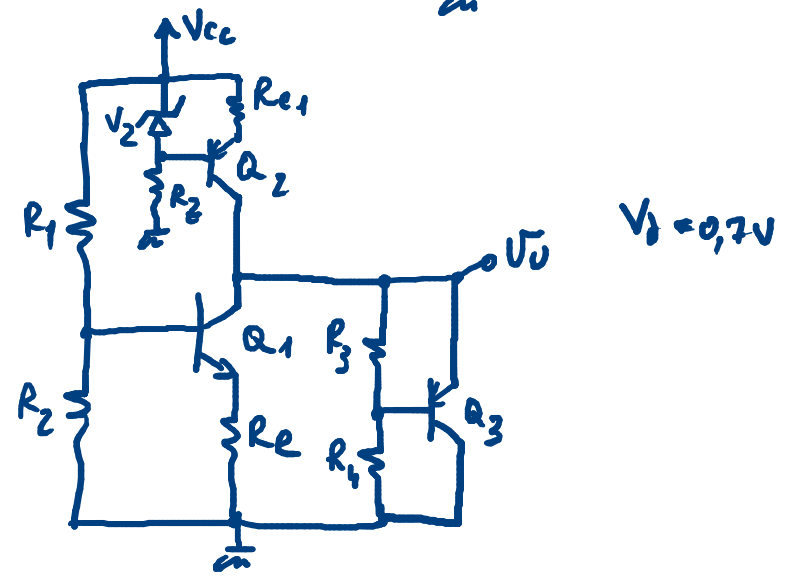
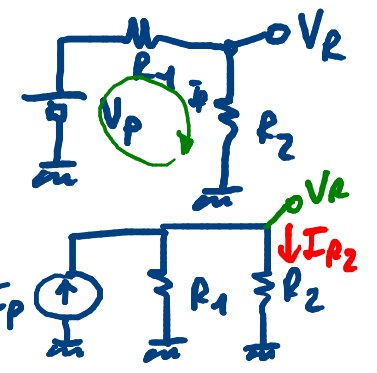


