Basic Electrical Science Lab
Course Code: EE152

Laboratory Manual

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Section: B

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CERTIFICATE

This is to certify that Mr./ Ms. _____ of Class B.Tech 1st year (2nd Sem), Division Sec A/B, bearing Roll. No._____, has satisfactorily completed the course experiments in the Laboratory Course Basic Electrical Science Lab (EE152) in the academic year 2020-2021 in the Institution of National Institute of Technology Goa.

Course Instructor

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Experiment 1

Verification of Ohms Law

1. **Aim**: To verify Ohms Law for the given circuit

2. **Software tools required:** MATLAB/SIMULINK

3. **Simulink Block sets Used:** Powergui, DC Voltage Source, Series RLC Branch, Current Measurement, Voltage Measurement, Display, Scope, XY Graph, Controlled Voltage Source, Ramp, Group 1 signal builder

4. **Theory**: Ohms Law states that the voltage across conducting materials is directly proportional to the current through the material. one arrives at the usual mathematical equation that describes this relationship

$$V \alpha I$$

$$\Rightarrow V = IR$$

Where, V – Voltage across the element

I – Current flowing through the element

R - Resistance offered by the element

R is also the slope of the straight line when V-I characteristics are plotted. Normally resistance is a positive quantity.

5. **Circuit Diagram:** The considered circuit for Ohms law verification is as given in fig. 1a. The connected circuit in MATLAB/Simulink is given in Fig.1b.

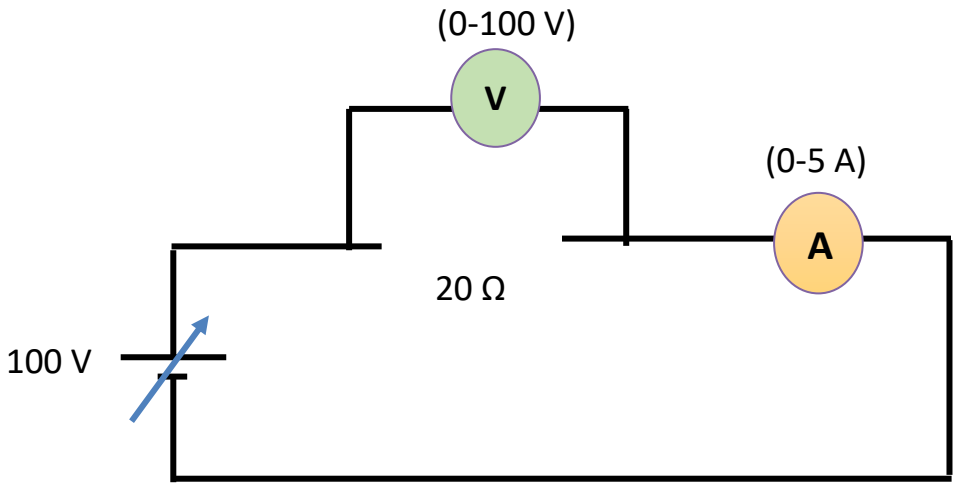

Fig1a: Circuit Diagram

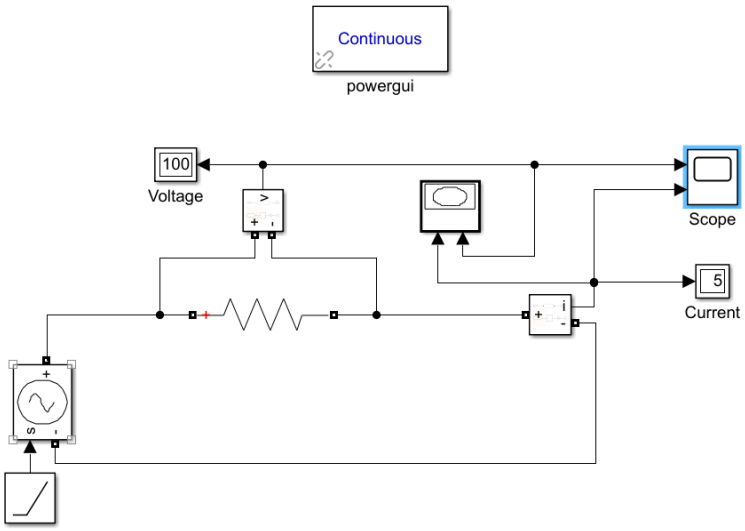

Fig1b: Circuit connections in Simulink

6. Procedure:

i. The mentioned Simulink blocksets are connected as shown in Figure 1b.
ii. Apply the specified voltage across the specified resistance
iii. Measure the current flowing through the resistor
iv. V-t, I-t and V-I plots are generated
v. The same procedure is repeated for specified types of inputs like Constant DC, Ramp, etc.

