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LCA (LAB) OPEN ENDED LAB

SUBMITTED TO "SIR WAQID JAN"

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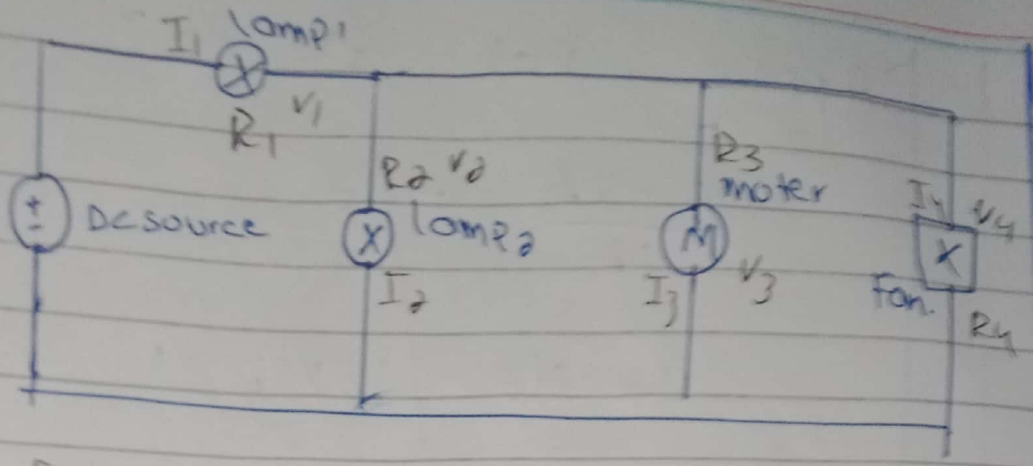
(1)



find

current flow through each component

voltage across each component

power loss in each

If source = 12V –

Solution :-

Let

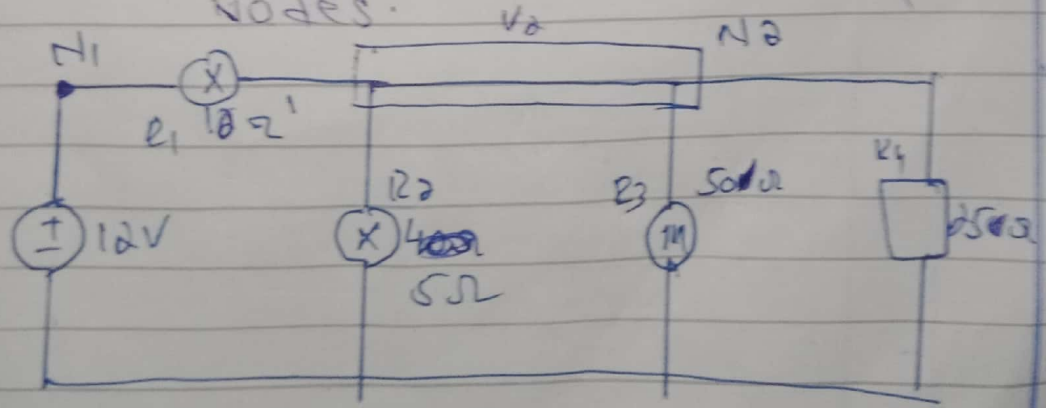
R1 = 10 ohm

R2 = 50 ohm

R3 = 50 ohm

R4 = 25 ohm.

Re draw Fig & identify nodes.



P-TO

Apply KCL on N1

$$\frac{V_1 - V_2}{10} = 12$$

$$V_1 - V_2 = 120 \rightarrow (1)$$

at node 2:-

$$\frac{V_2 - V_1}{10} + \frac{V_2}{5} + \frac{V_2}{50} + \frac{2V_2}{25} = 0$$

Taking lcm.

$$\frac{5V_2 - 5V_1 + 10V_2 + V_2 + 2V_2}{50} = 0$$

$$-5V_1 + 18V_2 = 0 \rightarrow (ii)$$

multiply eq1 by 5 & Add 2

$$5V_1 - 5V_2 = 600$$
$$-5V_1 + 18V_2 = 0$$

$$23V_2 = 600$$

$$\boxed{V_2 = 26.08} \rightarrow \text{Ans}$$

Put $V_0 = 26.6$ in (1)

$$V_1 - V_0 = 120$$

$$V_1 - 26.6 = 120$$

$$V = 120 + 26$$

$$\boxed{V_1 = 146\ V} \rightarrow **$$

current through each component

* current through comp1 R_1 -

as $V = IR$

$$V/R = I$$

$$I_1 = \frac{V_1}{R_1}$$

$$I_1 = \frac{146}{10}$$

$$\boxed{I_1 = 14.6\ A}$$

Current through R2 :-

$$I_2 = \frac{V_2}{R_2}$$

$$I_2 = 26/50$$

$$\boxed{I_2 = 0.52 \quad 5.0}$$

Current through R3

$$I_3 = V_3/R_3$$

$$I_3 = 26/50$$

$$\boxed{I_3 = 0.5\,A}$$

Current through R4

$$I_4 = \frac{V_4}{R_4}$$

$$I_4 = 26/25$$

$$\boxed{I_4 = 1.04\,A} \rightarrow$$

Voltage across each Component :-

From eqv * & **

$V_1 = 146\ V$

$V_2 = 26\ V$

From Fig

V_1 voltage across lamp

& V_2 voltage across lamp.

$V_4 = 146\ V$

$V_{L_2} = 26\ V$

Also

lamp & moter and fan are in parrallel hence voltage will be same

$$V_2 = V_3 = V_4 = 26 \text{ volt}$$

(6)

Power loss !-

Power loss at lamı :

$$P = I \cdot V$$

$$P_1 = I_1 \cdot V_1$$

$$P_1 = 14.6 \times 146$$

$$P_1 = 2131 \text{ watt}$$

P at lamp 2:-

$$P_2 = I_2 \cdot V_2$$

$$= 5.2 \times 26$$

$$\boxed{P_2 = 135.2 \text{ Watt}}$$

P at moter :

$$P_3 = I_3 \times V_3$$

$$= 0.5 \times 26$$

$$\boxed{P_3 = 13 \text{ watt}}$$

$$P_4 = I_4 \times V_4$$

$$\boxed{P_4 = 27.04 \text{ watt}}$$

Result:-

Voltage across lamp1 $V_1 = 146V$
" " lamp2 $V_2 = 26V$
" " moter $V_3 = 28V$
" " fan $V_4 = 26V$

current through lamp1 $I_1 = 14.6A$
" " lamp2 $I_2 = 5.2A$
" " moter $I_3 = 0.5A$
" " fan $I_4 = 1.04A$

power loss :-

power loss at lamp1 $P_1 = 2131W$
" " " lamp2 $P_2 = 135.2W$
" " " Moter $P_3 = 13W$
" " fan $P_4 = 27.04W$