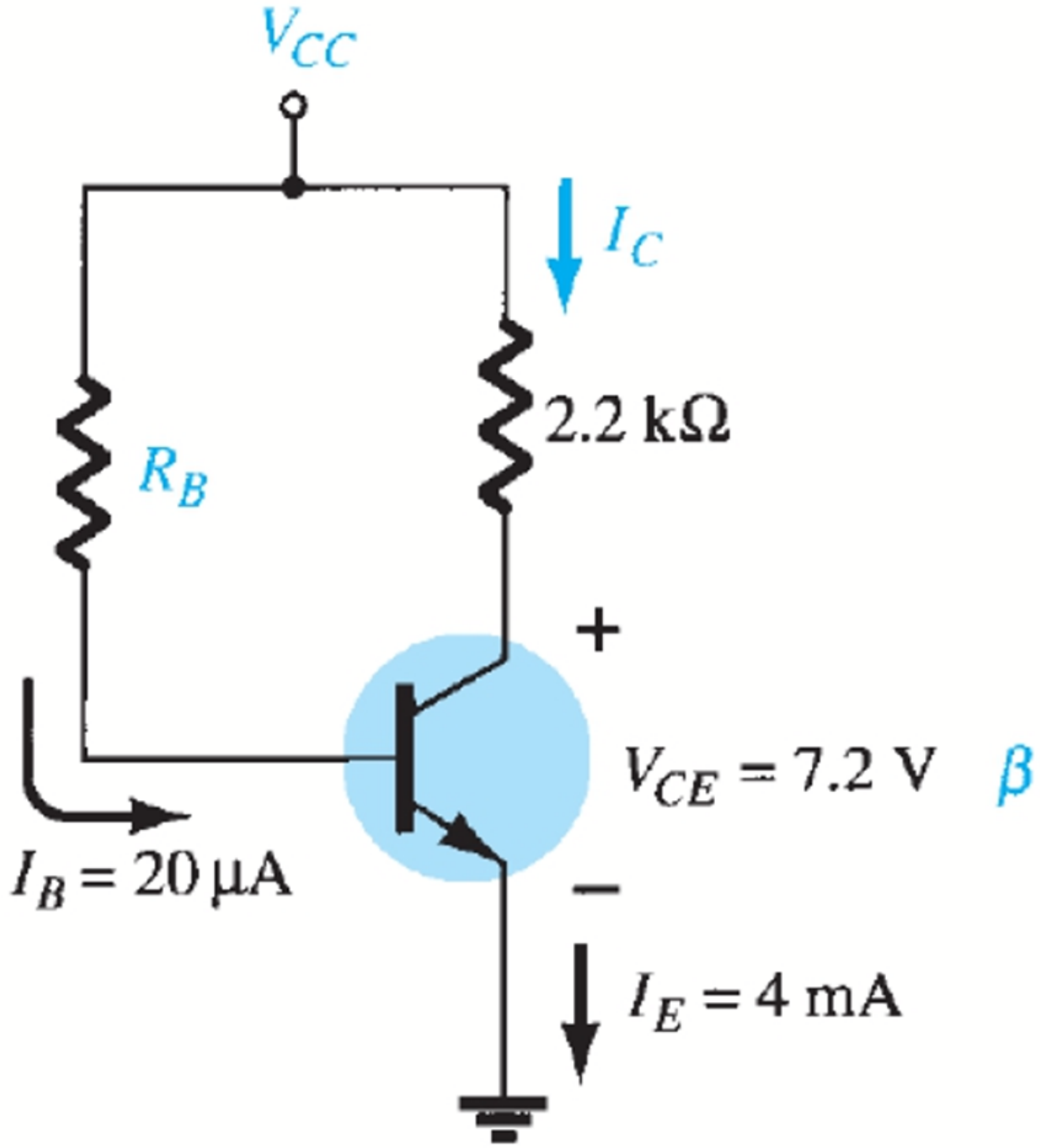
1. Given the information appearing in figure 1 (a), determine:
a) I_C, **b)** V_{CC}, **c)** β, **d)** R_B



