

Ex: 6.2

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

$$\frac{50}{50 + 1} < \alpha < \frac{150}{150 + 1}$$

$$0.98 < \alpha < 0.993$$

Ex: 6.3

$$\begin{aligned} I_C &= I_E - I_B \\ &= 1.460 \text{ mA} - 0.01446 \text{ mA} \\ &= 1.446 \text{ mA} \end{aligned}$$

$$\alpha = \frac{I_C}{I_E} = \frac{1.446}{1.460} = 0.99$$

$$\beta = \frac{I_C}{I_B} = \frac{1.446}{0.01446} = 100$$

$$I_C = I_S e^{v_{BE}/V_T}$$

$$\begin{aligned} I_S &= \frac{I_C}{e^{v_{BE}/V_T}} = \frac{1.446}{e^{700/25}} \\ &= \frac{1.446}{e^{28}} \text{ A} = 10^{-15} \text{ A} \end{aligned}$$

Ex: 6.4

$$\beta = \frac{\alpha}{1 - \alpha} \text{ and } I_C = 10 \text{ mA}$$

$$\text{For } \alpha = 0.99 \quad \beta = \frac{0.99}{1 - 0.99} = 99$$

$$I_B = \frac{I_C}{\beta} = \frac{10}{99} = 0.1 \text{ mA}$$

$$\text{For } \alpha = 0.98 \quad \beta = \frac{0.98}{1 - 0.98} = 49$$

$$I_B = \frac{I_C}{\beta} = \frac{10}{49} = 0.2 \text{ mA}$$

Ex: 6.13

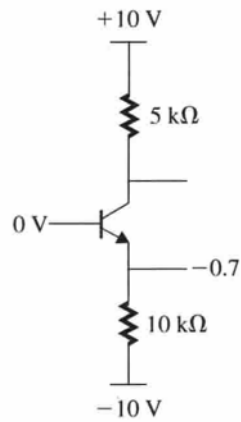


Fig 6.13

$$\beta = 50, V_{BE} = 0.7 \text{ V}$$

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

$$= 0 - 0.7 = -0.7 \text{ V}$$

$$I_E = \frac{-0.7 + 10}{10 \text{ K}}$$

$$= 0.93 \text{ mA}$$

$$I_C = \frac{50}{51} I_E = 0.91 \text{ mA}$$

$$V_C = 10 - 0.91 \times 5$$

$$= 5.45 \text{ V}$$

$$I_B = \frac{I_C}{\beta} = \frac{0.91}{50}$$

$$= 0.0182 \mu\text{A}$$