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20301378

Assignment — 03

CSE 251, Section -12

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Ans to the Q-1:-

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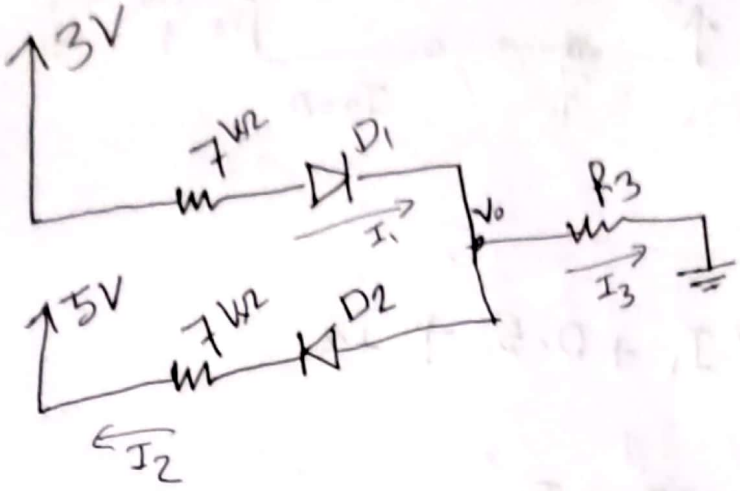
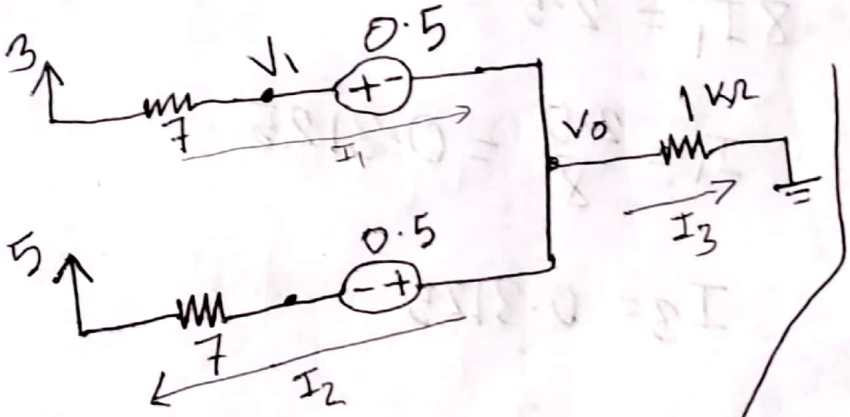


Step-1:- $D_1 \rightarrow$ ON

$D_2 \rightarrow$ ON



KVL →

$$-3 + 7I_1 + 0.5 + I_3 = 0$$

or, $$-5 - 7I_2 - 0.5 + I_3 = 0$$

$$I_1 = I_2 + I_3$$

After solving—

$I_1 = 0.23$ ✓

$I_2 = -0.65 < 0$ ✓

$I_3 = 0.88$ ✓

Assumption wrong

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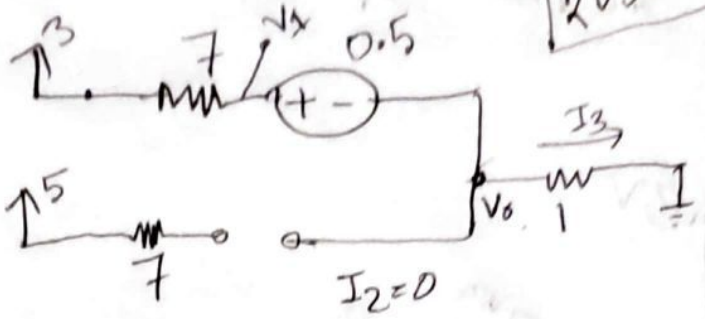
* Now,

