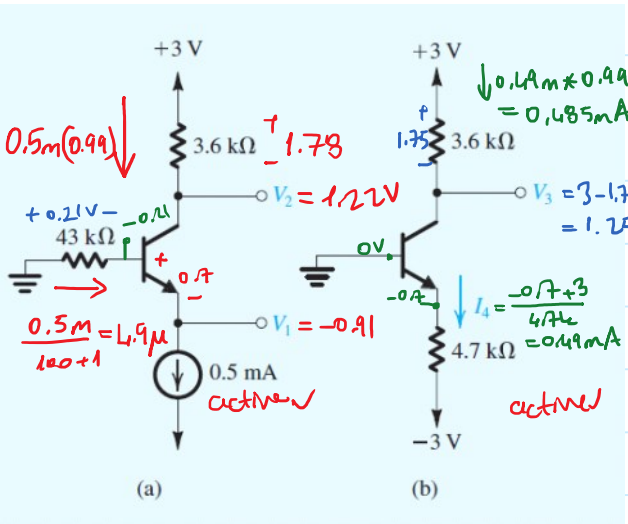
Q1

6.61 For the circuits in Fig., find values for the labeled node voltages and branch currents. $\beta = 100$.

$\alpha = \frac{\beta}{\beta+1} = 0.99$

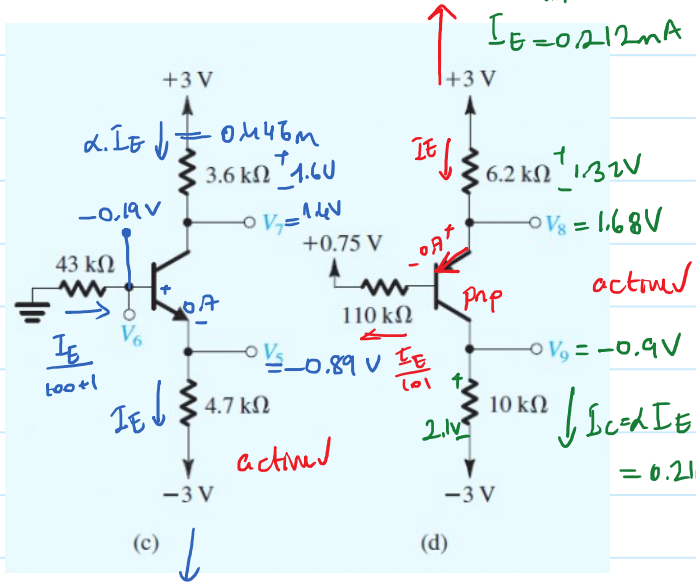


0.495m = 0.5m(0.99)

0.5m/101 = 4.9μ

0.49m * 0.99 = 0.485mA

$I_4 = \frac{-0.7+3}{4.7k}$ = 0.49mA

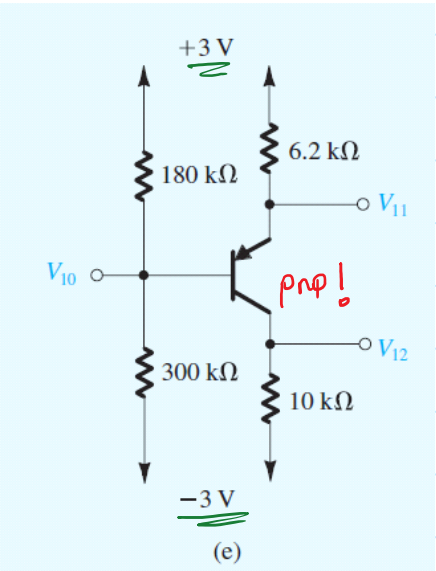


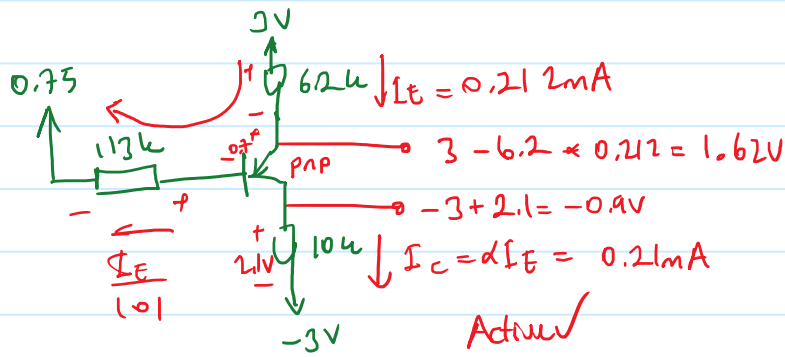
$3 - I_E(6.2k) - 0.7 - 110k.\frac{I_E}{101} = 0.75$

