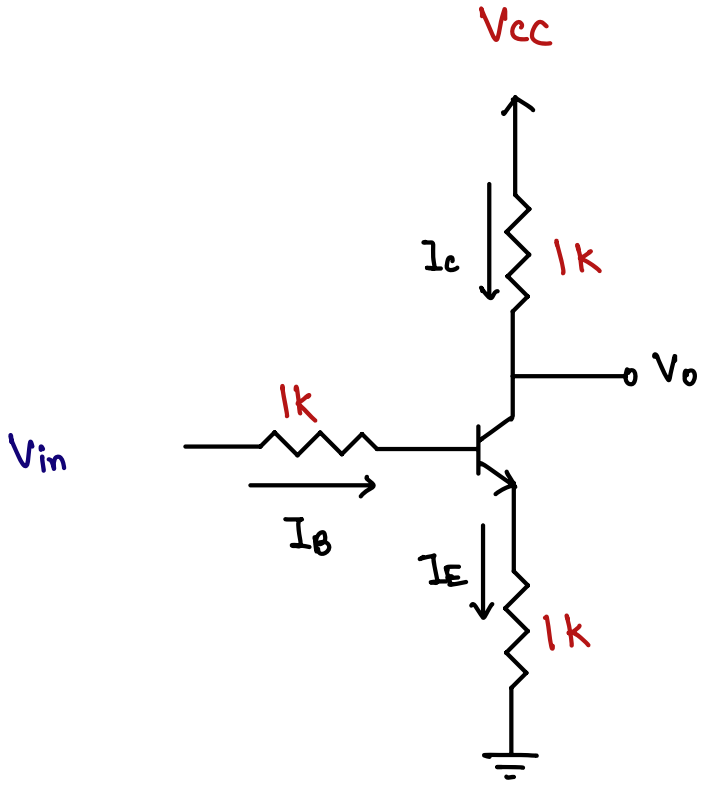


$\beta = 100$

Q. Assuming active mode, find I_B, I_C, I_E and V_o if $V_{in} = 5V$ & $V_{CC} = 10V$.

Validate the assumption.

(7) a) Assuming active

$$-5 + I_B + 0.7 + 101 I_B = 0$$

$$I_B = \frac{4.3}{102}$$

$$= 0.0422 \text{ mA}$$

$$I_C = 100 \times 0.0422 \text{ mA} = 4.22 \text{ mA}$$

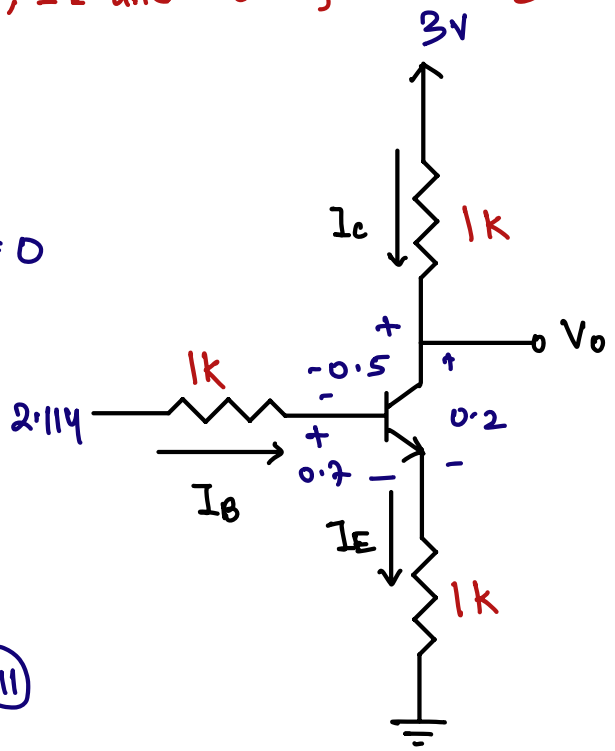
$$V_C = 10 - 1 \times 2c = 5.78 = V_o$$

$$I_E = 101 \times 0.0422 = 4.2622 \text{ mA}$$

$$V_E = 1 \times I_E = 4.2622 \text{ V}$$

$V_{CE} = V_C - V_E = 10.04\ V > 0.3\ V$ ∴ Active

Q. Assuming sath mode find I_B, I_C, I_E and V_o if $V_{in} = 3\ V$. and $V_{CC} = 3V$.



b)

$$-3 + I_B + 0.7 + (I_C + I_B) = 0$$

$$2I_B + I_C = 2.3 \quad \text{—— (I)}$$

$$-3 + I_C + 0.2 + (I_C + I_B) = 0$$

$$I_B + 2I_C = 2.8 \quad \text{—— (II)}$$

$$I_B = 0.6\ mA \quad I_C = 1.1\ mA$$

$$\frac{I_C}{I_B} = 1.83 < \beta \quad \therefore \text{ Saturation}$$

c) find V_{in} if $V_{cc} = 10V$ and $V_o = 3.824V$ in active mode.

⇒ Assuming active

$$I_C = \frac{10 - 3.824}{1k} = 6.176\,mA$$

$$I_B = \frac{1}{100} \times I_C = 0.06176\,mA$$

$$-V_{in} + I_B \times 1 + 0.7 + 1 \times I_E = 0$$

$$-V_{in} + I_B + 0.7 + (\beta + 1) I_B = 0$$

$$V_{in} = 6.99952 = 7V$$

d) I-V characteristic of BJT.

Ans: → in slide