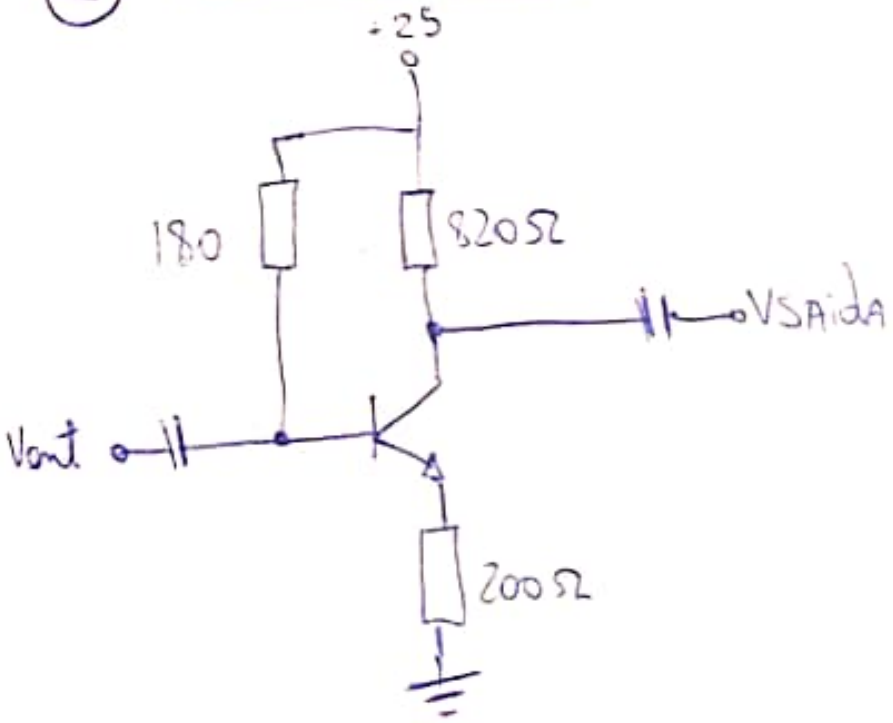
① **$I_C = 9,918\,mA$**



$$25 = 180K \cdot 16 + 0,7 + 200 \cdot I_C$$

$$25 = \frac{180K \cdot I_C}{80} + 0,7 + 200 \cdot I_C$$

$$25 = 0,7 + \left(\frac{180K}{80} + 200\right) I_C$$

$$\frac{25 - 0,7}{\frac{180K}{80} + 200} = I_C$$

$I_C = 9,918\,mA$

$V_E = 200 \cdot 9,92 = 1,98\,V$

$V_C = 25 - 820 \cdot 9,92\,mA = 16,86\,V$

$I_C = 9,918\,mA$

(2) $15 = 5,1K \cdot I_C + 620K \cdot I_b + 0,7$

$15 = 5,1K \cdot I_C + \frac{620K \cdot I_C}{150} + 0,7$

$15 = 0,7 + \left(5,1K + \frac{620K}{150}\right) \cdot I_C$

$\frac{15 - 0,7}{5,1K + \frac{620}{150}} = I_C$

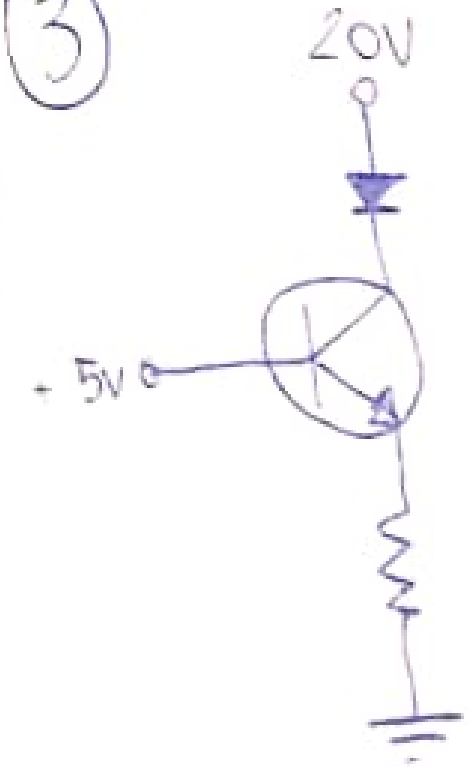
$\hookrightarrow \boxed{I_C = 1,55mA}$

$V_E = 0$

$V_{CE} = 15 - 5,1K \cdot 1,55 \cdot 10^{-3}$

$\boxed{V_{CE} = 7,09V}$

3



$$I_{LED} = (5 - 0{,}7) / 120$$

$$I_{LED} = 4{,}3 / 120 = 35{,}8\ mA$$

④ $\frac{20}{40K+10K} = 4 \cdot 10^{-4} = 1b$

$V_B = 4.10^{-4} \cdot 10K = 4V$

$V_E = 4 \quad | -0,7 = 3,3 \; V$

$I_E = I_C = \frac{V_E}{R_E} = \frac{3,3}{2K} = 1,65mA$

$V_C = 20 - 4K \cdot 1,65mA = 13,4V$ ~~3V~~

$V_{CC} = 13,4 - 3,3 = 10,1V$

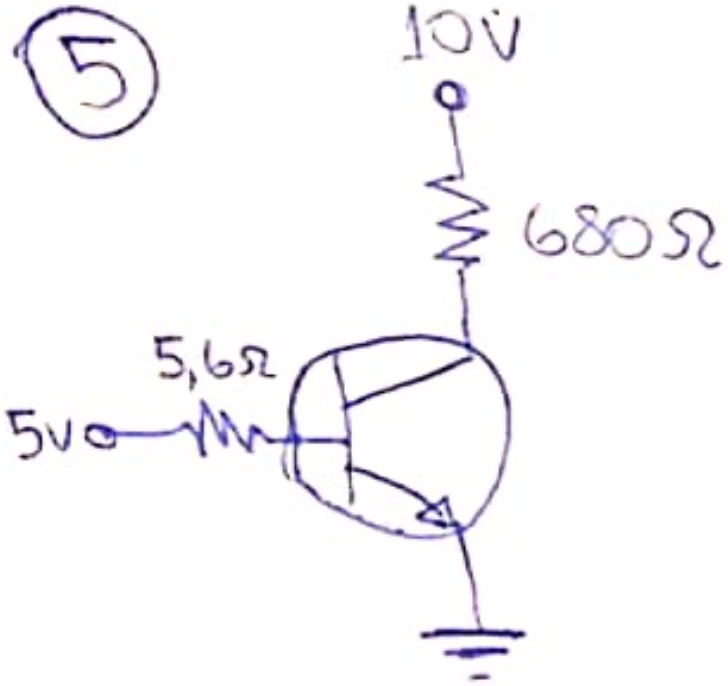
$V_B = 4V$

$V_E = 3,3\ V$

$V_C = 13,4V$

$V_{CC} = 10,1V$

(5)



(a) $I_C = 10\,V / 680\,\Omega = 14,7\,mA$

$I_B = (5 - 0,7\,V) / 5,6 = 0,76\,A$

(b) $V_C = 0V$

(c) $V_{CE} = 0V$