



$$\beta = 100$$

$$V_{BE, \text{active}} = 0.7 \text{ V}$$

$$V_{BE, \text{sat}} = 0.8 \text{ V}$$

$$V_{CE, \text{sat}} = 0.2$$

$$V_{CE, \text{edge of sat}} = 0.3 \text{ V}$$

ii) calc value of R_B so that BJT operates in edge of sat.

$$V_{CE} = 0.3 \text{ for edge of sat.}$$

$$3.5 I_C + V_{CB} - I_B R_B = (5 - 2)$$

$$\Rightarrow 3.5 \times \frac{100}{101} - 0.4 - \frac{1}{101} R_B = 3$$

$$\Rightarrow R_B = 6.6 \text{ k}\Omega$$

(i) $R_B = 10 \text{ k}\Omega$ // let \rightarrow active

$$3.5 I_C + V_{CB} - I_B R_B = 5 - 2$$

$$\Rightarrow 3.5 \times \frac{100}{101} + V_{CB} - \frac{1}{101} \times 10 = 3$$

$$\Rightarrow V_{CB} = -0.365$$

$$V_{CE} = V_{CB} + V_{BE}$$

$$= -0.365 + 0.7$$

$$= 0.335 > 0.3 \rightarrow \text{So, active}$$

$$V_{CB} = V_{CE} - V_{BE}$$

$$= 0.3 - 0.7$$

$$V_{CB} = -0.4$$

$$I_E = 1$$

$$I_E = I_B + I_C = I_B + \beta I_B$$

$$I_B = \frac{I_E}{\beta + 1} = \frac{1}{101}$$