7. Graphical Results:

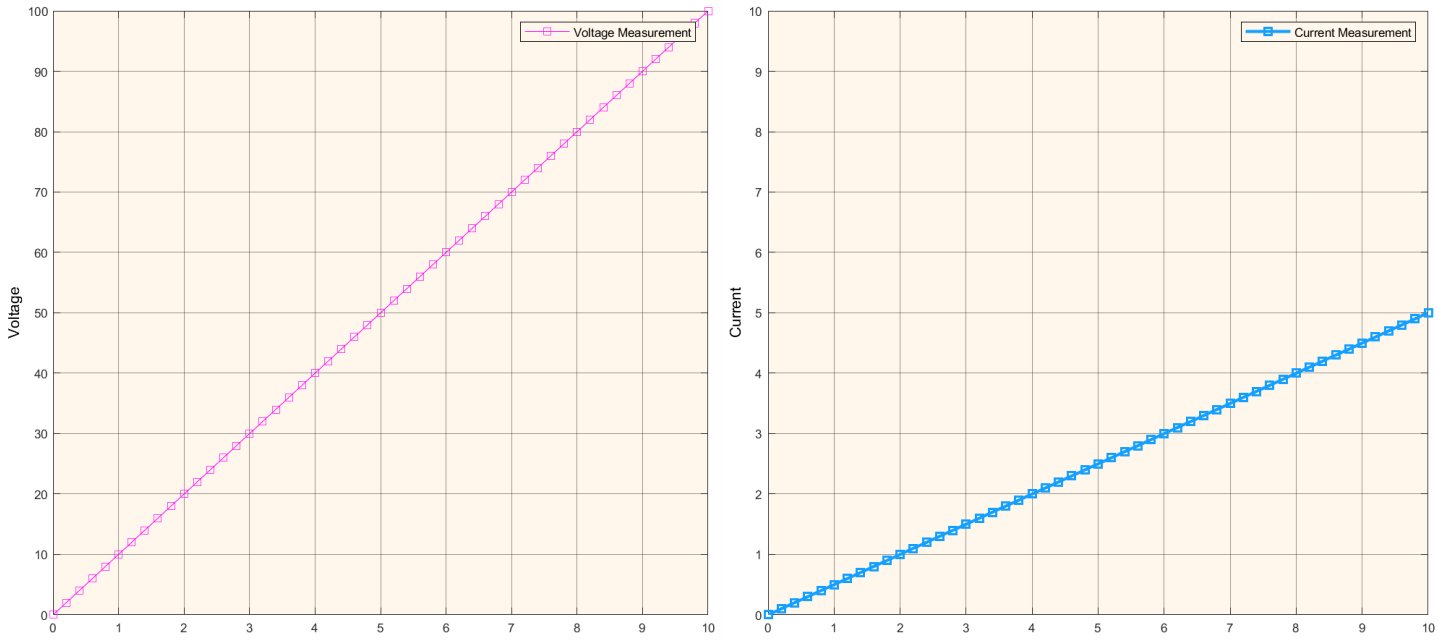

Fig.2a: Voltage Vs Time and Current Vs time Plots

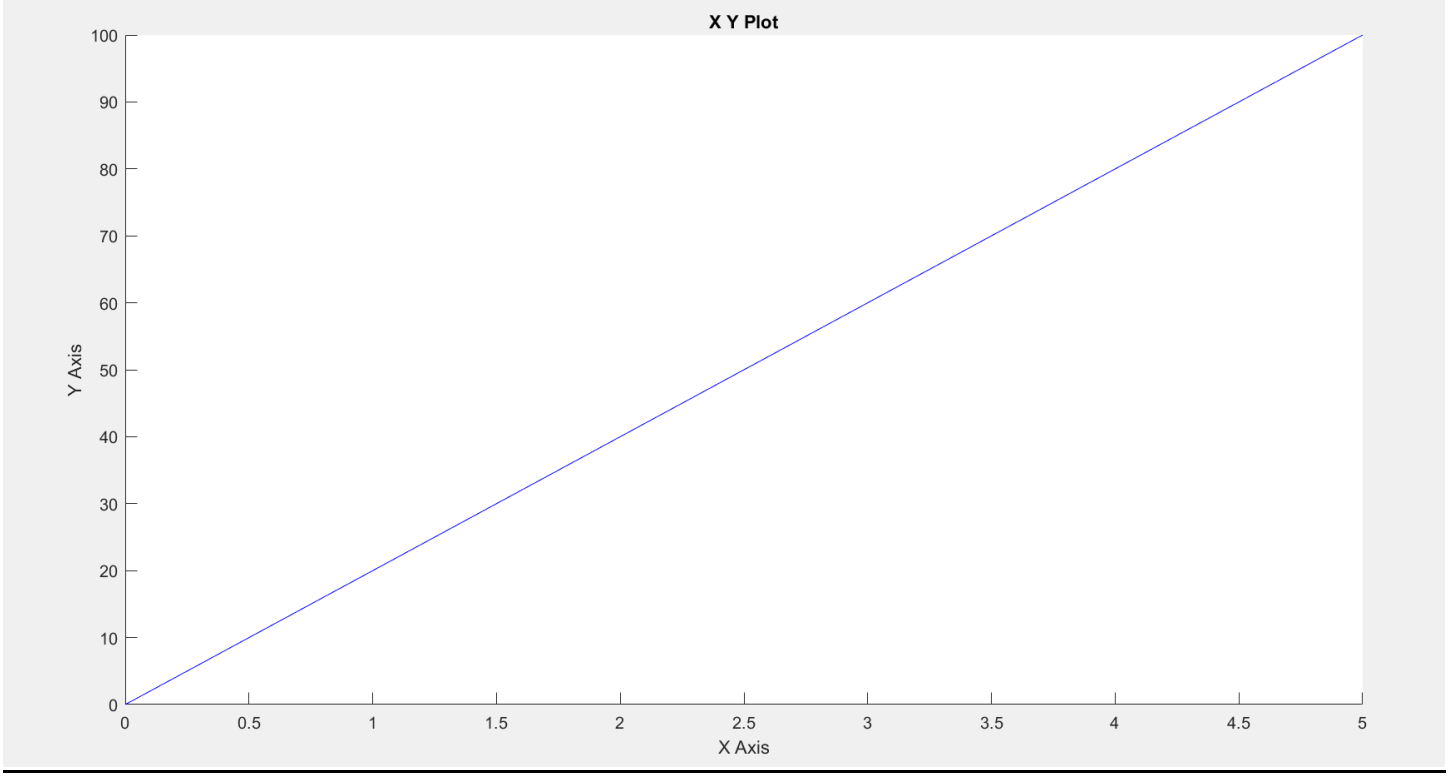

Fig2b: V-I Characteristics

8. **Precautions:**

a) Ensure that 'powergui' block set is included in the Simulink file.
b) Ensure that connections are properly made.
c) Ensure that the scale of the graphs should be adjusted to the range in which the readings vary.

9. **Inferences**: From the output, it can be inferred that as the input ramp is varied from 0-100 V, the current through the resistance varies from 0-5 A.

