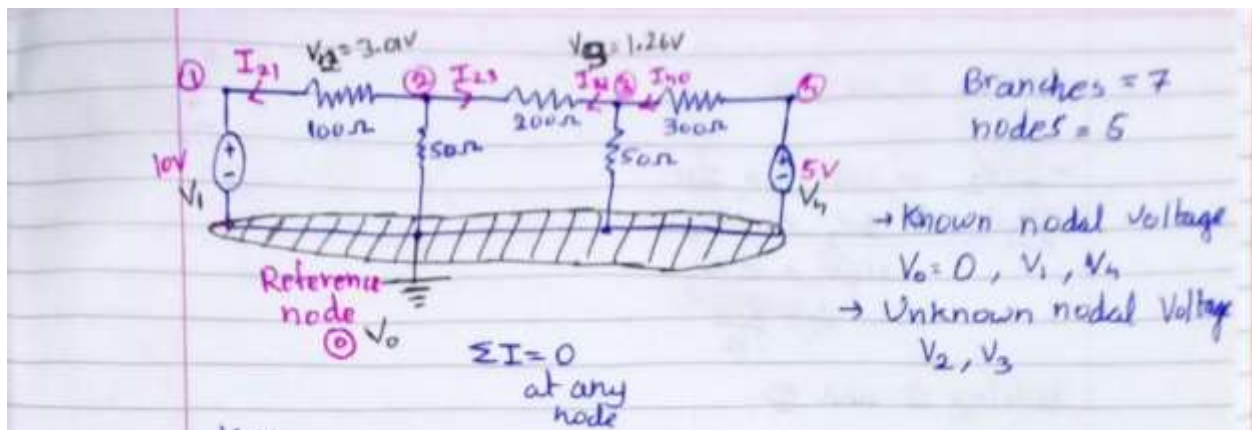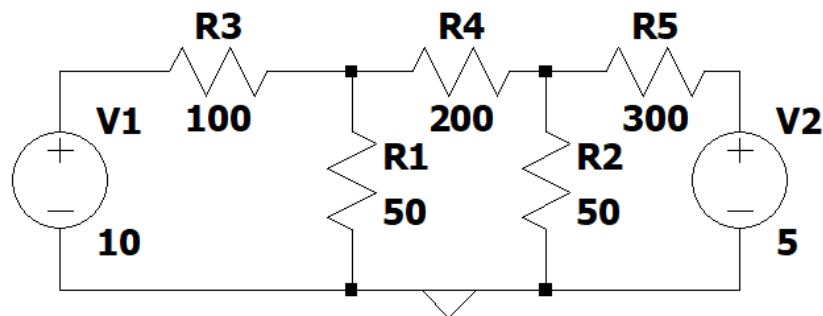# Verification of Kirchhoff's Current Law

Objectives:

1. To verify KCL and find the Nodal Voltages
2. To verify it on breadboard on www.tinkercad.com

Verification of KCL and Nodal Voltages

Observation:

S.No	Parameter to be measured	Value Measured with Units
1	V_2	3.01V
2	V_3	1.12V
3	I_{12}: Current through R_1	0.069A
4	I_{23}: Current through R_2	0.009A
5	I_{34}: Current through R_3	-0.0129A
6	I_{20}: Current through R_4	0.0602A
7	I_{30}: Current through R_5	0.0225A

Calculations:

- KCL

Node 2 $\sum I_{\text{entering node}} = \sum I_{\text{leaving node}}$

$$I_{02} = I_{21} + I_{23}$$

$$\Rightarrow \frac{0 - V_2}{50} = \frac{V_2 - V_1}{100} + \frac{V_2 - V_3}{200}$$

$$\Rightarrow \frac{-V_2}{50} = \frac{V_2 - 10}{100} + \frac{V_2 - V_3}{200}$$

$$\Rightarrow -4V_2 = 2V_2 - 20 + V_2 - V_3$$

$$\Rightarrow \boxed{7V_2 - V_3 = 20} \quad - \text{①}$$

- KCL

Node 3 $\sum I_{\text{entering node}} = \sum I_{\text{leaving node}}$

$$I_{43} = I_{32} + I_{30}$$

$$\Rightarrow \frac{V_4 - V_3}{300} = \frac{V_3 - V_2}{200} + \frac{V_2 - V_0}{50}$$

$$\Rightarrow 2V_4 - 2V_3 = 3V_3 - 3V_2 + 12V_3 - 12V_0$$

$$\Rightarrow \boxed{17V_3 - 3V_2 = 10} \quad - \text{②}$$

Solving ① and ②

$$-\cancel{x_4x_2} - 21V_2 + 119V_3 = 70$$
$$\underline{21V_2 - 3V_3 = 60}$$
$$116V_3 = 130$$
$$V_3 = \frac{130}{116}$$