$\beta_{\min} = 300$



$V_D = 0,7V$

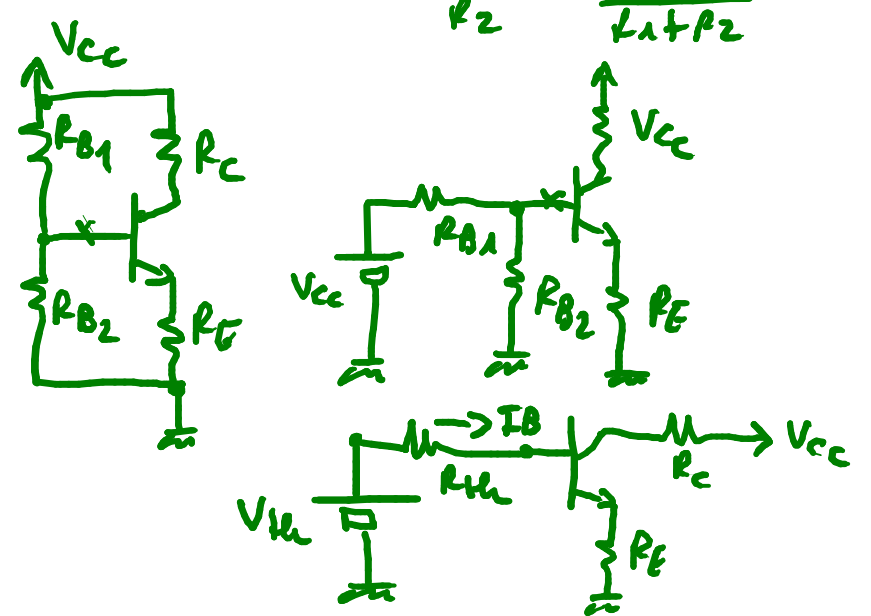


$$I_R = \frac{V_P}{R_1 + R_2}$$

$$V_R = R_2 I_R = \frac{R_2}{R_1 + R_2} V_P$$

$$V_R = I_P \cdot R_1 \parallel R_2 = \frac{I_P R_1 R_2}{R_1 + R_2}$$

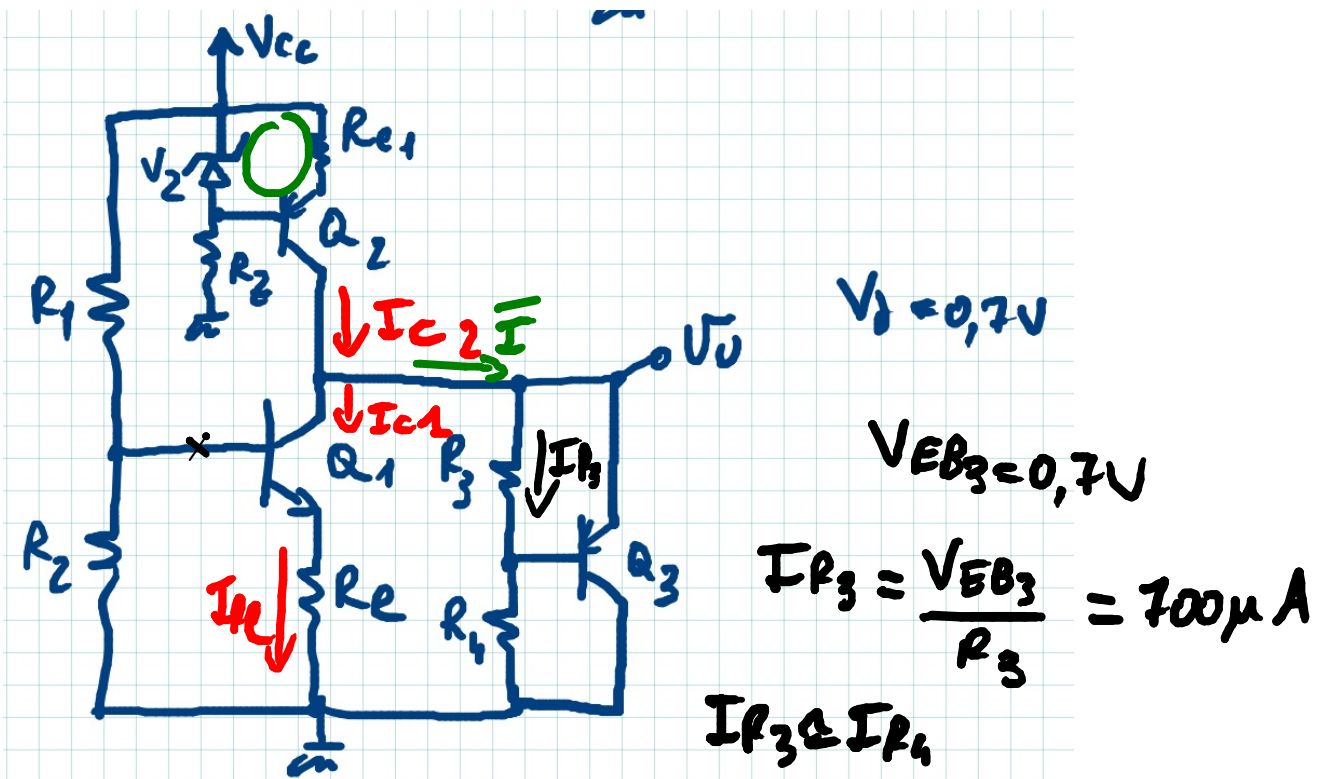
$$I_{P2} = \frac{V_R}{R_2} = \frac{R_1 I_P}{R_1 + R_2}$$



$$V_{th} = \frac{V_B R_{B2}}{R_{B1} + R_{B2}} \quad R_{th} = R_{B1} \parallel R_{B2}$$

$$V_{th} \gg R_{th} I_B \quad \frac{V_B R_{B2}}{R_{B1} + R_{B2}} \gg \frac{R_{B1} R_{B2} I_B}{R_{B1} + R_{B2}}$$

$$\frac{V_B}{R_{B1} + R_{B2}} \gg \frac{R_{B1} I_B}{R_{B1} + R_{B2}}$$



$$V_U = (R_3 + R_4) \frac{V_{EB3}}{R_3} = 4,9V = V_{E3}$$

$$\frac{V_{CC} R_2}{R_1 + R_2} = V_{BE1} + R_E I_{RE1}$$

$$\left[ \frac{V_{CC} R_2}{R_1 + R_2} - V_{BE1} \right] \frac{1}{R_E} = I_{RE1} = \underline{3 \mu A} \approx I_{C1}$$