I_E = 0.212mA

$0 - (43k).\frac{I_E}{101} - 0.7 - I_E.(4.7k) = -3V$

$I_E \cong 0.45mA$



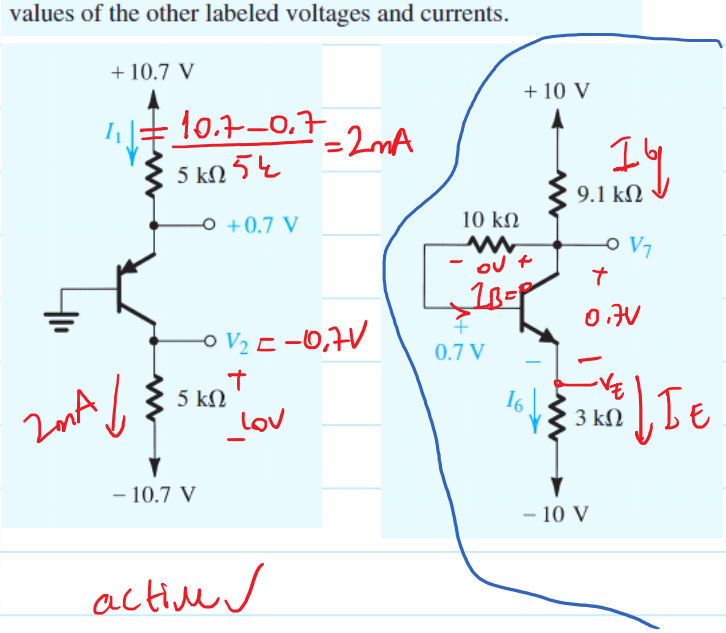


$3 - (6.2k)I_E - 0.7 - 113k\frac{I_E}{101} = 0.75$

$I_E = 0.212mA$

Q2

6.28 For the circuits in Fig. P6.28, assume that the transistors have very large β. Some measurements have been made on these circuits, with the results indicated in the figure. Find the values of the other labeled voltages and currents.



$\beta \to \infty$ then $\alpha \to 1$

$I_1 = \frac{10.7 - 0.7}{5k} = 2mA$

$I_B = \frac{I_E}{\beta + 1} = 0$ ($\beta \to \infty$)

$10 - 9.1k \cdot I_E - 0.7 - 3k \cdot I_E = -10$

$I_E = 1.6mA = I_6$

$10 - 9.1k \cdot I_6 = V_7$

$V_7 = -4.5V$

$V_E = -10 + I_6 \cdot 3k$

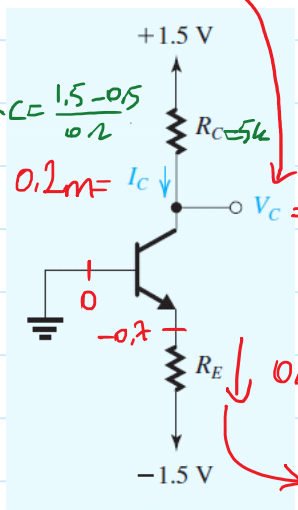
$= -5.2V$

active ✓

active ✓

Q3

D 6.34 Design the circuit in Fig. P6.34 to establish $I_C = 0.2$ mA and $V_C = 0.5$ V. $\beta = 100$.



