Name :

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I.D :

16431

Subject :

LCA (Lab)

Instructor :

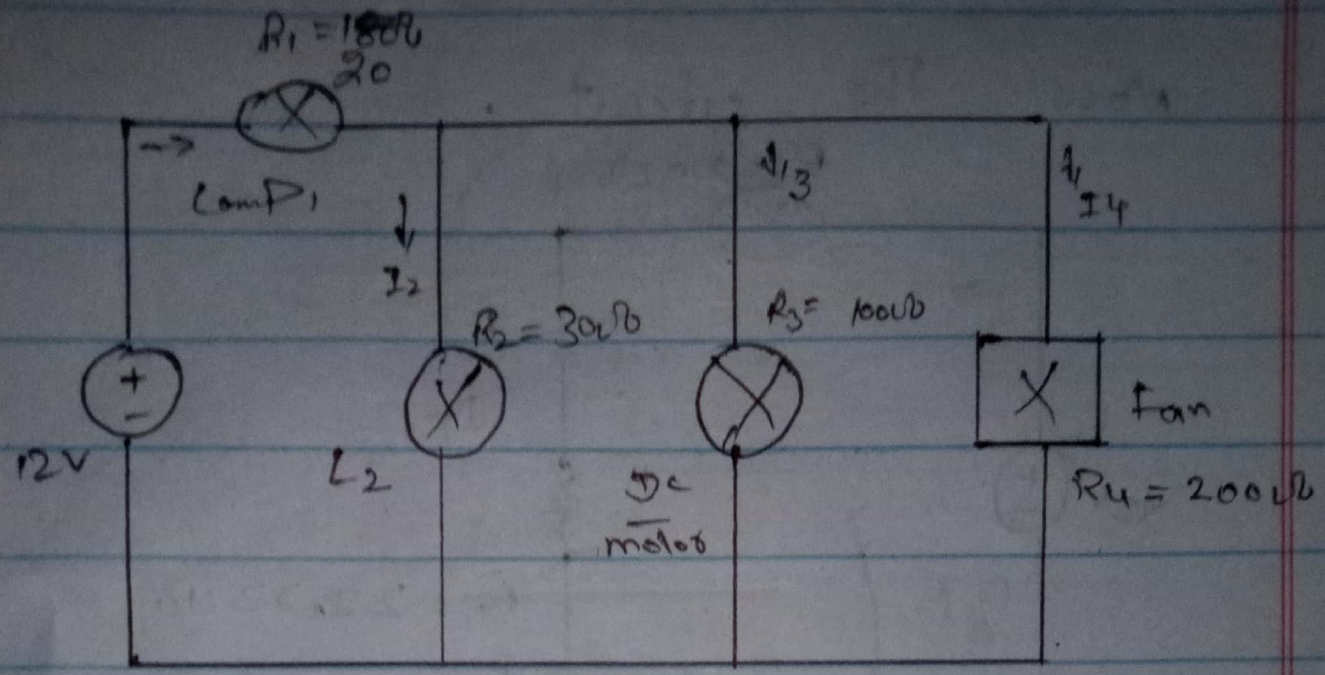
Sir Waleed Jan

Date :

27-06-2020

Assignment :

Open Ended Lab



Here R_2, R_3 and R_4 are in parallel, Therefore

$$R_T = R_2 \parallel R_3 \parallel R_4 = \frac{1}{\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}}$$