$I_E = (\beta+1) I_B \Rightarrow \beta = \frac{4mA}{20\mu A} - 1 = 199$

$I_c = \beta . I_B = 199 . 20\mu A = 3,98 mA$

kvl for output loop:

$V_{cc} - I_c . 2,2k\Omega - V_{CE} = 0 \Rightarrow V_{cc} = 3,98mA . 2,2k\Omega + 7,2V$

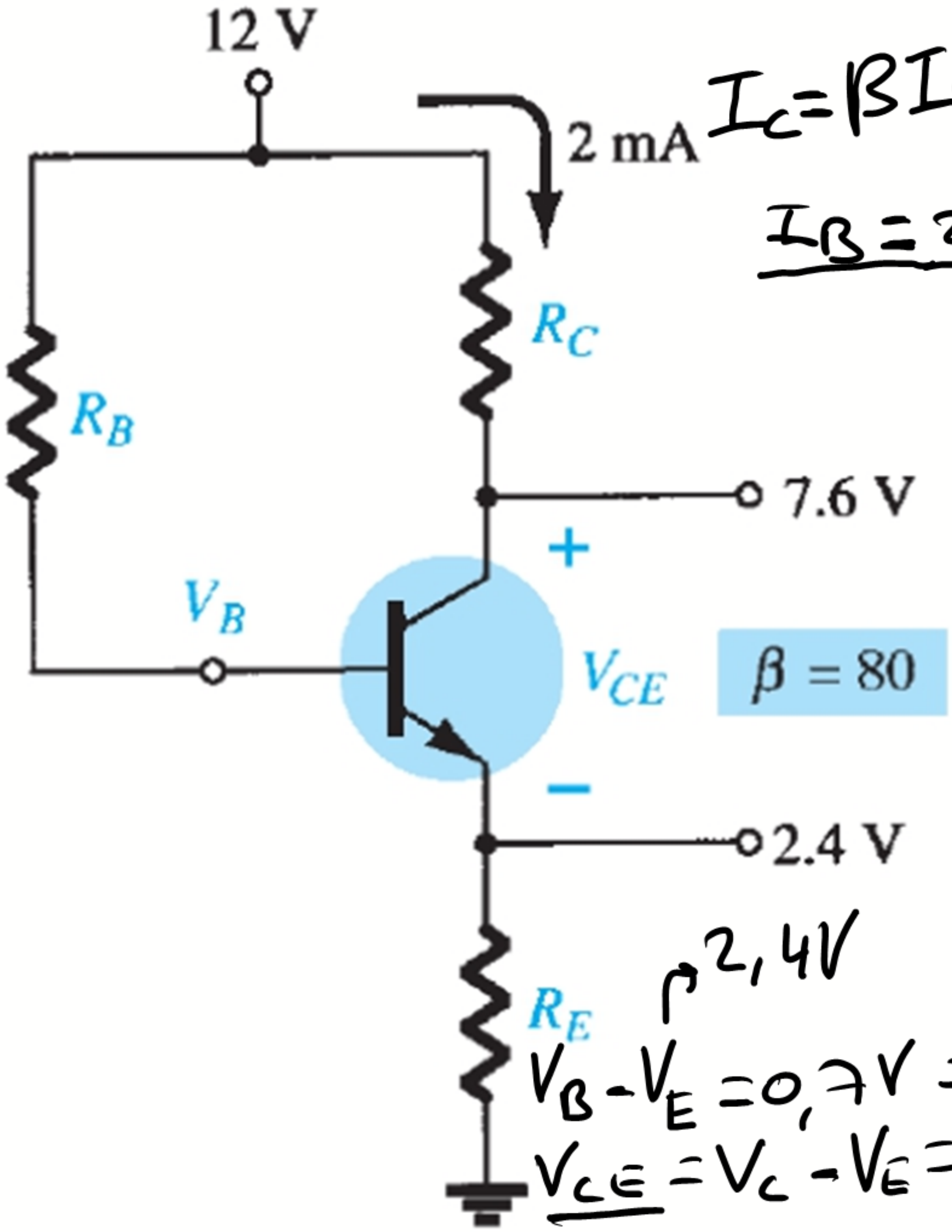
$V_{cc} = 15,96V$

kvl for input loop:

