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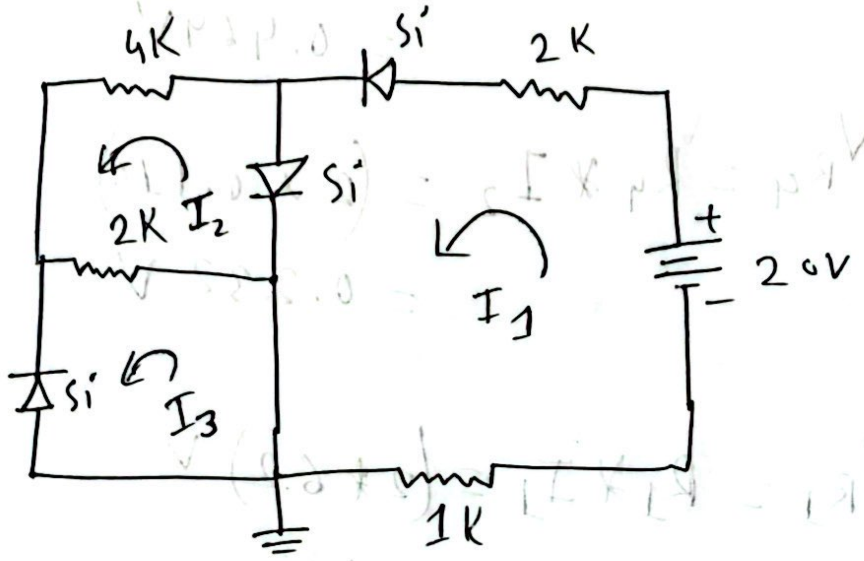
# Ans to the Q:No: 1




$I_3 = 0$ , $V_3 = 0$ [Reversed Biased]

Applying KVL in loop 1,

$-20 + 2*I_1 + 0.7 + 0.7 + 1*I_1 = 0$

$I_1 = 6.2\,mA$

Applying KVL in loop 2,

$4*I_2 + 2*I_2 - 0.7 = 0$

$I_2 = 0.116\,mA$

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For $R_3$, $V_{R_3} = R_3 * I_2 = (4 * 0.116)$

$= 0.464V$

For, $R_4$, $V_{R_4} = R_4 * I_2 = (2 * 0.116)$

$= 0.232 V$

For $R_1$, $V_{R_1} = R_1 * I_1 = (2 * 6.2) V$

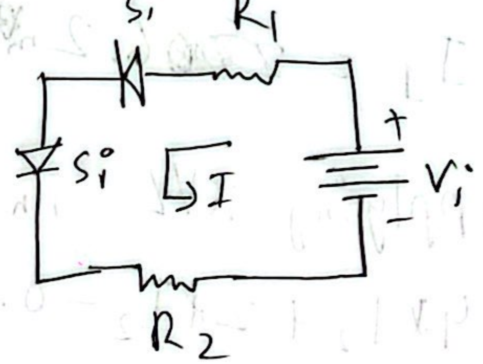
$= 12.4V$

For $R_2$, $V_{R_2} = R_2 * I_1 = (1 * 6.2) V$

$= 6.2 V$

For load line,

Let $I = 0$




Since, $D_1 = D_2 = V_D$

$-V_1 + IR_1 + 2VD + IR_2 = 0$

$-V_1 = 2VD$

$\therefore V_D = 5V$

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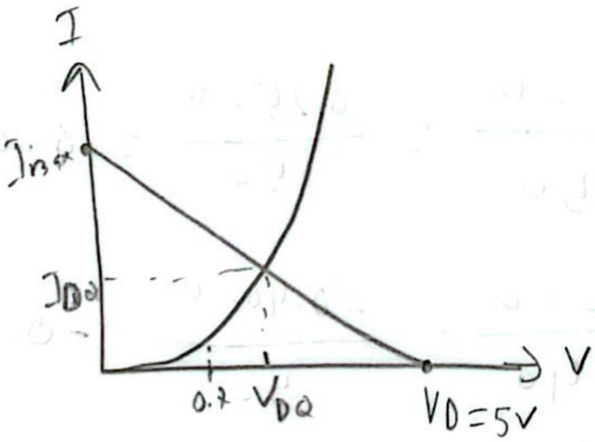
~~Loop~~

Let , $V_D = 0$

$$-V_1 + 0 + I(R_1 + R_2) = 0$$

$$I_{max} = \frac{V_1}{R_1 + R_2} = \frac{10}{3}$$

$$= 3.33 mA$$




Load line.

