HASEEB ULLAH
ID NO 16314
Subject: Open ended lab (LCA LAB)
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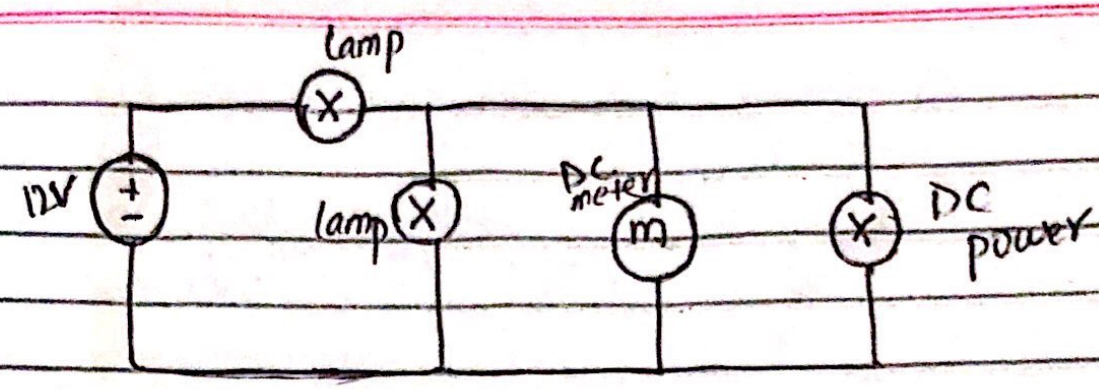


Solution:-

solving through nodals.

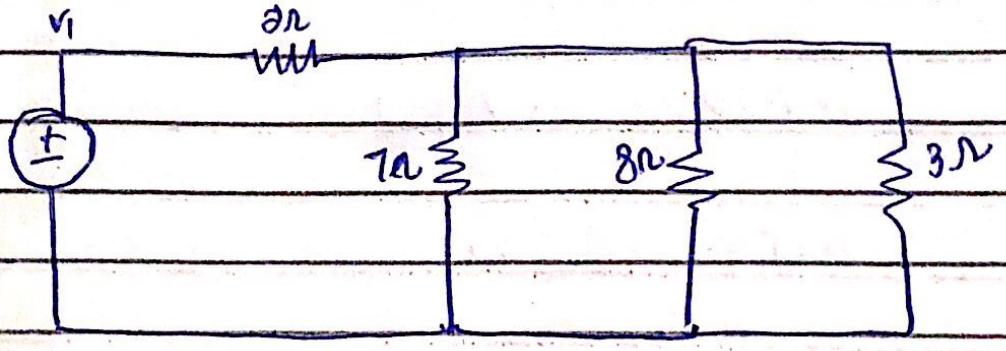
let

$R_1 = 2$

$R_2 = 7$

$R_3 = 8$

$R_4 = 3$



Apply KCL on node 1.

$$\frac{V - V_2}{2} = 12$$

$$V_1 - V_2 = 12 \times 2$$

$$V_1 - V_2 = 24$$

$$V_1 = 24 + V_2 \quad \text{— (1)}$$

Applying KCL on node 2.

$$\frac{V_2 - V_1}{2} + \frac{V_2}{7} + \frac{V_2}{8} + \frac{V_2}{3}$$

Taking L.C.M

$$\frac{168V_2 - 168V_1 + 48V_2 + 42V_2 + 112V_2}{336}$$

$$\frac{370V_2 - 168V_1 = 0}{336}$$

$$1.10V_2 - 0.5V_1 = 0$$

$$1.10V_2 = 0.5V_1$$

$$\frac{1.10V_2}{0.5} = V_1$$

$$2.2\,V_2 = V_1$$

$$V_1 - 2.2V_2 = 0 \quad \text{—} (3)$$

put the value of V_1 in eq (2)

$$(24 + V_2) - 0.2V_2 = 0$$

$24 + V_2 - 0.2V_2 = 0$

$24 + 0.8V_2 = 0$

$0.8V_2 = -24$

$V_2 = -\frac{24}{0.8}$

$V_2 = -30$

Putting the value of V_2 in eq (1)

$V_1 = 24 + V_2$

$V_1 = 24 + (-30)$

$V_1 = -6$

find current

(i) $I_1 = V_1/R_1$

$I_1 = -6/2$

$I_1 = -3A$

(ii) $I_2 = V_2 / R_2$

$I_2 = -30/7$

$I_2 = -4.28A$

(iii) $I_3 = I / R_3$

$I_3 = -30/8$

$I_3 = -3.75A$

$I_4 = I / R_4$

$I_4 = -30/3$

$\boxed{I_4 = -10}$

find voltage.

(ii) $V_1 = I_1 R_1$

$V_1 = I_1 R_1$

$V_1 = -3(2)$

$V_1 = -6V$

(iii) $V_2 = I_2 R_2$

$V_2 = -4.28(7)$

$V_2 = -29.96V$

(iii) $V_3 = I_3 R_3$

$V_3 = -3.75(8)$

$\boxed{V_3 = -30V}$

$V_4 = I_4 R_4$

$V_4 = -2(3)$

$V_4 = -6V$

find power

(i) $P_1 = V_1 \times I_1$

$P_1 = -6 \times -3$

$\boxed{P_1 = 18W}$

(ii) $P_2 = V_2 I_2$

$P_2 = -29.96 \times -4.28$

$P_2 = 128.22W$

(iii) $P_3 = V_3 I_3$

$P_3 = -30 \times -3.75$

$P_3 = 112.5\ W$

(iv) $P_4 = V_4 I_4$

$P_4 = -6(-10)$

$\boxed{P_4 = 60W}$