$D_1 \rightarrow$ ON

$D_2 \rightarrow$ OFF



KVL →

$$3 = 7I_1 + 0.5 + I_3$$

$$I_1 = I_2 + I_3$$

$$I_1 = 0 + I_3$$

$$I_1 = I_3$$

$$8I_1 = 2.5$$

$$I_1 = \frac{2.5}{8} = 0.3125$$

$$I_3 = 0.3125$$

→

* $V_o = 1 \cdot I_3$

$= 0.312\ V$

* $V_D = V_A - V_C$

$= 0.312 - 5$

$= -4.68$ ← V_{D_o}

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verify :-

$D_1 \rightarrow ON$

$I_1 = 0.3125 > 0$

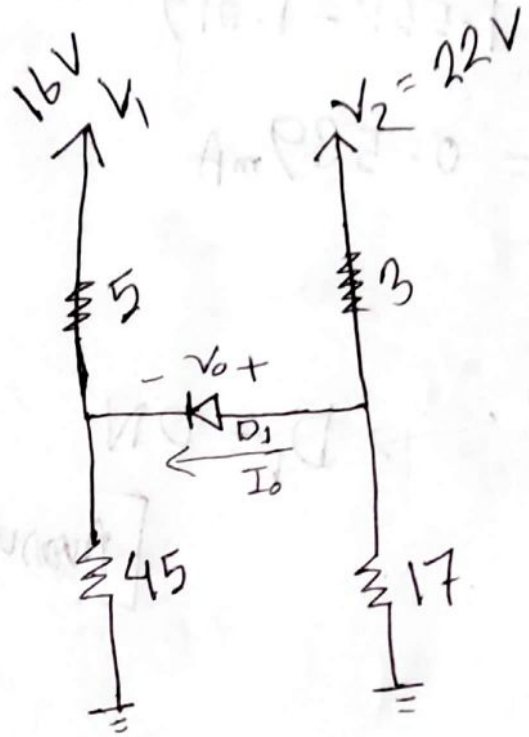
↳ Assumption right

$V_D = -4.68 < V_{D_0}$

↳ Assumption right

Q-2 :-

$V_{D_0} = 0.5V$



$V_A - V_B = 0.5$

Supernode –

$V_A\left(\frac{1}{3}+\frac{1}{17}\right) - \frac{22}{3} +$

$V_B\left(\frac{1}{5}+\frac{1}{45}\right) - \frac{16}{5}$

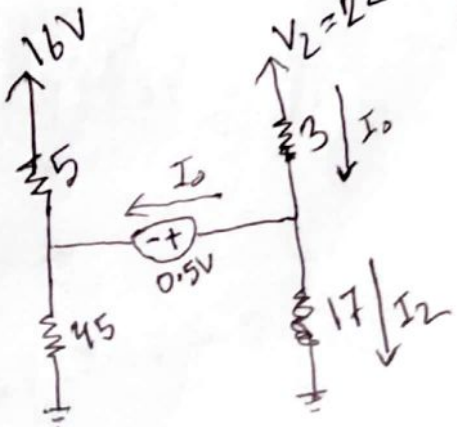
$= 0$

After solving –

$V_A = 17.325$

$V_B = 16.826$

step-1 :- $D_1 = ON$



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$$I_1 = \frac{22 - V_A}{3} = \frac{22 - 17.326}{3} = 1.558\,mA$$

$$I_2 = \frac{17.326 - 0}{17} = 1.019$$

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$$I_1 = I_0 + I_2$$

$$I_0 = I_1 - I_2$$

$$= 1.558 - 1.019$$

$$= 0.539\,mA$$

Verify: $I_0 > 0 \longrightarrow D_1 = ON$

[Assumption right]

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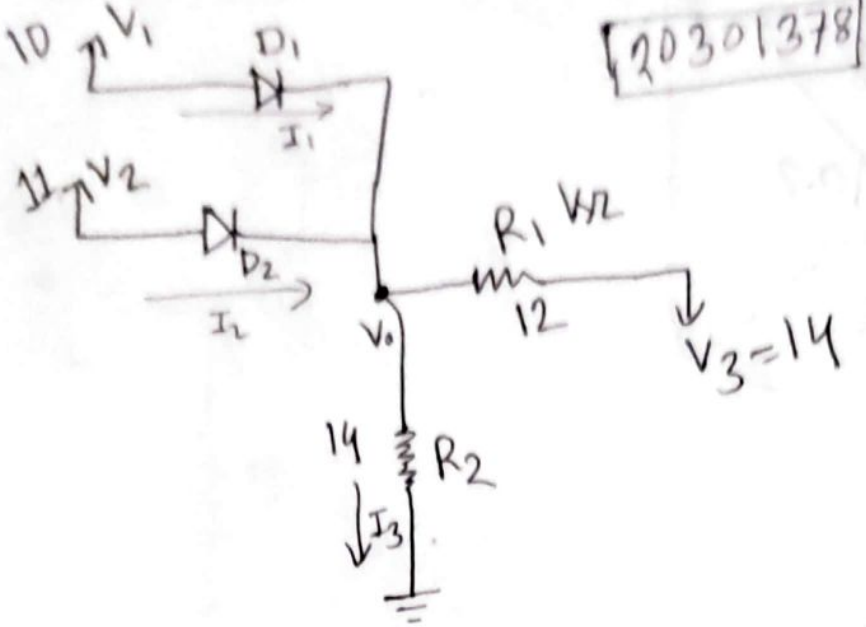
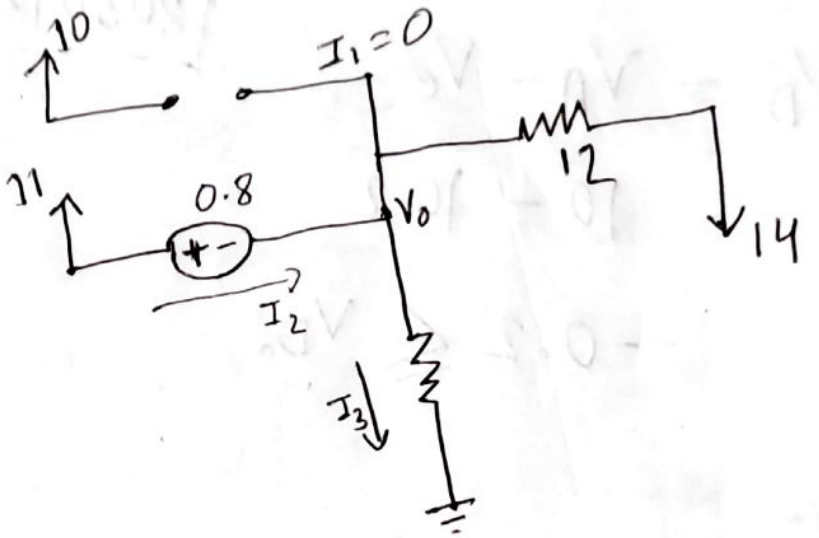
Question-3:-