$$I_{B1MAX} = \frac{I_{RE1}}{\beta_{Fmin} + 1} = 9,96 \mu A$$

$$I_{R1, R2} = \frac{V_{CC}}{R_1 + R_2} = 1 \mu A \gg I_{B1MAX}$$

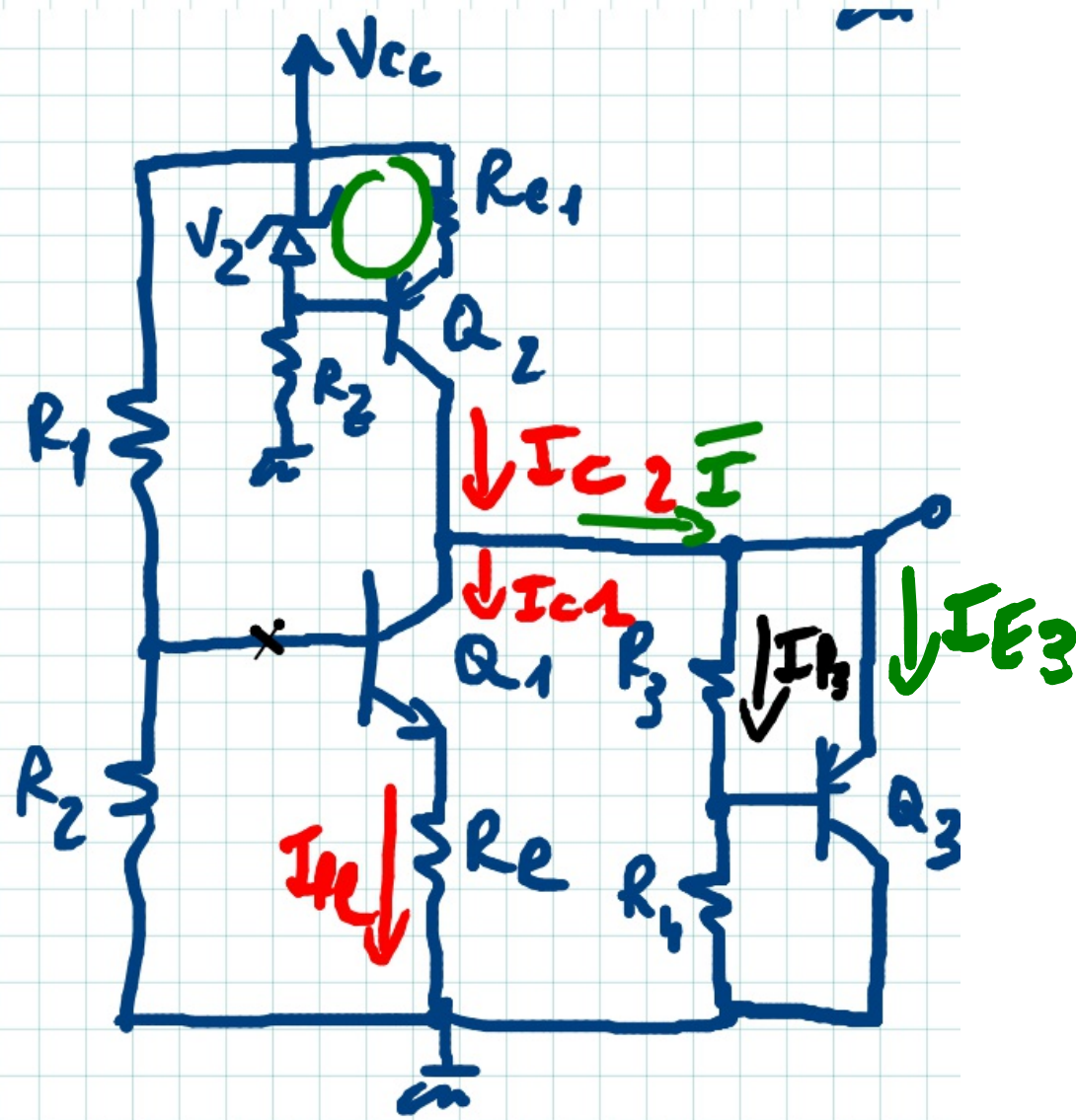
$$V_{B2} = V_{CC} - V_2 = 6,3V$$

$$V_2 = R_{E1} I_{E2} + V_{BE} \rightarrow I_{E2} = \frac{V_2 - V_{BE}}{R_{E1}} = 5 \text{ mA}$$

$$I_{E2} \approx I_{C2} = 5 \text{ mA}$$

$$I_{R2} \approx I_{D2} = \frac{V_{CC} - V_2}{R_2} = 3,15 \mu A$$

$$I_{D2} \gg I_{B2MAX} = \frac{I_C}{\beta_{Fmin}} = 16,67 \mu A \quad \underline{\underline{OK}}$$



