### Q-3.12)

a)  
\[ I_C = \frac{12 - 0.7}{10k} = 1.13 mA \]
\[ R_C = \frac{12 - (12) - 6 - 1.13 \times 10k}{1.13 \times \frac{75}{76}} = 6.008k \]

b)  
\[ V_B = 0 - 50k \times \frac{1}{76} = -0.6579V \]
\[ R_C = \frac{5 - 2}{75/76} = 3.04k \]

c)  
\[ I_C = 75 \times \frac{8 - 0.7 - (-2)}{10k + 76 \times 10k} = 0.9058 mA \]
\[ V_{EC} = 8 - (-8) - 0.9058 \times 3 - 0.9058 \times \frac{76}{75} \times 10 = 4.1038V \]

d)  
\[ I_B = \frac{5 - 0.7}{10k \times 76 + 20k + 2k \times 76} = 46.137 \mu A \]
\[ V_C = 5 - 10k \times 0.046137 \times 76 = 1.494V \]

### Q-3.15)

a)  
\[ \beta = \frac{-1 - 0.7 - (-3)}{4.8k / 500k} = 134.42 \rightarrow \alpha = \frac{134.42}{135.42} = 0.9926 \]
\[ I_C = 134.42 \times \frac{1}{500k} = 268.84 \mu A \]
\[ V_{CE} = 3 - (-3) - 4.8k \times 135.42 \times \frac{1}{500k} = 4.700V \]
b) \[
\beta = \frac{5 - 4 - 4 - 0.7 - (-5)}{100k} = -1 = 10.63 \rightarrow \alpha = \frac{10.63}{11.63} = 0.914
\]

Q-3.21)

\[
I_E = \frac{10 - 2}{10k} = 0.8mA
\]

\[
I_C = 0.8mA - \frac{2 - 0.7}{50k} = 0.774mA
\]

\[
\beta = \frac{2 - 0.7}{50k} = 29.77
\]

\[
\alpha = \frac{0.774}{0.8} = 0.9675
\]

\[
V_{EC} = 10 - (-10) - 10k \times 0.774 - 10k \times 0.8 = 4.26V
\]

Q-3.22)

\[
V_C = -9 + 4.7 \times \frac{50}{51} = -4.392V
\]

\[
V_E = 50k \times \frac{1}{51} + 0.7 = 1.680V
\]
Q-3.25)

\[ I_{e1} = I_{e2} = \frac{1mA}{2} = 0.5mA \]

\[ V_{c1} = V_{c2} = 5V - 4k \times 200 \times \frac{0.5mA}{201} = 3.01V \]

Q-3.30)

\[ I_{EQ} = \frac{18 - 0.7 - 0.7}{50 \times \frac{33 - 10}{51 + 51 + 33}} = 2.971mA \]

\[ V_{CEQ} = 18 - 2.2 \times 2.971 - 2.971 \times \frac{51}{30} = 8.433V \]