[20301378]



(a) $D_1 \rightarrow$ OFF.

$D_2 \rightarrow$ ON



$I_1 = 0$

$\therefore V_0 = 11 - 0.8$

$= 10.2$

$I_3 = \frac{V_0 - 0}{14} = 0.72857$

$\Rightarrow I_1 + I_2 + I_3 = I_3$

$I_2 = 0.72857 - 0.31 = 0.41857$

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Now,

2030.1378

$$V_D = V_A - V_c$$

$$= 10 - 10.2$$

$$= -0.2 \leqq V_{D_0}$$

verify ⟶

$$I_{D_1} = 0.41857$$

[right Assumption]

$$V_D = -0.2 < V_{D_0}$$

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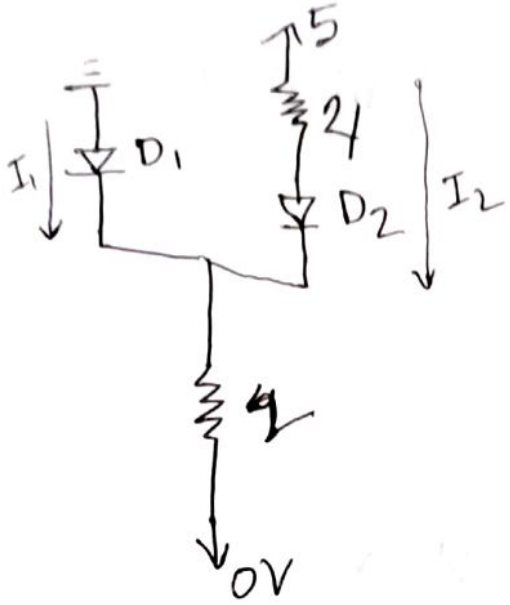
Question-4:-

$VD_0 = 0.5$



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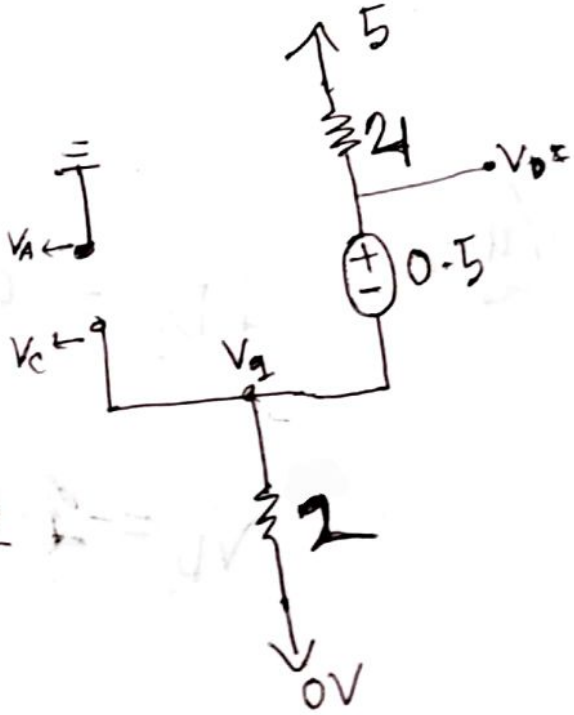
This is more Like OR-Logic gate, so we can say D_2 will work there.

