

# EEE Digital Assignment

## Mesh Current Analysis and Nodal Voltage Analysis

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Slot: L10+L11

Batch: 10(B-Tech Computer Science (Core))

## Mesh Current Analysis and Nodal Voltage Analysis

### AIM:

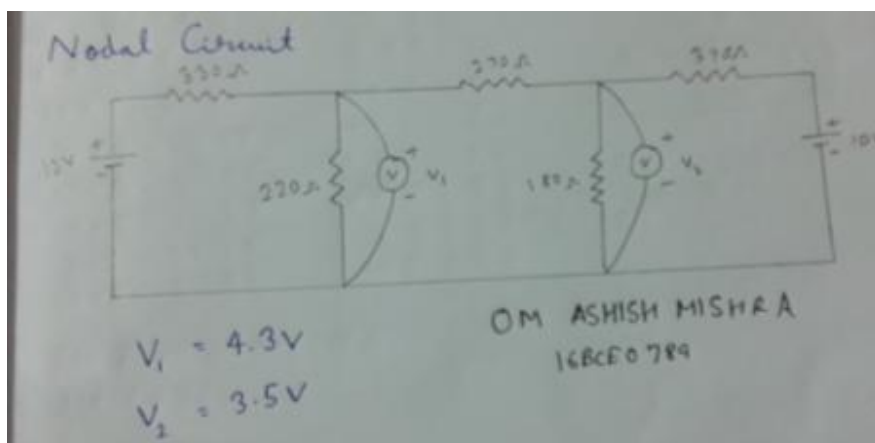
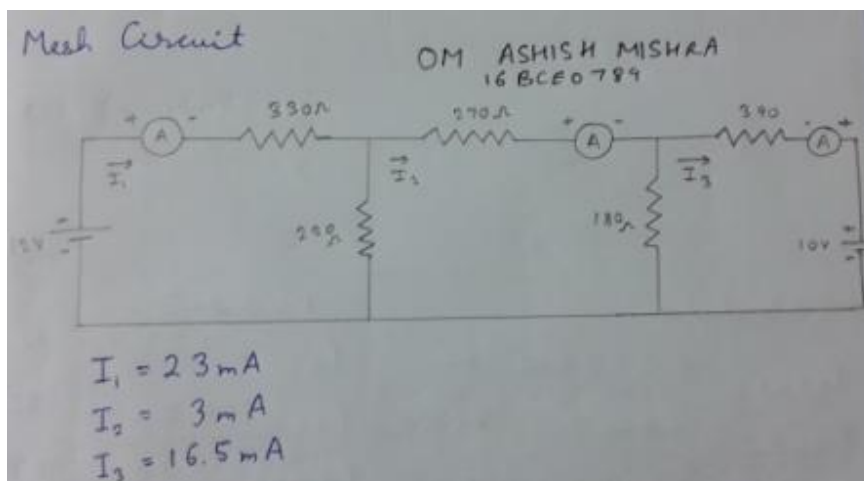
Find the loop and branch currents using mesh current analysis and verify practically for the circuit given below

Find the Nodal voltages and branch currents using nodal voltage analysis and verify practically for the circuit given below

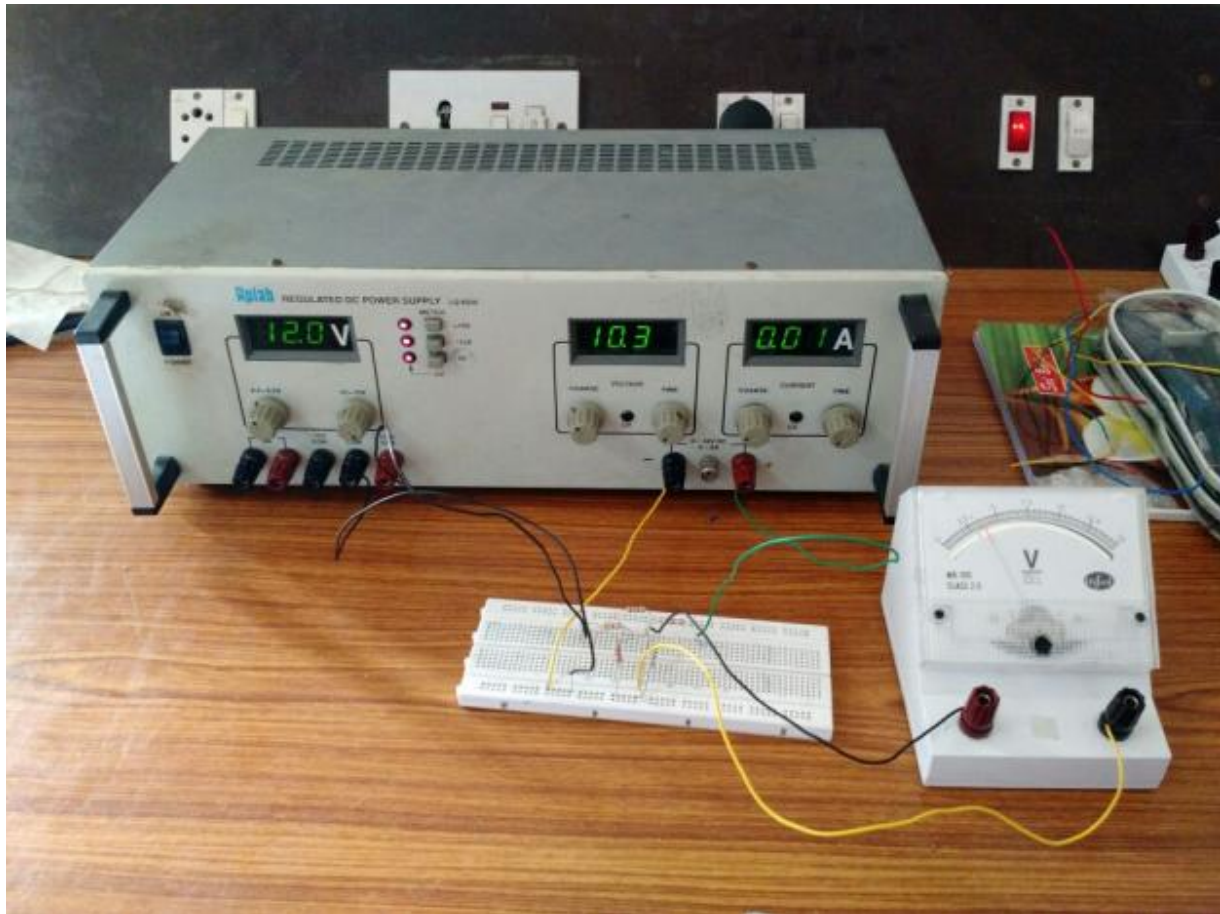
### APPARATUS REQUIRED:

- Connecting wires
- Resistance of  $330\Omega$ ,  $270\Omega$ ,  $390\Omega$ ,  $220\Omega$ ,  $180\Omega$
- Voltage supply of 10V, 12V
- Grounding 0V

### CIRCUIT DIAGRAMS:



PICTURE OF BREADBOARD CONNECTION:



MANUAL CALCULATION(S) / ROUGH WORK:

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$$\begin{aligned} -320I_1 - 210(I_1 - I_2) + 12 &= 0 \\ -550I_1 + 210I_2 &= -12 \rightarrow \textcircled{A} \\ -270I_2 - 180I_2 + 180I_3 - 210I_2 + 220I_1 &= 0 \\ 220I_1 - 670I_2 + 180I_3 &= 0 \rightarrow \textcircled{B} \\ -340I_3 - 10 - 180I_3 + 180I_2 &= 0 \\ 180I_2 - 520I_3 &= 10 \rightarrow \textcircled{C} \end{aligned}$$

From  $\textcircled{A}$ ,  $\textcircled{B}$ ,  $\textcircled{C}$  we get:

$$\begin{aligned} I_1 &= 23\text{mA} \\ I_2 &= 3.0\text{mA} \\ I_3 &= 16.5\text{mA} \end{aligned}$$

fig: Mess Analysis

Nodal Analysis

$$\frac{12 - V_1}{22k} = \frac{V_1 - 0}{24k} + \frac{V_1 - V_2}{33k} \quad \text{--- (1)}$$

$$\Rightarrow \frac{12 - V_1}{22} = \frac{V_1}{24} + \frac{V_1 - V_2}{33}$$

$$\Rightarrow \frac{12 - V_1}{22} = \frac{2V_1}{24} + \frac{V_1 - V_2}{33}$$

$$\Rightarrow (12 - V_1) \times 6 = 22V_1 + 22(V_1 - V_2)$$

$$\Rightarrow 22 \times 6 - 6V_1 = 22V_1 + 22V_1 - 22V_2$$

$$\Rightarrow 67V_1 - 22V_2 = 216 \quad \text{--- (2)}$$
  

$$\frac{V_2 - V_1}{33k} = \frac{V_2 - 0}{18k} + \frac{V_2 - 18}{14k} \quad \text{--- (3)}$$

$$\Rightarrow \frac{V_2 - V_1}{33} = \frac{V_2}{18} + \frac{V_2 - 18}{14}$$

$$\Rightarrow \frac{2V_2 - 2V_1}{33} = \frac{V_2}{18} + \frac{V_2 - 18}{14}$$

$$\Rightarrow \frac{2V_2 - 2V_1}{33} = \frac{7V_2 + 9V_2 - 18}{34}$$

$$\Rightarrow 28V_1 - 18V_2 = 187V_2 + 270 - 270$$

$$\Rightarrow 28V_1 - 187V_2 = -270 \quad \text{--- (4)}$$

From (2) & (4)

$$V_1 = 4.2V$$

$$V_2 = 3.8V$$

Fig: Nodal Analysis

#### GRAPH:

No graph is done for this experiment.

#### TABULATIONS:

AMMETER		
	CALCULATED	MEASURED
$I_1$	23mA	23.5mA
$I_2$	3mA	3.1mA
$I_3$	16.5mA	17mA

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VOLTMETER		
	CALCULATED	MEASURED
$V_1$	4.3V	4.35V
$V_2$	3.5	3.5V

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**INFERENCE / RESULT:**

Through this experiment we verified the Kirchhoff's law (current and voltage law).