$R_C = \frac{1.5 - 0.5}{0.2}$

$0.2m = I_C$

$\beta = 100 \Rightarrow \alpha = \frac{\beta}{\beta+1} = 0.99$

$I_C = \alpha I_E \Rightarrow I_E = \frac{I_C}{\alpha} = \frac{0.2}{0.99} = 0.202$

$0.202m = I_E$

$R_E = \frac{-0.7 + 1.5}{0.202m} = 3.96k$

Q4

6.51 The transistor in the circuit of Fig. P6.51 has a very high β. Find V_E and V_C for V_B (a) +2.0 V, (b) +1.7 V, and (c) 0 V.

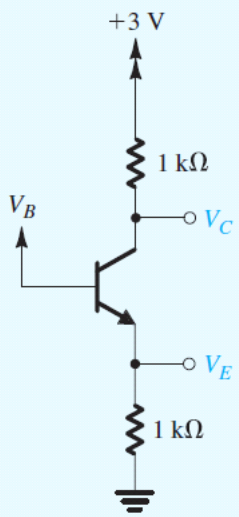
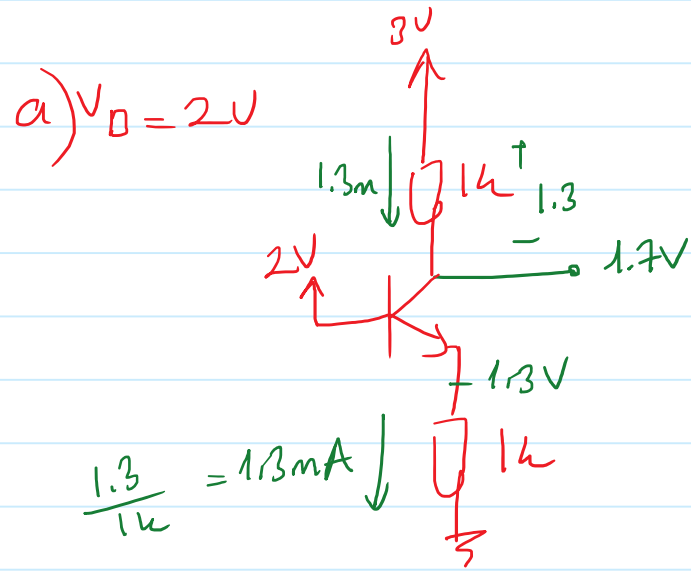


Figure P6.51

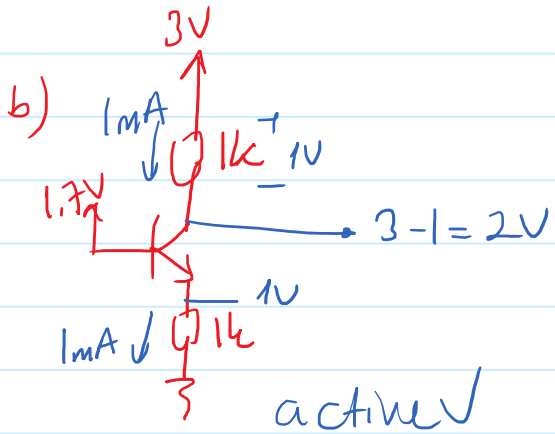
$\beta \to \infty \quad \alpha = \frac{\beta}{\beta+1} \to 1$

a) $V_B = 2V$



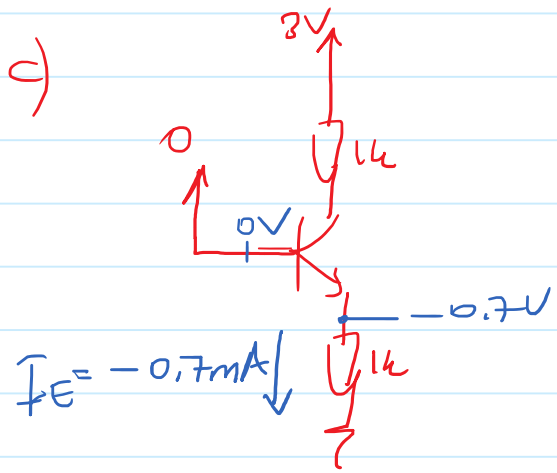
active ✓

b)



active ✓

c)



I_E cannot be negative

transistor is in cutoff.

$I_E = I_C = 0$

$V_E = 0 + 0 \cdot 1k = 0V$ ✓

$V_C = 3 - 0 \cdot 1k = 3V$