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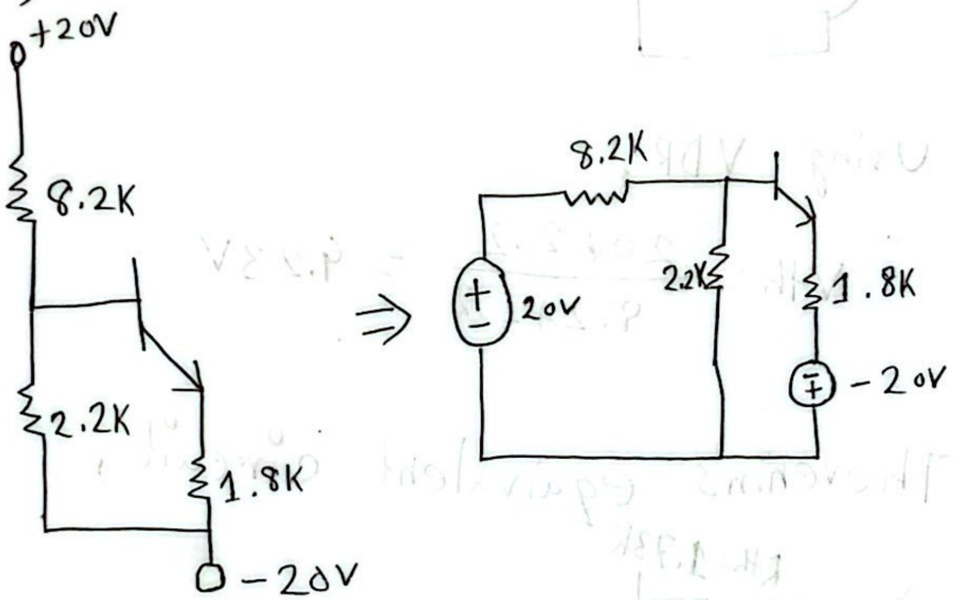
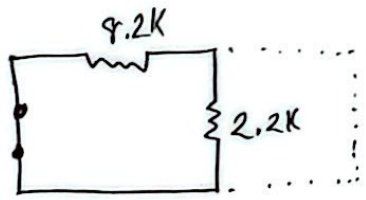
# Ans to the Q: NO: 2

For B E,




Using Thevenin's Theorem,

Rth:




$$R_{th} = (8.2 \| 2.2)K = \frac{8.2 * 2.2}{8.2 + 2.2} = 1.73K$$

Vth:

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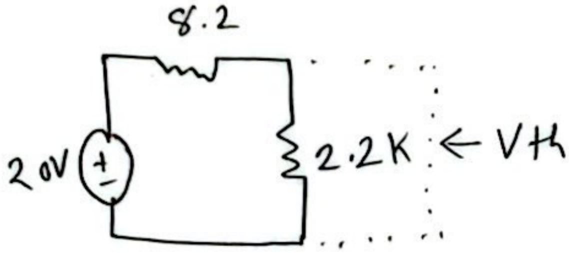
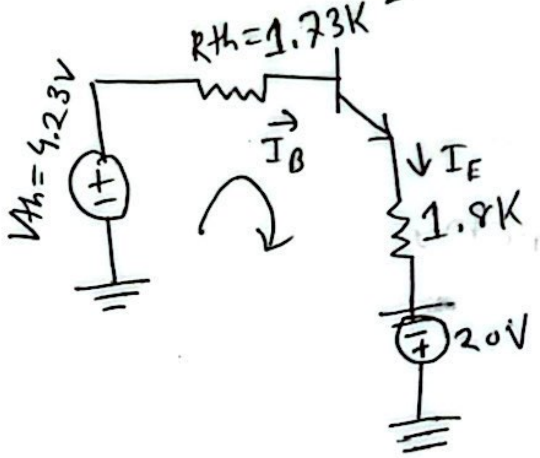
Vth:




Using VDR,

$$V_{th} = \frac{20*2.2}{8.2+2.2} = 4.23V$$

Thevenin's equivalent circuit,




Applying KVL in loop,

$$-V_{th} + R_{th} I_B + V_{BE} + 1.8K I_E - 20 = 0$$

$$\Rightarrow -4.23 + 1.73 I_B + 0.7 + 1.8 I_E - 20 = 0$$

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$$\Rightarrow -4.23 + 1.73 I_B + 0.7 + 1.8 I_B(\beta+1) - 20 = 0$$

$$\Rightarrow I_B = 0.12 \text{ mA}$$

$\beta = 100$ (Since $\beta$ is not given I am assuming the $\beta$ value as 100)

$$\therefore I_B = 0.12 \text{ mA}$$

$$\therefore I_C = \beta I_B = (100 * 0.12)$$

$$= 12 \text{ mA}$$

$$\therefore I_C = 12 \text{ mA}$$

$$\therefore I_E = I_B + I_C = 12.12 \text{ mA}$$

$$V_E \Rightarrow I_E = \frac{V_E - (-20)}{1.8}$$

$$\therefore V_E = 1.816 V$$

$$\therefore V_B = V_{BE} + V_E = (0.7 + 1.816) V$$

$$= 2.516 V$$

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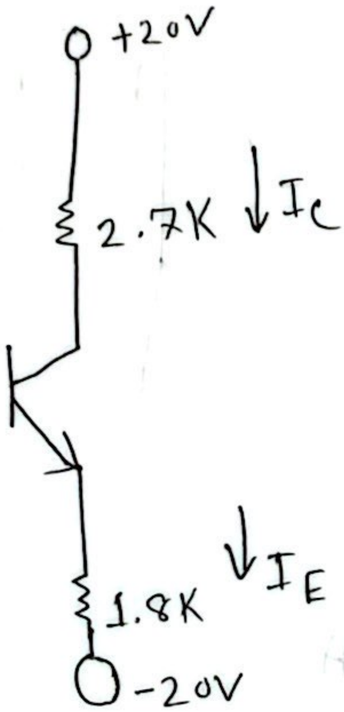
For CE,




Applying KVL ;

$$-20 + 2.7 I_c + V_{CE} + 1.8 I_E - 20 = 0$$

$$\Rightarrow -20 + 2.7(12) + V_{CE} + 1.8(12.12) - 20 = 0$$

$$\Rightarrow V_{CE} = -14.216V$$

$$\therefore V_C = V_{CE} + V_E = (-14.216 + 1.816)V$$

$$= -12.4V$$

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# DC Load Line Analysis :

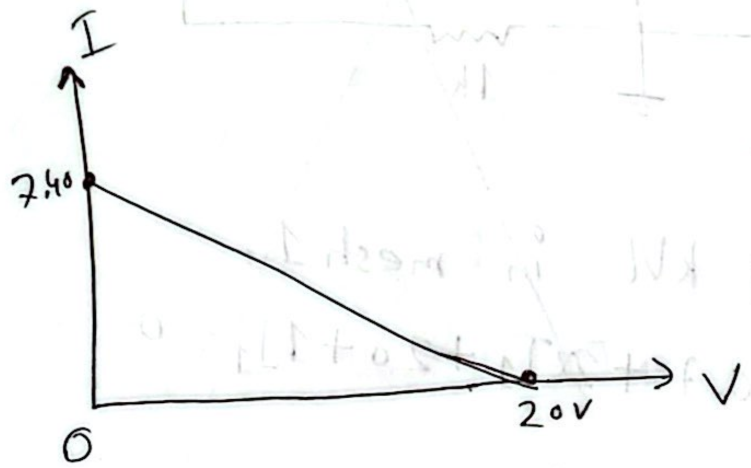
when, $I_c = 0$,

$$V_{CE} = V_{cc} = 20V$$

when,

$$V_{CE} = 0$$

$$I_c = \frac{20}{2.7} = 7.40mA$$




This circuit represents Voltage divider Biasing

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# Ans to the Q:NO:3

a)

$$\frac{V_1 - 0}{50} + \frac{V_2 - 0}{40} = \frac{0 - V_o}{100}$$

$$2V_1 + 2.5V_2 = -V_o$$

$$\therefore V_o = -(2V_1 + 2.5V_2)$$

b)

$$I_1 = \frac{V_1 - 0}{50} = \frac{0.25 - 0}{50} = 0.005\,mA$$

$$I_2 = \frac{V_2 - 0}{40} = \frac{-0.40 - 0}{50} = -0.01\,mA$$

$$I_f = \frac{0 - V_o}{100} = -\frac{V_o}{100}$$

$$I_1 + I_2 = I_f$$

$$\Rightarrow 0.005 - 0.01 = \frac{-V_o}{100}$$

$$\therefore V_o = 0.5V$$