pp1.

Q.1

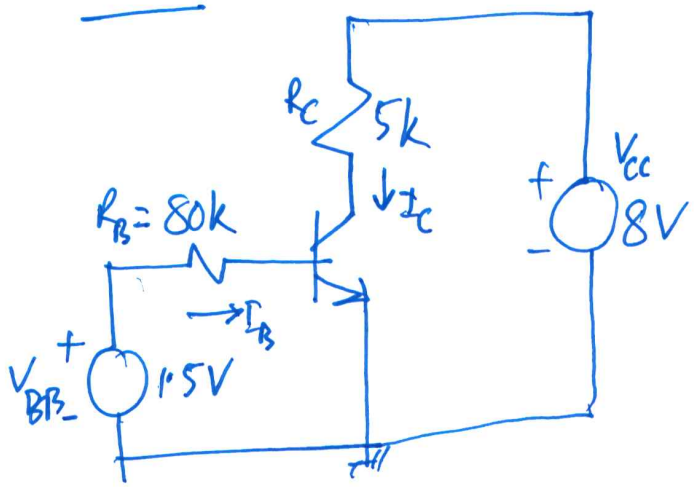
$$I_E = I_B + I_C$$

$$\beta = I_C / I_B \quad \text{and} \quad \alpha = I_C / I_E$$

$$\therefore \alpha = \frac{I_C}{I_E} = \frac{I_C/I_B}{I_E/I_B} = \frac{\beta}{(I_B+I_C)/I_B} = \frac{\beta}{\beta+1}$$

$$\beta = \frac{I_C}{I_B} = \frac{I_C/I_E}{I_B/I_E} = \frac{\alpha}{(I_E-I_C)/I_E} = \frac{\alpha}{1-\alpha}$$

Q.2



$$\therefore V_{BB} = I_B R_B + V_{BE(ON)}$$

$$\Rightarrow I_B = \frac{V_{BB} - V_{BE(ON)}}{R_B}$$

$I_B = 10\,\mu A$

$\therefore I_C = I_B \times \beta = 0.8\,mA$

$\beta = 80$

$V_{BE(ON)} = 0.7V$

$$\therefore V_{CC} = I_C R_C + V_{CE}$$

$\Rightarrow V_{CE} = 8 - 4 = 4V$

$$\alpha = \frac{\beta}{\beta+1} = \frac{80}{81} = 0.988$$

Q.3. $\alpha = 0.9836$

$\therefore \beta = \frac{\alpha}{1-\alpha} = 60$

$\therefore I_B = 50\mu A$

$I_C = 3mA$

$\therefore V_{CE} = 1.5V$

Follow the same steps in Q.2.

Yes, biased properly i.e BE : Forward
BC : Reverse

Q.4.

$I_C = 6mA \Rightarrow I_B = 40\mu A$

$V_B = 0.7V$

$\therefore V_C = 0.7 + 7.8 = 8.5V$

Since, $V_E = 0$; $V_{CE} = 8.5V$

$\therefore V_{CC} = I_C R_C + V_{CE}$

$= 9 + 8.5$

$= 17.5V$

Q.5. BE Junction is reverse biased.

$$I_B = 0$$

$$\therefore I_C = 0$$

$$\therefore V_{CE} = V_{CC} = 10V$$

Q.6. $$I_B = \frac{V_{BB} - V_{BE}}{R_B} = \frac{2.3 - 0.7}{20k} = 80\mu A$$

$$\therefore I_C = 8mA$$

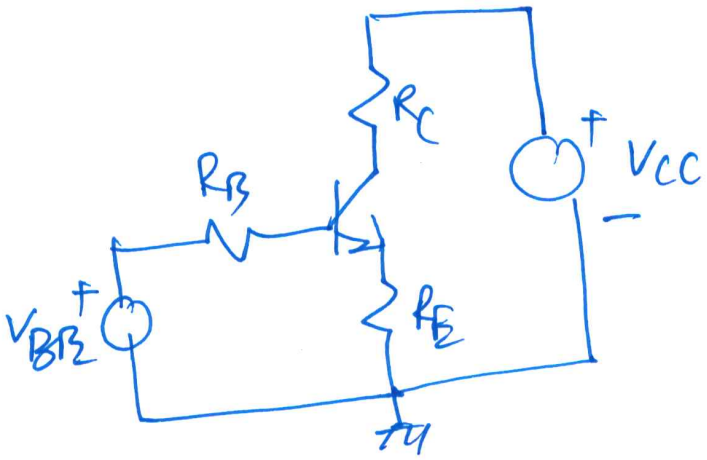
$$\therefore I_C R_C = 16V > V_{CC} \text{ ! not possible.}$$

Transistor will be saturated

$$V_{CE} \approx V_{CE}(sat) \approx 0.3V$$

$$I_C R_C = V_{CC} - V_{CE}(sat) \quad \text{and so on.}$$

Q.7.



$$V_{BB} = I_B R_B + V_{BE} + I_E R_E$$

$$= I_B R_B + V_{BE} + (I_B + \beta I_B) R_E$$

$$= I_B R_B + V_{BE} + I_B (\beta + 1) R_E$$

$$\therefore I_B = \frac{V_{BB} - V_{BE}}{R_B + (\beta + 1) R_E} = 6.6\,\mu A$$

$$\therefore I_C = \beta I_B \; ; \; I_E = I_B + I_C = 0.5346\,mA$$

$$= 0.53\,mA$$

$$V_{CE} = V_{CC} - I_C R_C - I_E R_E$$

$$= 3.083\,V$$