$V_{cc} - I_B R_B - V_{BE} = 0 \Rightarrow R_B = \frac{V_{cc} - V_{BE}}{I_B} = \frac{(15,96 - 0,7)V}{20\mu A}$

$R_B = 765 k\Omega$

2. Given the information provided in figure 1 (b), determine:
a) R_C, **b)** R_E, **c)** R_B, **d)** V_{CE}, **e)** V_B



$I_C = \beta I_B \Rightarrow I_B = \frac{2mA}{80}$

$\underline{I_B = 25\mu A}$

$V_B - \overset{2,4V}{V_E} = 0{,}7V \Rightarrow \underline{V_B = 3{,}1V}$

$\underline{V_{CE}} = V_C - V_E = 7{,}6 - 2{,}4 = \underline{5{,}2V}$

KVL for input:

$12 - i_B R_B - V_B = 0 \Rightarrow \underline{R_B} = \frac{12V - \overset{3,1}{V_B}}{\underset{25\mu A}{i_B}} = \underline{356k\Omega}$

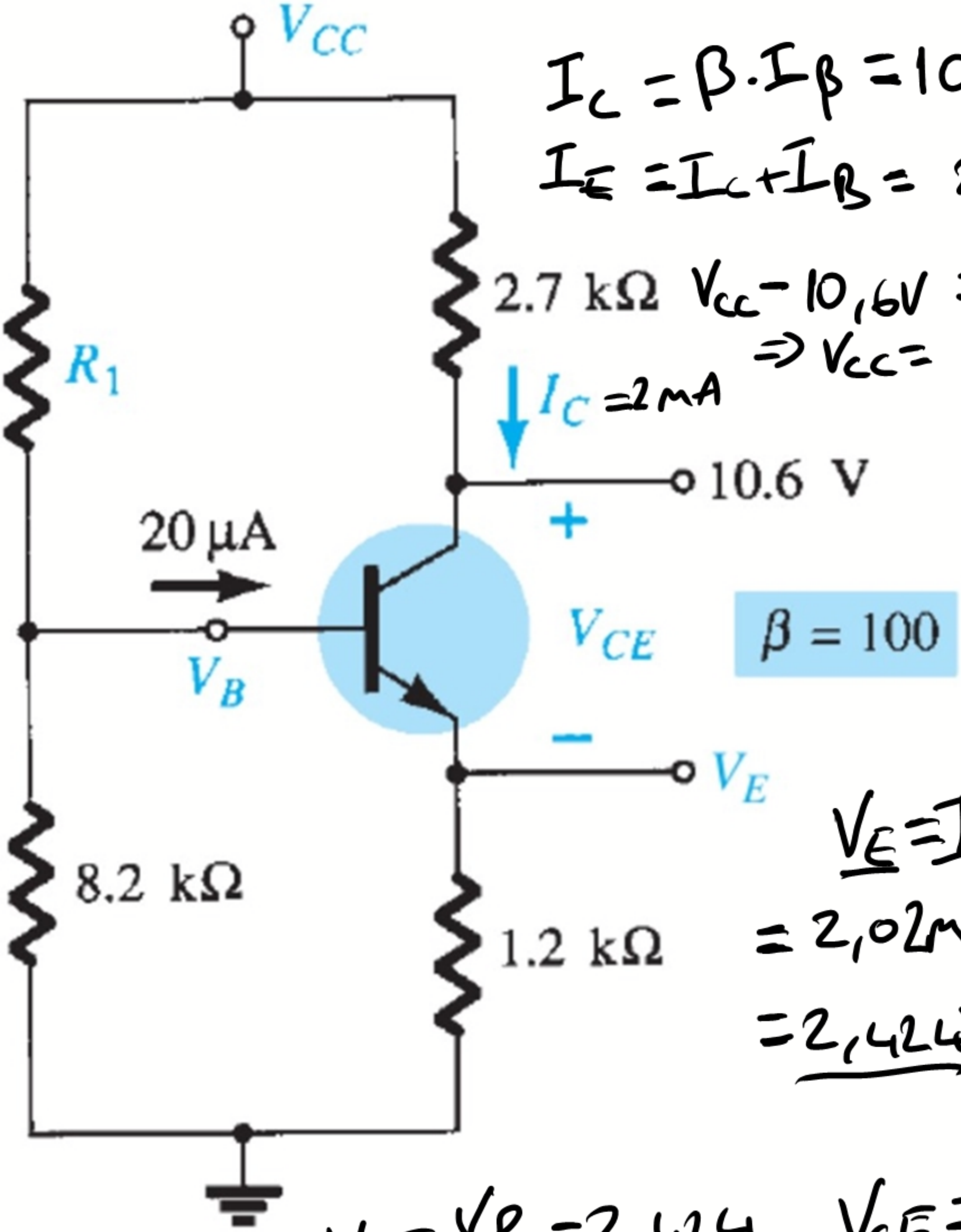
KVL for output:

$12 - i_C R_C - V_C = 0 \Rightarrow \underline{R_C} = \frac{12 - V_C}{I_C} = \frac{(12 - 7{,}6)V}{2mA} = \underline{2{,}2\,k\Omega}$

$I_E = (\underset{80}{\beta} + 1)\underset{25\mu A}{I_B} = 2mA$

$\underline{R_E} = \frac{V_E}{I_E} = \frac{2{,}4V}{2mA} = 1{,}2k\Omega$

3. Given the information appearing in figure 2 (a), determine:
a) I_C, **b)** V_E, **c)** V_{CC}, **d)** V_{CE}, **e)** V_B, **f)** R_1



$I_C = \beta \cdot I_B = 100 \cdot 20\mu A = 2mA$

$I_E = I_C + I_B = 2{,}02\ mA$

$V_{CC} - 10{,}6V = 2mA \cdot 2{,}7k\Omega$

$\Rightarrow V_{CC} = 16V$

$I_C = 2mA$

$V_E = I_E \cdot R_E$

$= 2{,}02mA \cdot 1{,}2k\Omega$

$= 2{,}424V$

$V_{BE} = 0{,}7V = V_B - 2{,}424$

$\Rightarrow V_B = 3{,}124V$

$V_{CE} = 10{,}6 - 2{,}424$

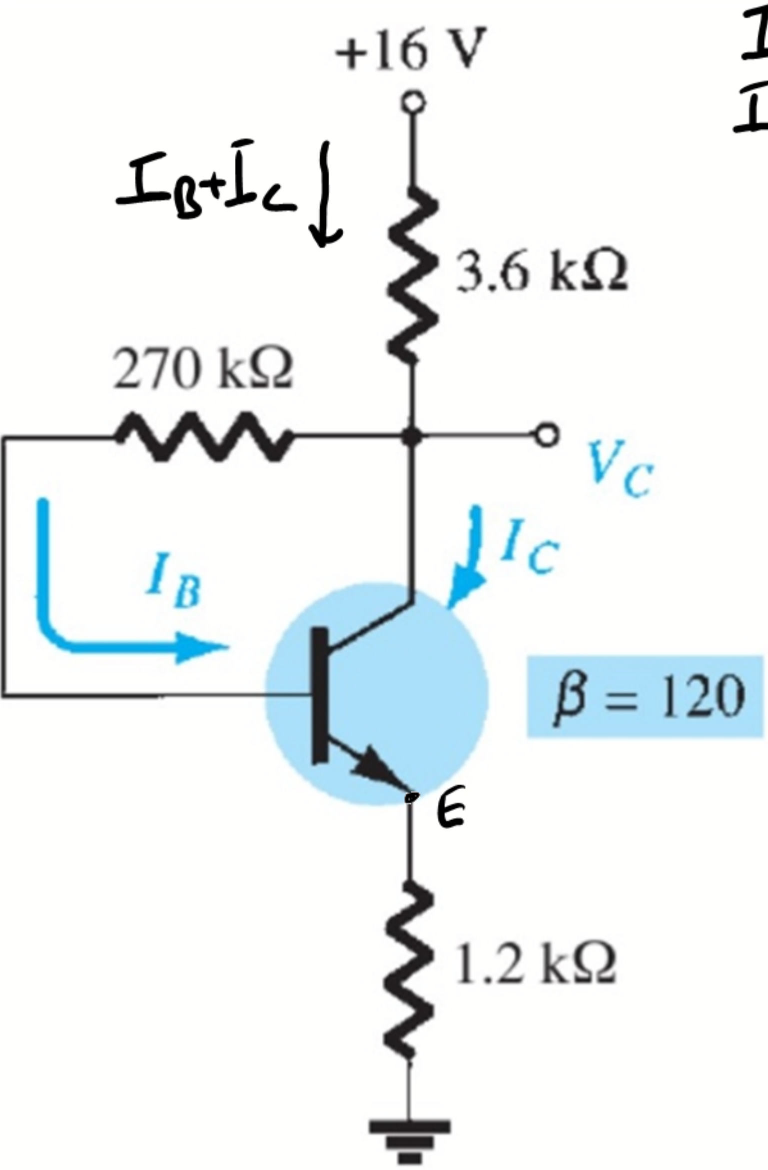
$= 8{,}176V$

$V_{R1} = 16 - 3{,}124 = 12{,}876$

$I_{R1} = 20\mu A + \frac{3{,}124V}{8{,}2k\Omega} = 401\mu A$

$R_1 = \frac{12{,}876V}{401\mu A} = 32{,}11k\Omega$

4. For the collector-feedback configuration of figure 2 (b), determine: **a)** I_B, **b)** I_C, **c)** V_C



$I_C = \beta . I_B = 120 I_B$

$I_E = (\beta + 1) . I_B = 121 I_B$

$16V - 121 I_B . 3{,}6k\Omega - I_B . 270k\Omega - 0{,}7V - 121 I_B . 1{,}2k\Omega = 0$