$$\bar{I} = I_{C2} - I_{C1} = 2 \text{ mA}$$

$$I_{E3} = \bar{I} - I_{R3} = 1,3 \text{ mA}$$

$$I_{B3 \text{ MAX}} = \frac{I_{E3}}{\beta_{\text{min}}} = 4,33 \mu\text{A}$$

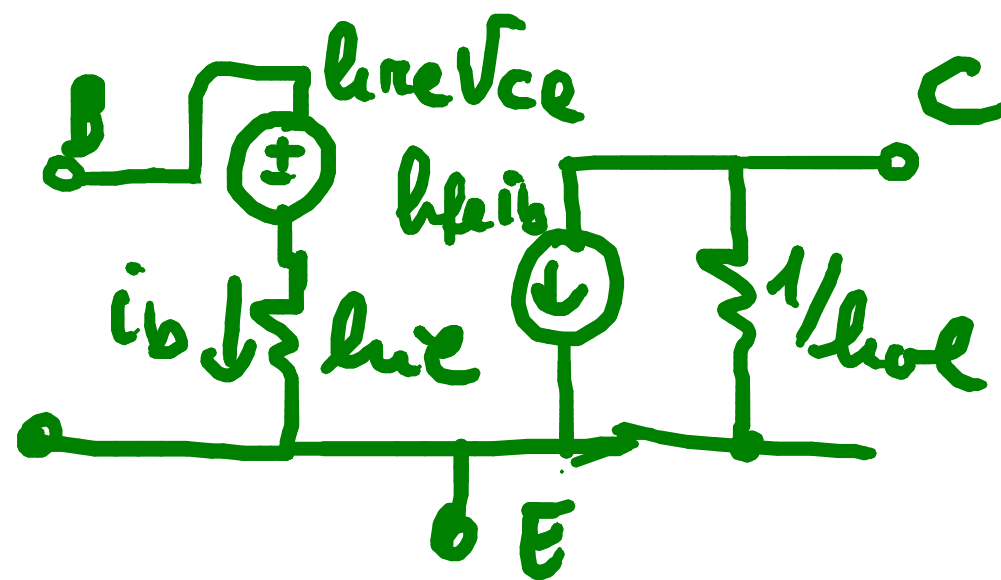
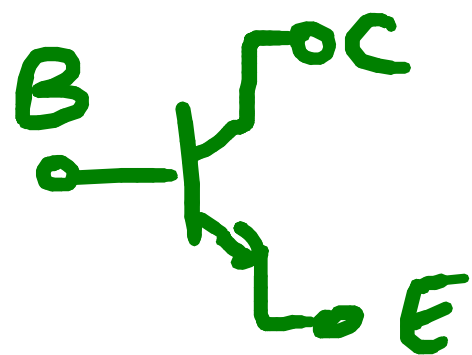
$$I_{B3 \text{ MAX}} \ll I_{R3, R4}$$