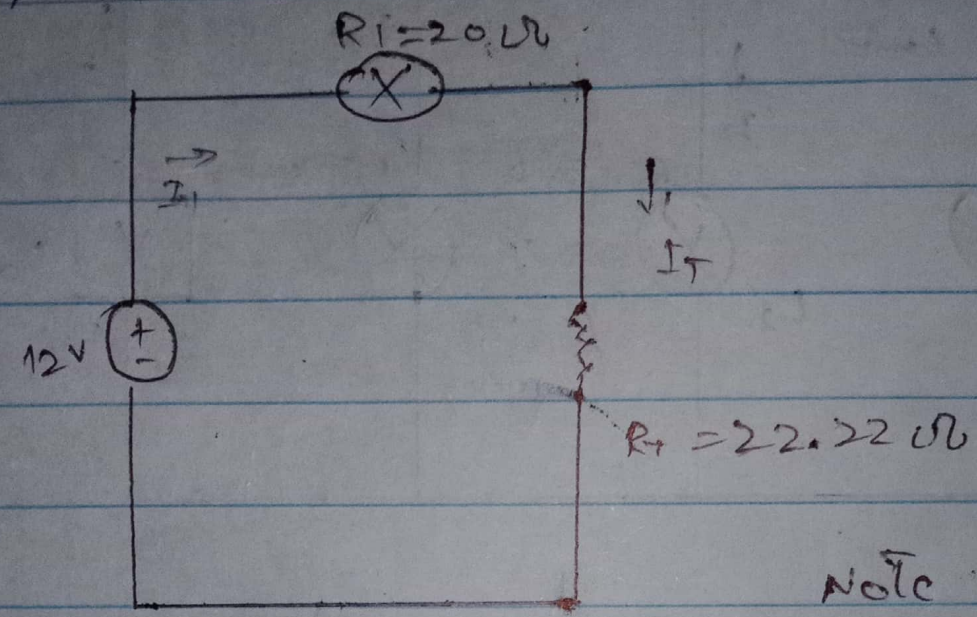
$$= \frac{1}{\frac{1}{30} + \frac{1}{100} + \frac{1}{200}}$$

$$= \frac{1}{0.03 + 0.01 + 0.005}$$

$$= \frac{1}{0.045}$$

$$R_T = 22.22\,\Omega$$

Now The circuit



Note

$$R_T = R_2 \,||\, R_3 \,||\, R_4$$

Since R_1 and R_T are in series I Through both resistance are same.

∴

Current Through Lamp1 is

$$I_1 = \frac{V}{R_1 + R_T} = \frac{12}{20 + 22.22}$$

$$I_1 = \frac{12}{42.22} = \boxed{0.2842\ A}$$

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Now The circuit modefies to

Voltage across Comp v_1

$$v_1 = \left(\frac{R_1}{R_T + R_1}\right) v$$

$$v_1 = \left(\frac{20}{22.22 + 20}\right) 12$$

$$v_1 = \frac{(20)(12)}{42.22}$$

$$= \frac{240}{42.22}$$

$$\boxed{v_1 = 5.6845\ v}$$

Now voltage across R_T

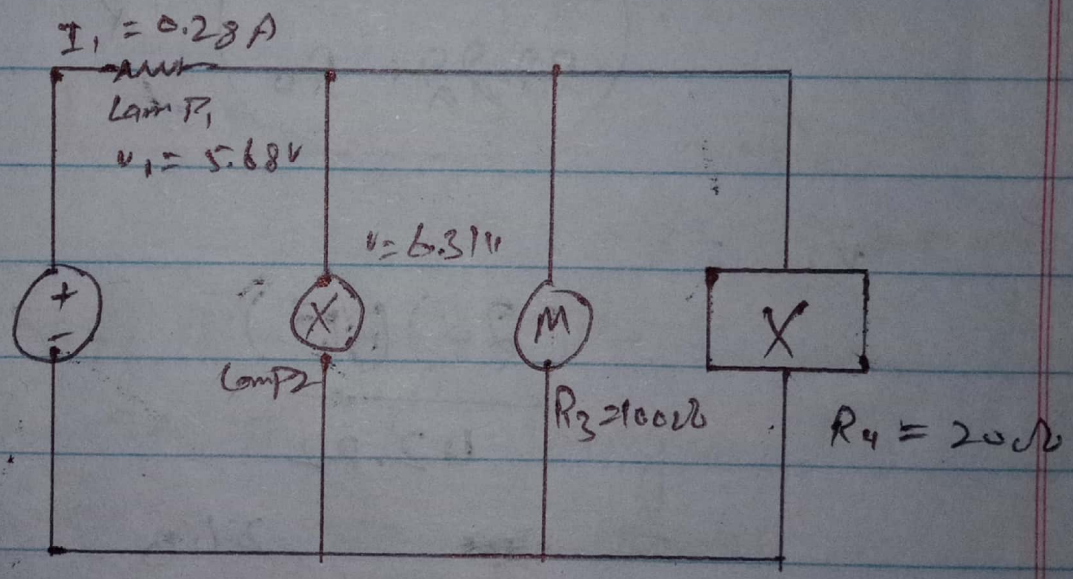
$$V_T = V - V_1$$

$$V_T = 12 - 5.6845$$

$$=$$

$$\boxed{V_T = 6.31V}$$

Now The circuit is



Since The voltage across Lamp2 is $V_T = 6.31V$ and R_2, R_3 and R_4 are in Parallel, so The voltage across R_2, R_3 and R_4 is same,