$\Rightarrow \underline{I_B} = \frac{15{,}3V}{850{,}8k} = 17{,}98\ \mu A$

$\underline{I_C} = \beta I_B = 120 . 17{,}98\ \mu A = 2{,}158\ mA$

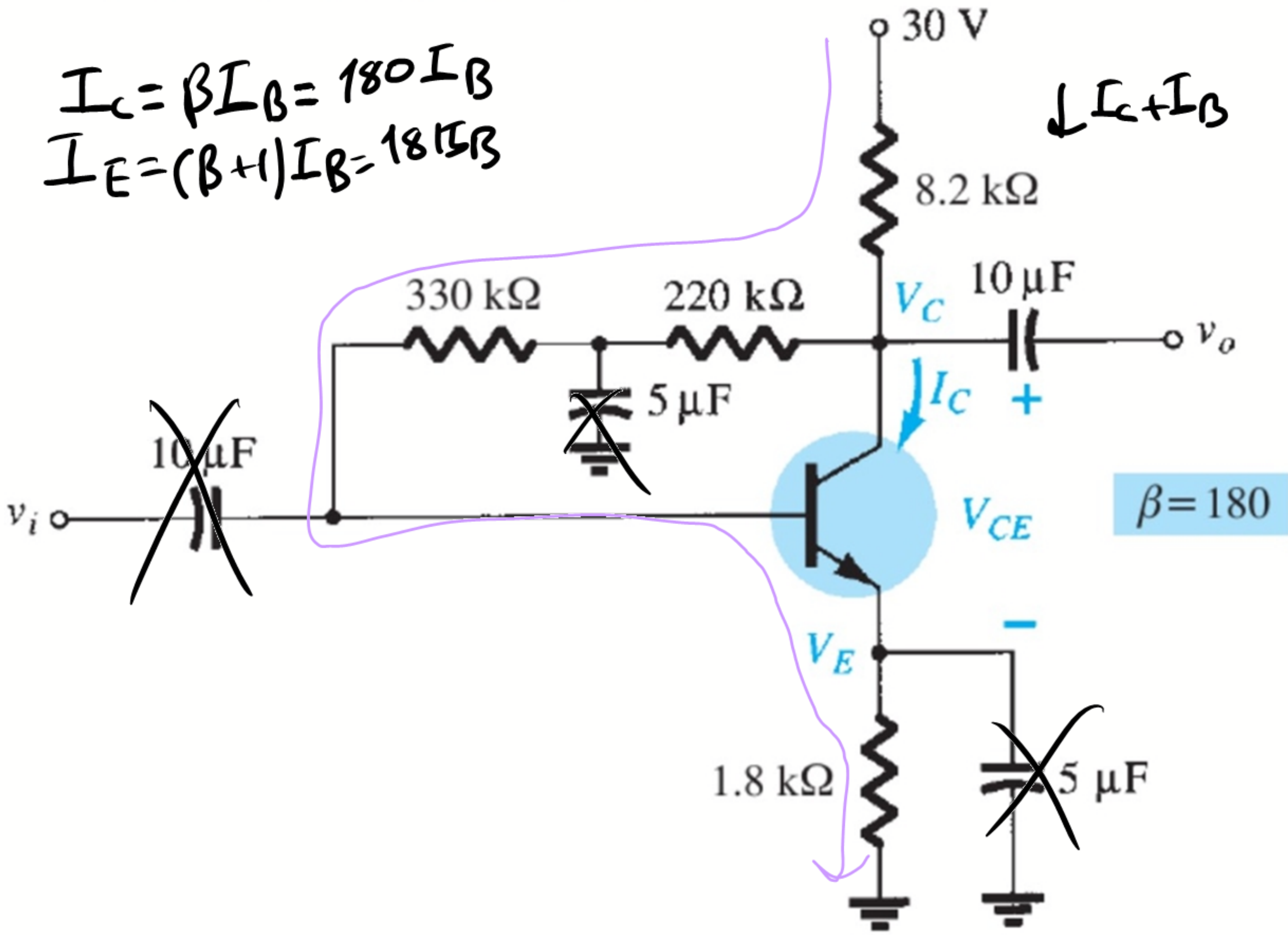
$16V - V_C = (I_B + I_C) . 3{,}6k\Omega \Rightarrow V_C = 16V - 2{,}176mA\ 3{,}6k\Omega$

$\Rightarrow V_C = 8{,}17$

5. For the voltage feedback network of figure 3 (a), determine: a) I_C, b) V_C, c) V_E, d) V_{CE}

$I_C = \beta I_B = 180 I_B$

$I_E = (\beta+1) I_B = 181 I_B$



$30V - (181 I_B) \cdot 8{,}2k\Omega - 550k\Omega \cdot I_B - 0{,}7V - 181 I_B \cdot 1{,}8k\Omega = 0$

$\Rightarrow I_B = \dfrac{(30-0{,}7)V}{2360k\Omega} = 12{,}42 \mu A$

$\underline{I_C} = 180 I_B = \underline{2{,}236 mA}$ $\quad I_E = 181 I_B = 2{,}248 mA$

