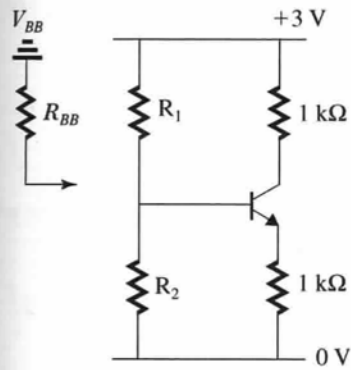


6.56

Ignoring  $I_B$ 

$$\text{For } V_B = \frac{R_2}{R_1 + R_2} V_{CC} = 1.5 \text{ V and}$$

$$\frac{V_{CC}}{R_1 + R_2} = 0.1 \text{ mA}$$

$$\Rightarrow R_2 = 15 \text{ k}\Omega$$

$$R_1 = 15 \text{ k}\Omega$$

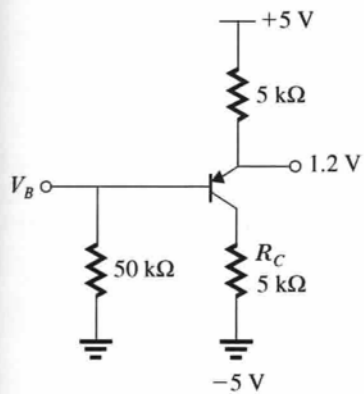
$$\text{For } \beta = 1009 \quad V_{BE} = 0.7 \text{ V, } R_{BB} = 7.5 \text{ k}\Omega$$

$$I_E = \frac{V_{BB} - 0.7}{R_{BB} / (\beta + 1) + 1} = \frac{1.5 - 0.7}{1 + 7.5 / 101} = 0.745 \text{ mA}$$

$$I_C = \beta I_E / (\beta + 1) = 0.74 \text{ mA}$$

$$V_C = 3 - 0.74 \times 1 = 2.26 \text{ V}$$

6.57

Measured  $V_E = 1.2\text{ V}$ 

$$I_E = \frac{5 - 1.2}{5} = 0.76\text{ mA}$$

$$V_B = 1.2 - 0.7 = 0.5\text{ V}$$

$$I_B = \frac{0.5 - 0}{50\text{ k}} = 0.01\text{ mA}$$

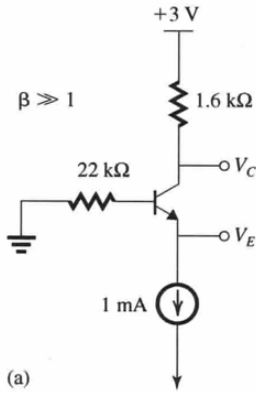
$$I_C = I_E - I_B = 0.75\text{ mA}$$

$$V_C = -5 + 0.75 \times 5 = -1.25\text{ V}$$

$$\beta = \frac{I_C}{I_B} = \frac{0.75}{0.01} = 75$$

$$\alpha = \frac{\beta}{\beta + 1} = \frac{75}{76} = 0.987$$

6.62 (a)



(a)

$$I_C = I_E = 1 \text{ mA}$$

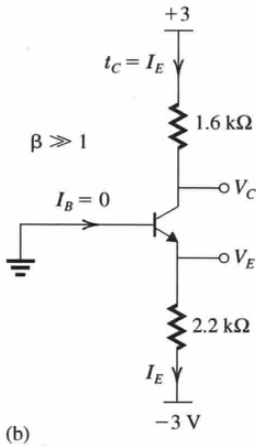
$$V_C = 3 - 1.6 \times 1 = 1.4 \text{ V}$$

$$I_B \approx 0 \quad \beta \gg 1$$

$$V_B = 0$$

$$V_E = V_B - 0.7 = -0.7 \text{ V}$$

(b)



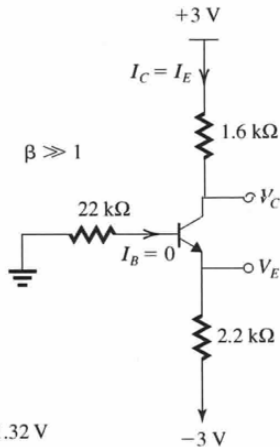
(b)

$$V_E = -0.7 \text{ V}$$

$$I_E = \frac{-0.7 + 3}{2.2 \text{ k}} = 1.05 \text{ mA}$$

$$V_C = 3 - 1.6 \times 1.05 = +1.32 \text{ V}$$

(c)



(c)

$$I_E = \frac{3 - 0.7}{2.2 \text{ k}} = 1.05 \text{ mA}$$

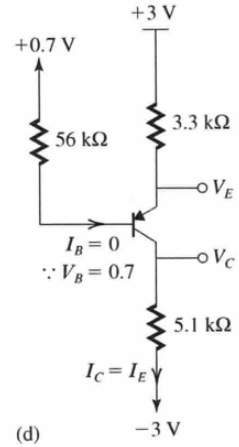
since  $I_B = 0$ ,  $+V_B = 0$

$$V_E = 0 - 0.7 = -0.7$$

$$V_C = 3 - 1.6 \times 1.05 = +1.32 \text{ V}$$

Note: essentially identical to (b) since  $I_B = 0$

(d)



(d)

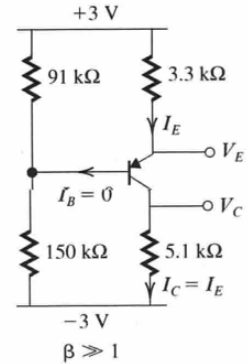
$$I_E = \frac{3 - 0.7 - 0.7}{3.3} = 0.48 \text{ mA}$$

$$V_E = 0.7 + 0.7 = 1.4 \text{ V}$$

$$V_C = -3 + 0.48 \times 5.1 = -0.55 \text{ V}$$

$$V_B = 0.7 \text{ V}$$

(e)



(e)

since  $I_B = 0$

$$V_B = -3 + \frac{150 \times 6}{150 + 91} = 0.73 \text{ V}$$

$$V_E = V_B + 0.7 \text{ V} = +1.43 \text{ V}$$

$$I_E = \frac{3 - 1.43}{3.3} = 0.48 \text{ mA}$$

$$V_C = -3 + 0.48 \times 5.1 = -0.55 \text{ V}$$