hence

$$V_2 \text{ (lamp}_2) = 6.31V$$
$$V_3 \text{ (Motor)} = 6.31V$$
$$V_4 \text{ (Fan)} = 6.31V$$

Now The current Through R_3 and R_4 are

$$I_2 \text{ (lamp}_2) = \frac{6.31}{30} = 0.2103A$$

$$I_3 \text{ (Motor)} = \frac{6.31}{100} = 0.06A$$

$$I_4 \text{ (Fan)} = \frac{6.31}{200} = 0.03A$$

(c)

Now for Power Losses.

Power Losses in Lamp$_1$ = $P_1 = V_1 I_1$

$P_1 = (5.68)(0.28)$

$\boxed{P_1 = 1.591\ W}$

Power losses in lamp2 = $P_2 = V_T I_2$

$= (6.31)(0.21)$

$\boxed{P_2 = 1.3251\ W}$

Power losses in Motor = $P_3 = V_T \times I_3$

$= (6.31)(0.06)$

$\boxed{P_3 = 0.37\ W}$

Power Losses in DC Fan = $P_4 = V_T \times I_4$

$P_4 = (6.31)(0.03)$

$\boxed{P_4 = 0.1893\ W}$

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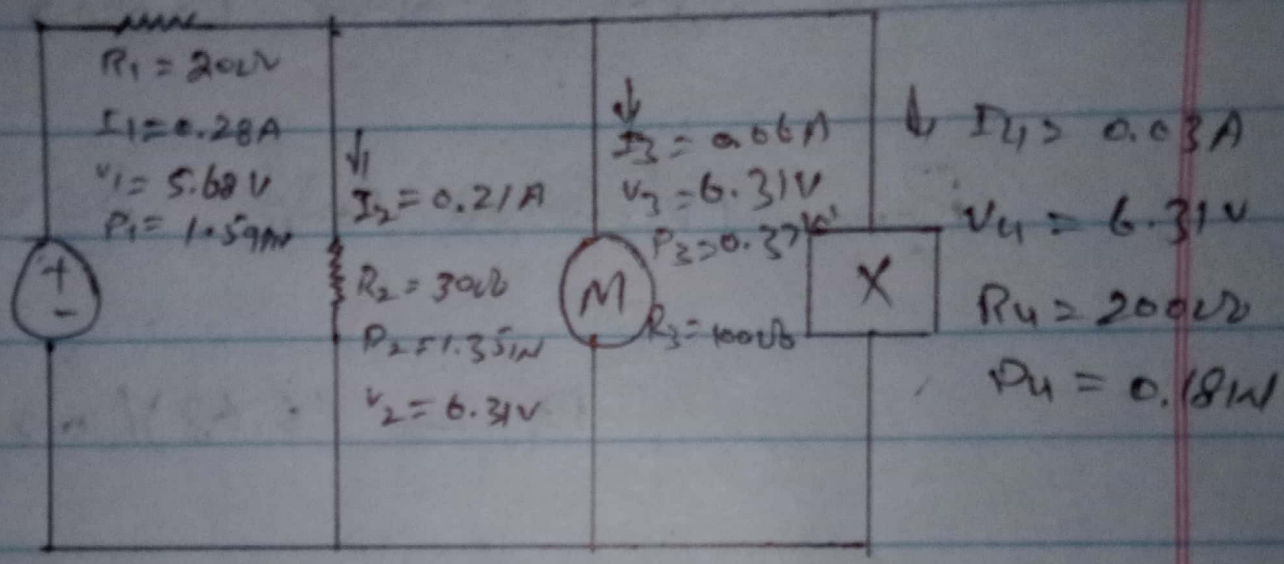
The Total circuit is



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The Total circuit is