DATE:

EXP NO: 3

DETERMINATION OF VOLTAGE IN CIRCUIT USING NODAL ANALYSIS

AIM:

To determine the voltage in the circuit using nodal analysis both theoretically and practically for a given DC circuit.

APPARATUS REQUIRED:

SNO	APPARATUS	SPECIFICATION	QUANTITY
1	Regulated Power Supply	(0-30)V	1
2	Multimeter	–	1
3	Resitor	470Ω, 330Ω	3, 2
4	Bread board	–	1

PROCEDURE:

1. Give connections as per the circuit diagram.

2. Switch ON the supply, vary the RPS and set a particular input voltage.

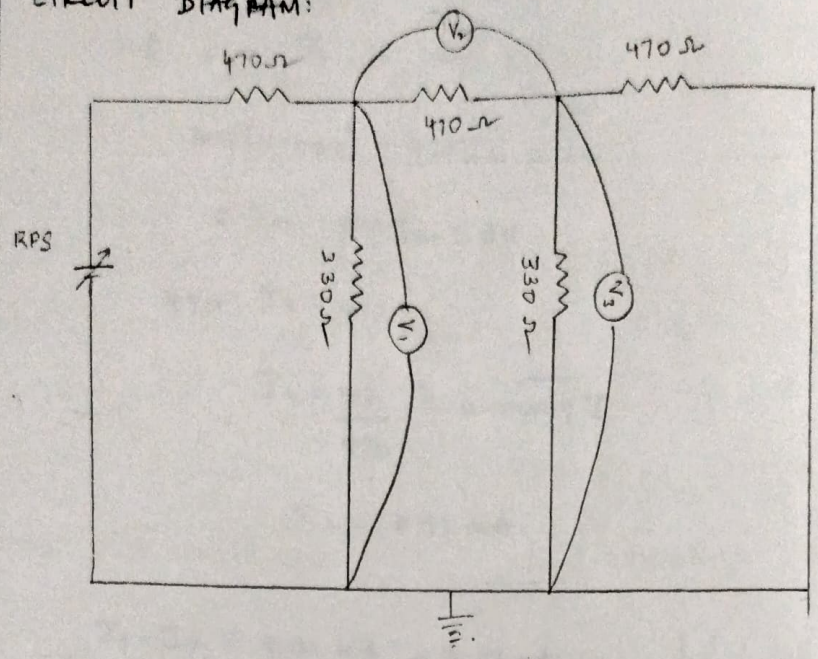
3. Note down the readings of ammeters and voltmeters and tabulate them.

4. Vary the RPS to its minimum value and switch off the supply.

5. Reduce the RPS to its minimum value and switch off the supply.

6. Using the tabulated values, verify Kirchoff's laws practically and verify it Theoretically.

CIRCUIT DIAGRAM:



TABULAR COLUMN:

PARAMETERS	THEORETICAL	PRACTICAL
I_1	0.685V	0.69 V
I_2	0.452V	0.48 V
$I_1 - I_2$	0.186 V	0.19 V.

CALCULATION:

Let D point be ground $\rightarrow V_D = 0$

Let potential at points A and B be V_A and V_B using nodal analysis at node A,

current entering = 0.

current leaving = $\frac{V_A}{330} + \frac{V_A - V_B}{470} + \frac{V_A - 2}{470}$

By KCL, $\frac{V_A}{330} + \frac{V_A - V_B}{470} + \frac{V_A - 2}{470} = 0$

$\frac{2V_A - V_B - 2}{470} + \frac{V_A}{330} = 0.$

RESULT:

Thus, The nodal analysis verified practically and Theoretically. The resultant voltage for 2V supply are:

a) The voltage V_1 is 0.638 V

b) The voltage V_2 is 0.186 V

c) The voltage V_3 is 0.452 V.

$$330(2V_A - V_B - 2) + 470V_A = 0$$

$$660V_A - 330V_B - 660 + 470V_A = 0$$

$$1130V_A - 320V_B = 660 \quad \text{——} (1)$$

At node B:

current entering = 0.

current leaving = $\frac{V_B - V_A}{470} + \frac{V_B}{470} + \frac{V_B}{330}$

By KCL,

$$\frac{V_B - V_A}{470} + \frac{V_B}{470} + \frac{V_B}{330} = 0$$

$$330(2V_B - V_A) + 470V_B = 0$$

$$660V_B - 330V_A + 470V_B = 0$$

$$-330V_A + 1130V_B = 0 \quad \text{——} (2)$$

Solving (1) and (2).

$V_A = 0.638\ V = V_1$

$V_B = 0.187\ V = V_3$.

$V_2 = V_A - V_B = 0.638 - 0.187$.

$= 0.4521\ V$.