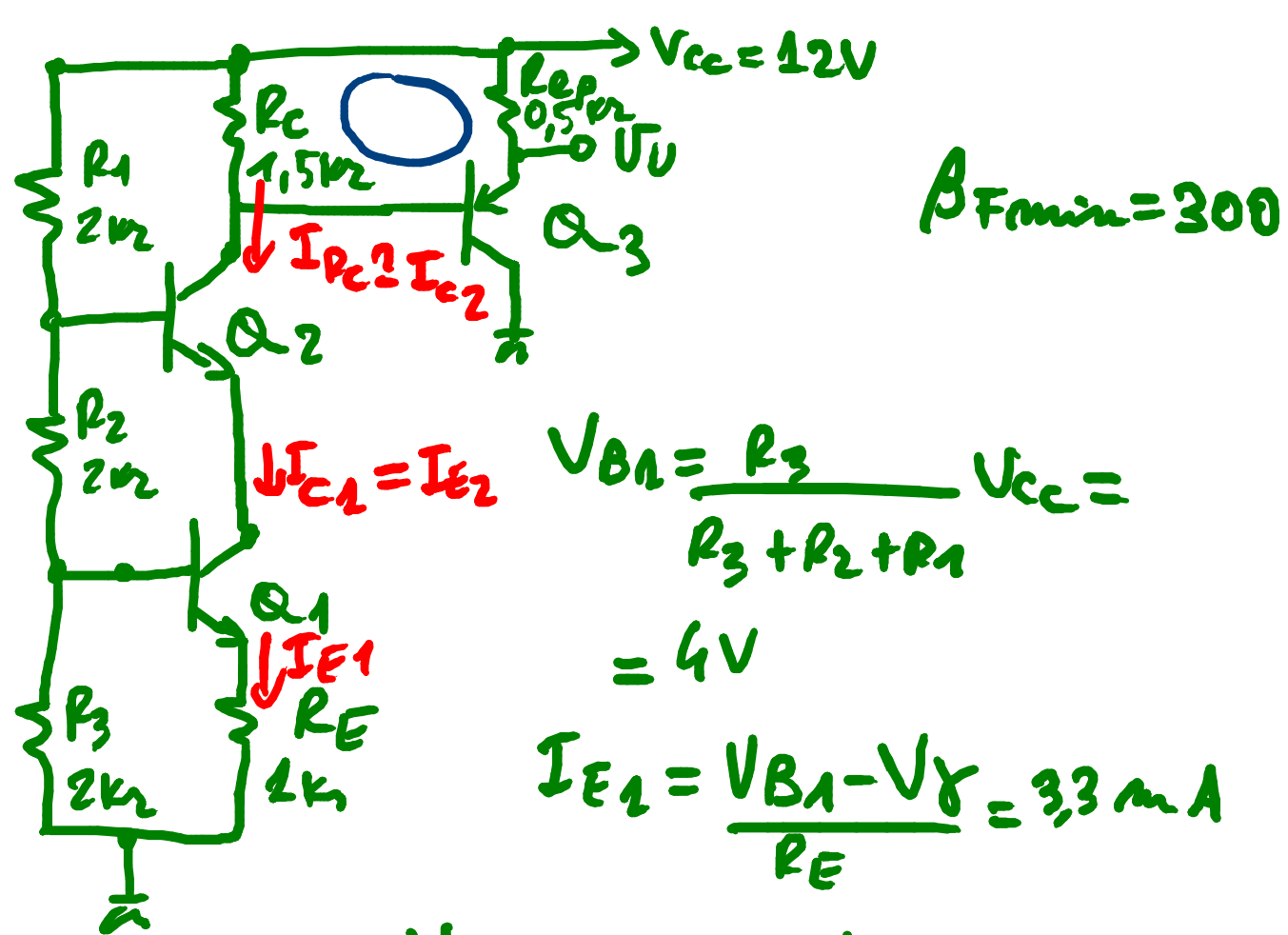
$$V_{CE2} = \underbrace{V_{CC} - R_{E1} I_{C2}}_{V_{E2}} - \underbrace{V_{U}}_{V_{C2}} = 2,2 \text{ V OK}$$

Zona  
Attiva  
Direct  
Q2

$$V_{CE1} = \underbrace{V_{U}}_{V_{C1}} - \underbrace{R_{E1} I_{E1}}_{V_{E1}} = 1,6 \text{ V OK}$$

Zona  
attiva  
diretta





$$V_{B1} = \frac{R_3}{R_3 + R_2 + R_1} V_{CC} = 4V$$

$$I_{E1} = \frac{V_{B1} - V_{\gamma}}{R_E} = 3.3 \text{ mA}$$

$$I_{RP} = \frac{V_{CC}}{R_1 + R_2 + R_3} = 2 \text{ mA}$$

$$I_{E1} \approx I_{C1} = I_{E2} \approx I_{C2} \Rightarrow I_{B1} \approx I_{B2} = 11 \mu\text{A}$$

$$I_{RP} \gg I_{B1} \wedge I_{B2}$$

$$I_{C2} \approx I_{C1} \quad R_C I_{C2} = R_{EP} I_{E3} + V_{\gamma}$$

$$\frac{R_C I_{C2} - V_{\gamma}}{R_{EP}} = I_{E3} = 8.5 \text{ mA}$$

$$I_{B3} = \frac{I_{E3}}{\beta_{Fmin}} = 28.33 \mu\text{A} \ll I_{C2}$$

$$V_{C1} = V_{E2} = V_{CC} - R_1 I_{RP} - V_{\gamma} = 7.3 \text{ V}$$

$$V_{E1} = V_{B1} - V_{\gamma} = 3.3 \text{ V}$$

$$V_{CE1} = V_{C1} - V_{E1} = 4 \text{ V}$$

$$V_{C2} = V_{CC} - R_C I_{C2} = 7 \text{ V}$$