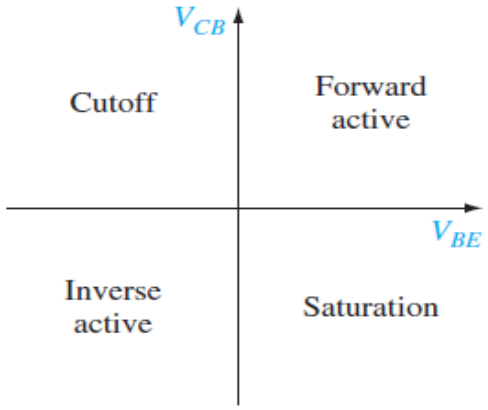
1. You should correctly answer the conditions of V_{CB} and V_{BE} under the three operation modes to get full marks.



2.

$$L_B = \sqrt{D_B \tau_{B0}} = 1.414 \times 10^{-3}\ cm \qquad L_E = \sqrt{D_E \tau_{E0}} = 2.828 \times 10^{-4}\ cm$$

$$p_{E0} = \frac{n_i^2}{N_E} = 45 \qquad n_{B0} = \frac{n_i^2}{N_B} = 4500$$

$$\Rightarrow \gamma = \frac{1}{1 + \frac{p_{E0}}{n_{B0}} \cdot \frac{D_E L_B}{D_B L_E} \cdot \frac{\tanh(X_B/L_B)}{\tanh(X_E/L_E)}} = 0.9959$$

$$\alpha = \gamma \alpha_T = 0.9893 \qquad \beta = \frac{\alpha}{1-\alpha} = 92.458$$