

EEM 214 Elektronik

LAB 3

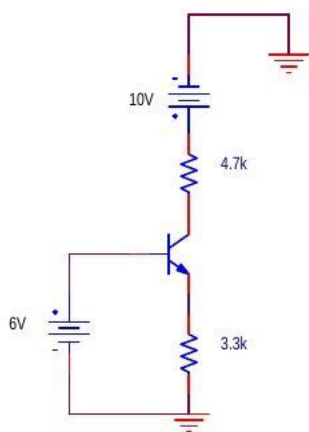
Önçalışma

A.

EEM

1) Find the mode of the transistors (active , cut off, saturation)? If they are in active mode find the Q-points of the transistors? ($\beta = 100$ $V_{BE} = 0.7$)

a)



$$I_C = \beta \cdot I_B \quad I_E = (\beta + 1) \cdot I_B$$

From Base – Emitter loop:

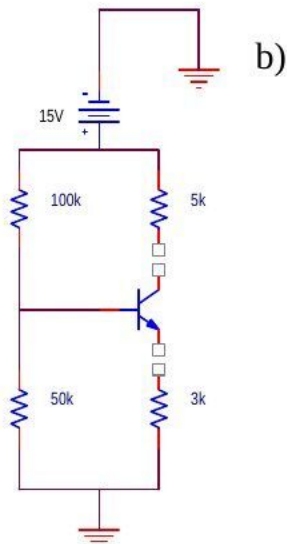
$$- 6V + V_{BE} + I_E \cdot 3.3k = 0 \Rightarrow 101 \cdot I_B \cdot 3.3k = 6V - 0.7V$$

$$I_B = \frac{5.3}{3300 \cdot 101} = 15.90 \mu A$$

$$I_C = 100 \cdot I_B = 1.5mA$$

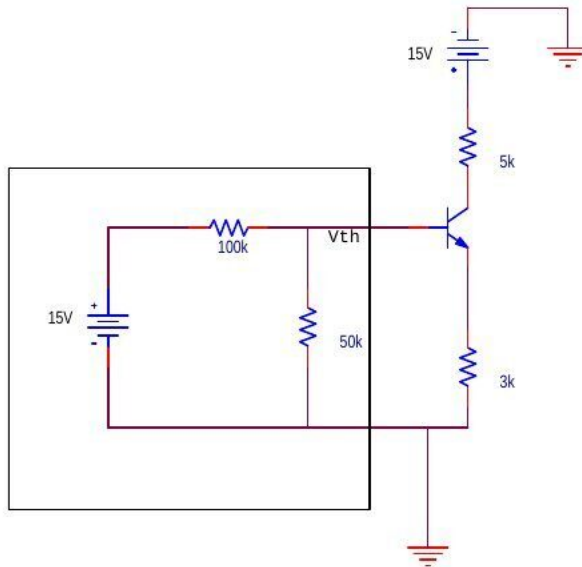
$$I_{CSAT} = \frac{10}{4.7k + 3.3k} = 1.25mA$$

Since $I_{CSAT} < I_C$ the transistor is saturating.



b)

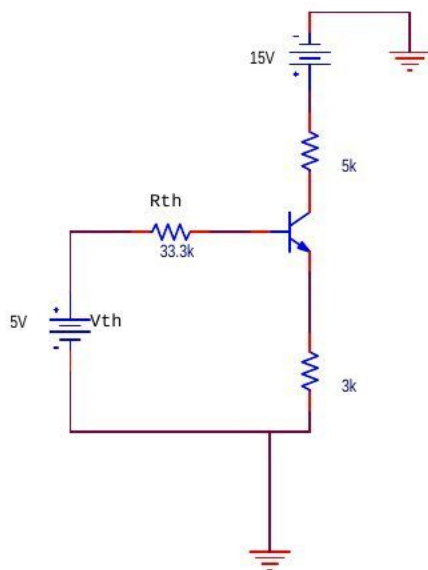
We can solve the problem using Exact method. We first convert the circuit to its equivalent and simplify the circuit.



We can now find the Thevenin equivalent circuit.

$$R_{TH} = \frac{100k \cdot 50k}{100k + 50k} = 33.3k$$

$$V_{TH} = \frac{15V}{150k} \cdot 50k = 5V$$



$$I_C = \beta \cdot I_B \quad I_E = (\beta + 1) \cdot I_B$$

From Base – Emitter loop:

$$- 5V + I_B \cdot 33.3k + V_{BE} + I_E \cdot 3k = 0$$

$$I_B = \frac{4.3}{336.3k} = 12.79\mu A$$

$$I_C = \beta \cdot I_B = 1.28mA$$

$$I_{CSAT} = \frac{15}{8k} = 1.875mA$$

Since $I_{CSAT} > I_C$ the transistor is active.

$$V_{CE} = V_C - V_E \quad V_C = 15 - I_C \cdot 5k = 8.6V \quad V_E = I_E \cdot 3k = 3.875V$$

$$V_{CE} = 4.725V$$