$$\Rightarrow \boxed{V_3 = 1.1206V}$$

$$\Rightarrow \boxed{V_2 = 3.017V}$$

$$I_{12} = \frac{10-3.01}{100\Omega} = 0.069A$$

$$I_{23} = \frac{3.01-1.126}{200\Omega} = 0.009A$$
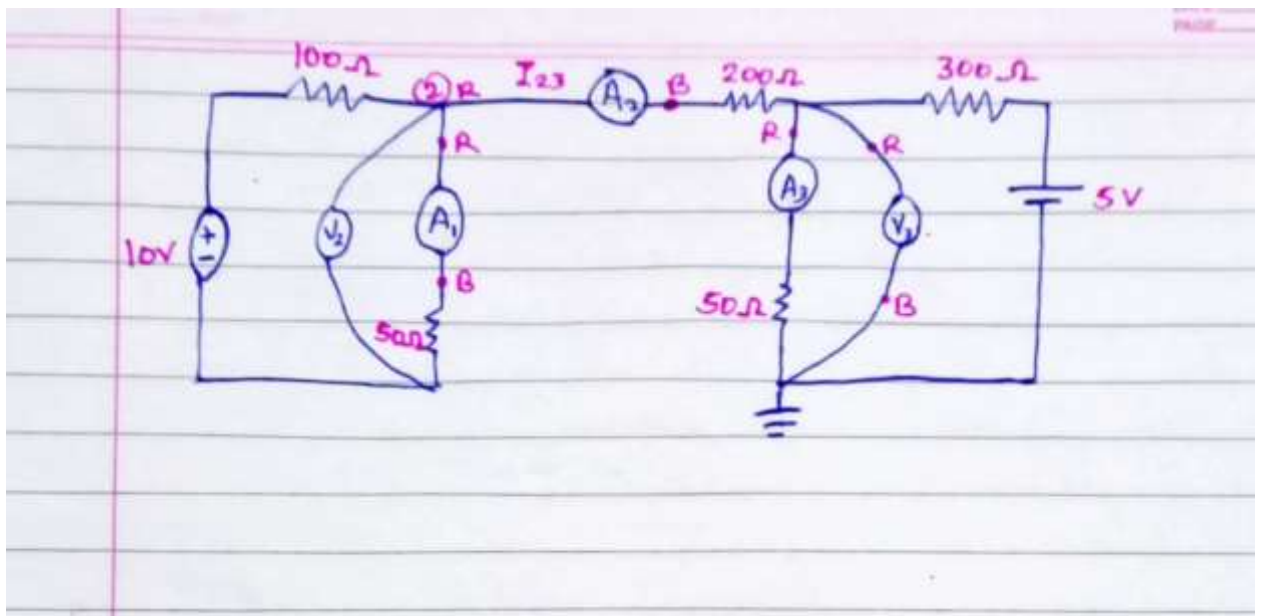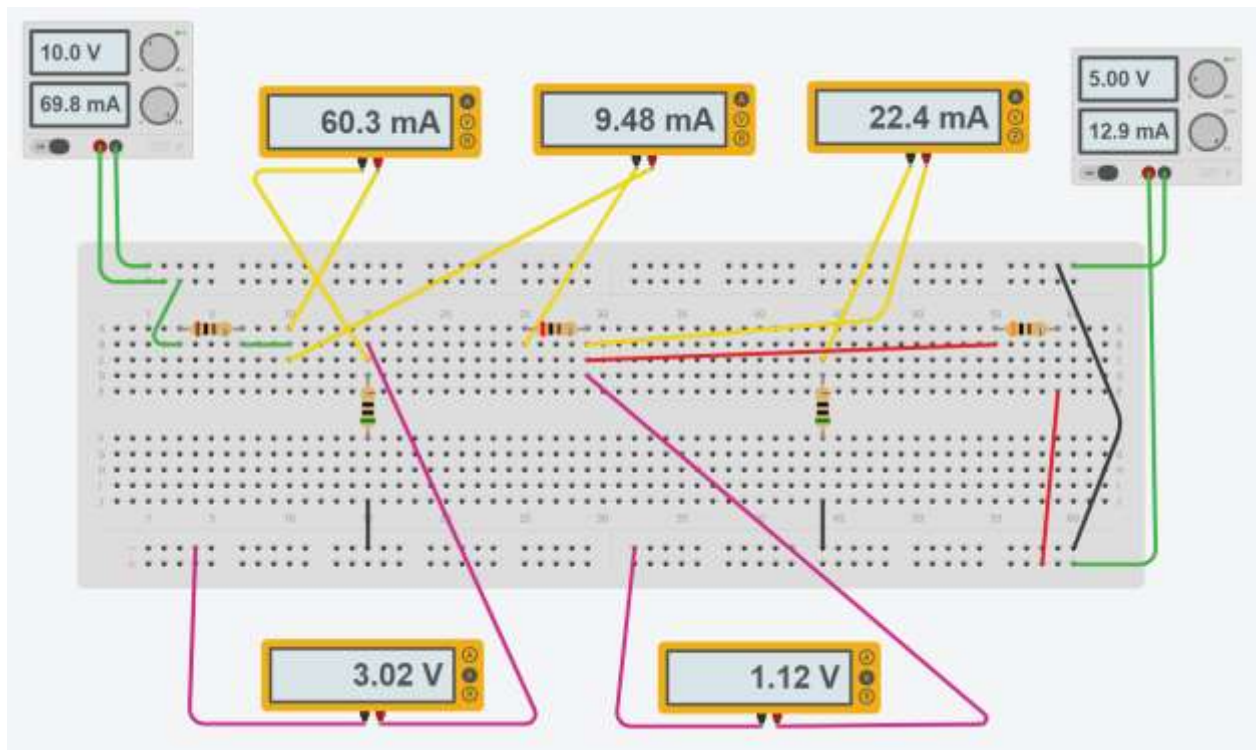
$$I_{34} = \frac{1.126-5}{300\Omega} = -0.0129A$$

$$I_{20} = \frac{3.01-0}{50\Omega} = 0.0602A$$

$$I_{30} = \frac{1.126-0}{50\Omega} = 0.0225A$$

Power supplied = $V_1 \times I_{12}$
by 10V = $10 \times 0.069A = 0.69W$
Power dissipated = $V_{12} \times I_{12}$
in 100Ω = $6.99 \times 0.069 = 0.48W$

$V_{12} = V_{10} - V_{20}$
$= 10 - 3.01$
$= 6.99V$

TinkerCAD Circuit:

To Do:

1. Verify KCL using the above measurements
2. Paste the Sharable link and Screenshot of Simulation done in TinkerCAD
3. Picture of the theoretical calculation done in your notebook