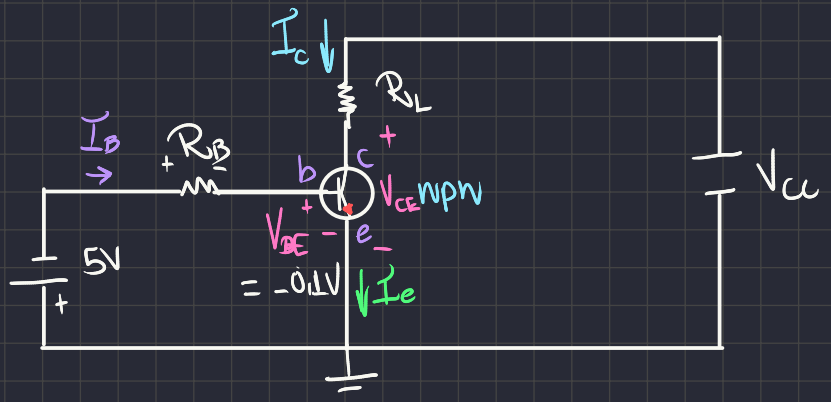
Lista 02 ⇒

Ge = 0,3V

1)



ICO = 2,5μA (25°C)
↳ 2x por 10°C

V_{bb} = 5V

I_E = 0V I_B = -ICO

a) Em 75°C, ICO = 80μA, então:

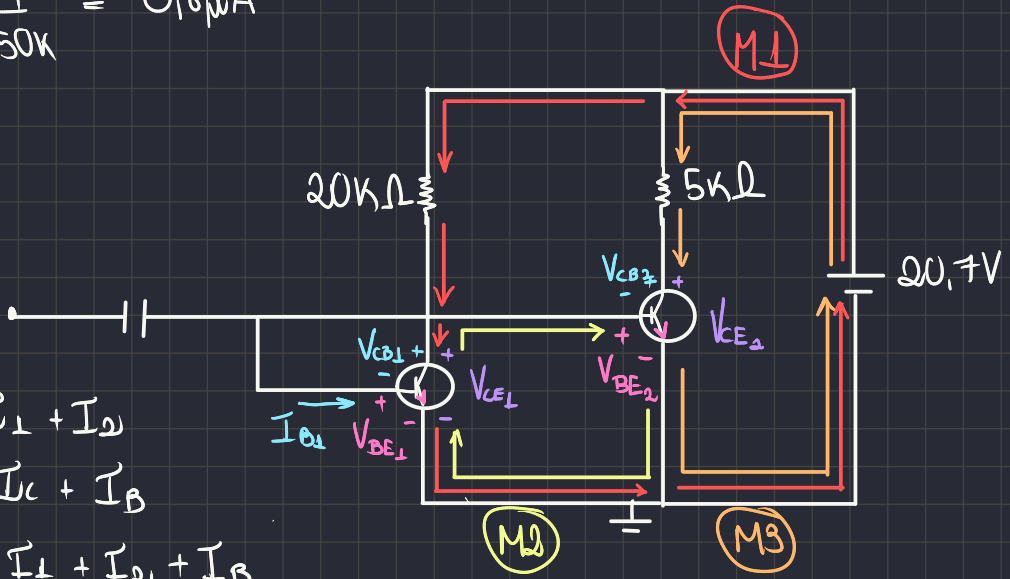
I_B = - 80μA $5 + V_{R_B} + V_{BE} = 0 \Rightarrow V_{R_B} = -5 + 0,1 = -4,9V$

$R_B = \frac{V_{RB}}{I_B} \Rightarrow R_B = \frac{-4,9}{-80 \cdot 10^{-6}} = 61,25k\Omega$

b) Se V_{BB} = 1V e R_B = 50kΩ

$I_B = \frac{4}{50K} = 0,8\mu A$

2)



$I_C = I_1 + I_2$

$I_E = I_C + I_B$

$I_E = I_1 + I_2 + I_B$

a) I_{B1}, I_{B2}, I_{C1} e I_{C2}.

M1 $-20,7 + V_{CE_1} + 20K I_1 = 0$ ⇒ I_1 = 1mA

M2 $-V_{CE_1} + V_{BE_2} = 0 \Rightarrow V_{BE_2} = V_{CE_1} = 0,7V$

M3 $V_{CE_2} + 5K I_3 - 20,7 = 0$

- Fazendo o nó:

$$I = I_{B2} + I_{C1} + I_{B1} \rightarrow 1 \cdot 10^{-3} = \overbrace{I_{B1} + I_{B2} + \beta I_{B1}}^{=} \rightarrow$$

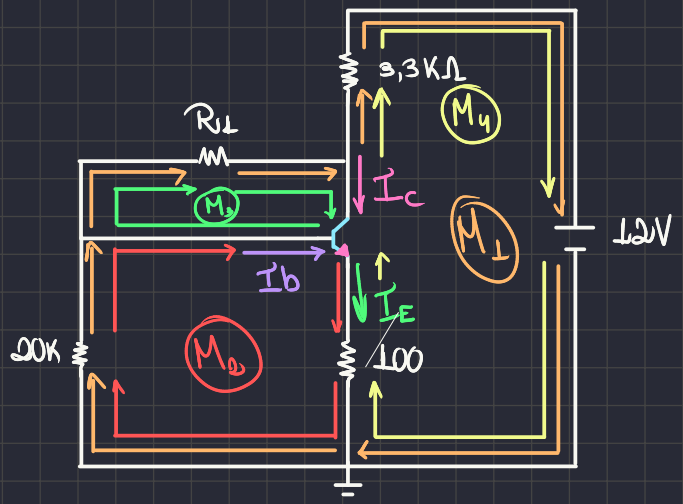
$$I_{E1} = I_{B1} + I_{C1}$$

$$I_{C1} = \beta I_{B1}$$

$$1 \cdot 10^{-3} = I_{B1}(2 + \beta) \rightarrow I_{B1} = \frac{1 \cdot 10^{-3}}{50} = 20\mu A$$

$$I_{C1} = I_{C2} = 48 \cdot 20 \cdot 10^{-6} = 0{,}96mA$$

3)



$\alpha = 0{,}98$

$V_{BE} = 0{,}7V$

$I_C = \alpha I_E \rightarrow I_C = 1{,}96mA$

$I_E = 2mA$

- Determine R_{L1}:

M_1 $12 + 20K(I_2 + I_1) + R_{L1}(I_{L1} + I_3) + 3{,}3K(I_1 + I_4) = 0$

M_2 $100(I_2 - I_4) + 20K(I_2 + I_1) + V_{BE} = 0$

M_3 $R_{L1}(I_1 + I_3) + V_{CB} = 0$