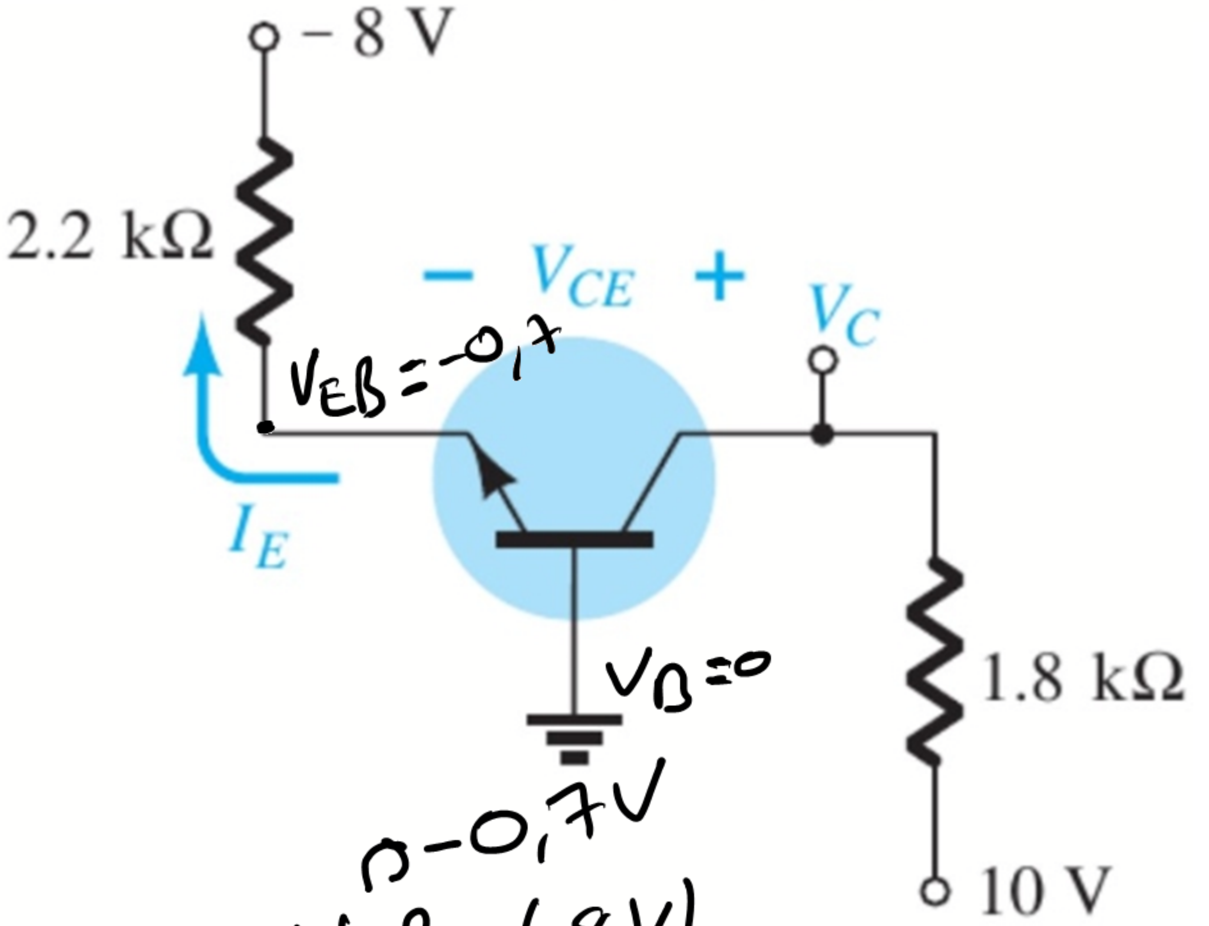
$30V - V_C = I_C \cdot 8{,}2k\Omega \Rightarrow \underline{V_C = 11{,}66V}$

$\underline{V_E} = I_E \cdot 1{,}8k\Omega = \underline{4{,}05V}$

$\underline{V_{CE}} = (11{,}66 - 4{,}05)V = \underline{7{,}61V}$

6. For the network of 3 (b), determine:

a) I_E, **b)** V_C, **c)** V_{CE}



$$\underline{I_E} = \frac{\overset{0-0{,}7V}{V_{EB}} - (-8V)}{2.2k\Omega} = \underline{3{,}32\,mA}$$

$I_C \cong I_E = 3{,}32\,mA$ (we don't know β so I used approximate value)

$10 - V_C = 1{,}8k\Omega \cdot 3{,}32\,mA \Rightarrow \underline{V_C = 4{,}024V}$

$\underline{V_{CE}} = 4{,}024V - (-0{,}7V) = \underline{4{,}724V}$