Step-1:- $D_1 = OFF$

$D_2 = ON.$



KVL → $5 = 4I_2 + 0.5 + 2I_2$

$I_2 = 0.75$

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* $V_o - V_1 = 0.5$

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Now) $\frac{V_1}{2} = 0.75$

$V_1 = 1.5$

$\Rightarrow$ $V_o - 1.5 = 0.5\ V$

$V_o = 0.5 + 1.5 = 2\ V$

$V_D = V_A - V_C$

$= 0 - 1.5$

$= -1.5 \lesssim V_D$

Verify :- $I_{D_2} = 0.75 > 0$ ∴ right Assumption ✓

$V_D = -1.5 \lesssim V_{D_0}$ → right Assumption ✓

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Question 5 :

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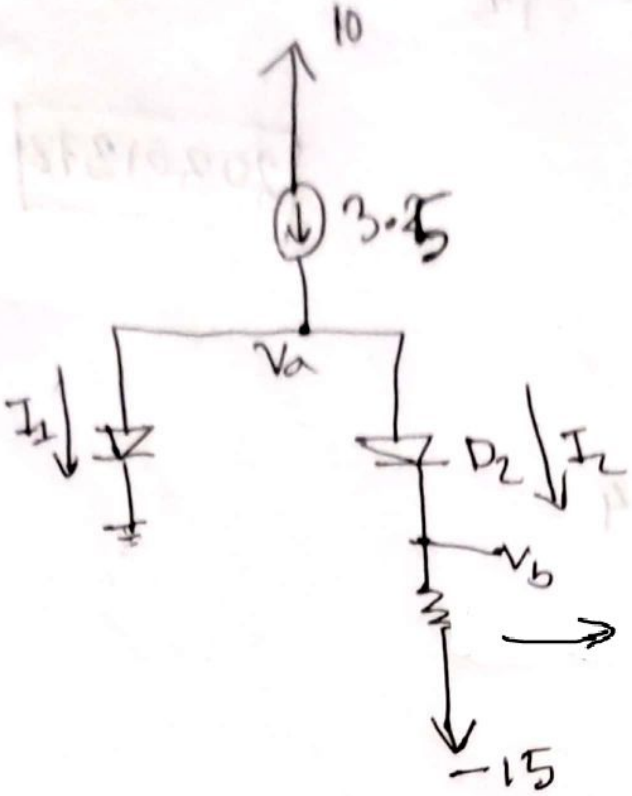
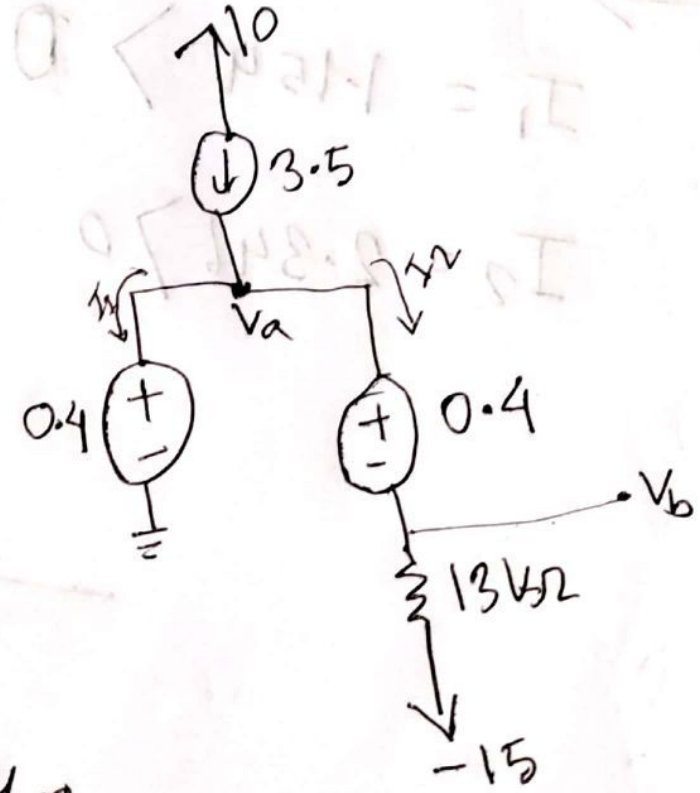


⟹

$D_1 \rightarrow$ ON

$D_2 \rightarrow$ ON,



$V_a = 0.4\,V$

⟹ $V_a - V_b = 0.4$

$V_b = 0.4 - 0.4$

$= 0\,V$

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$$I_1 = \frac{0-(-15)}{13} = \frac{15}{13} = 1.154$$

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$$I_8 = I_1 + I_2$$

$$I_2 = I_8 - I_1$$

$$= 3.5 - 1.154$$

$$= 2.346$$

Verify ⟶

$I_1 = 1.154 > 0$

$I_2 = 2.346 > 0$

⟶ Right Assumption.

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