10. **Conclusion:** The Ohms law is verified for all the specified inputs for the studied resistive network.

Assignment:

a. Consider the below Step function as input with R = 5Ω

V(t) = 50V $0 \le t \le 5$ sec

= -50V $5 \le t \le 10$ sec

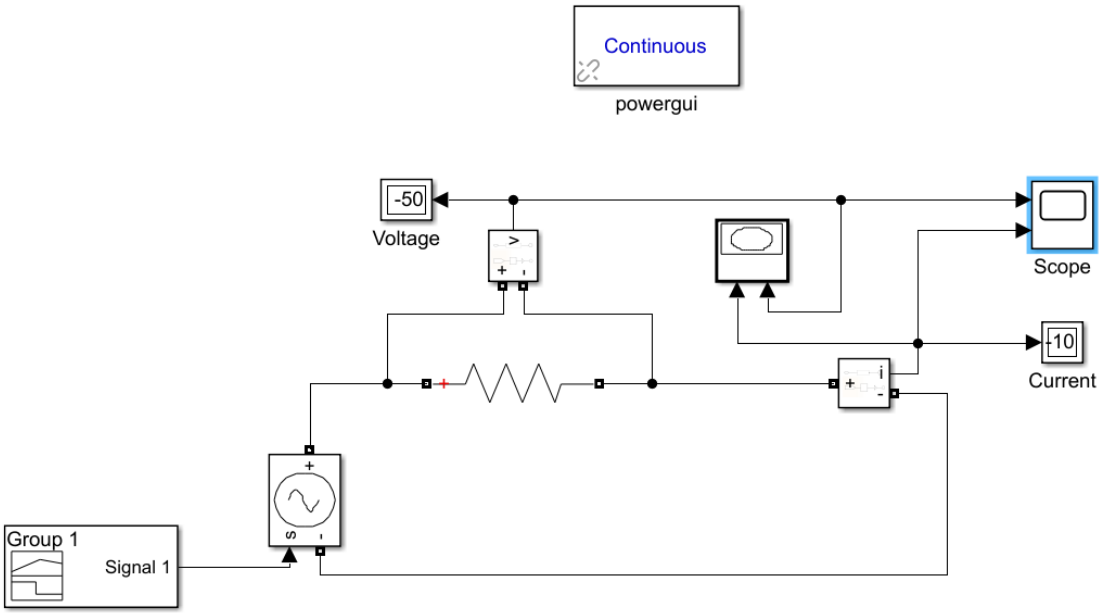

Fig3a: Circuit connections in Simulink

Procedure:

1. The mentioned Simulink blocksets are connected as shown in Figure 3a.
2. Connect the Group 1 signal builder with the controlled voltage source to apply the specified voltage across the specified resistance.
3. Measure the current flowing through the resistor.
4. V-t, I-t and V-I plots are generated.

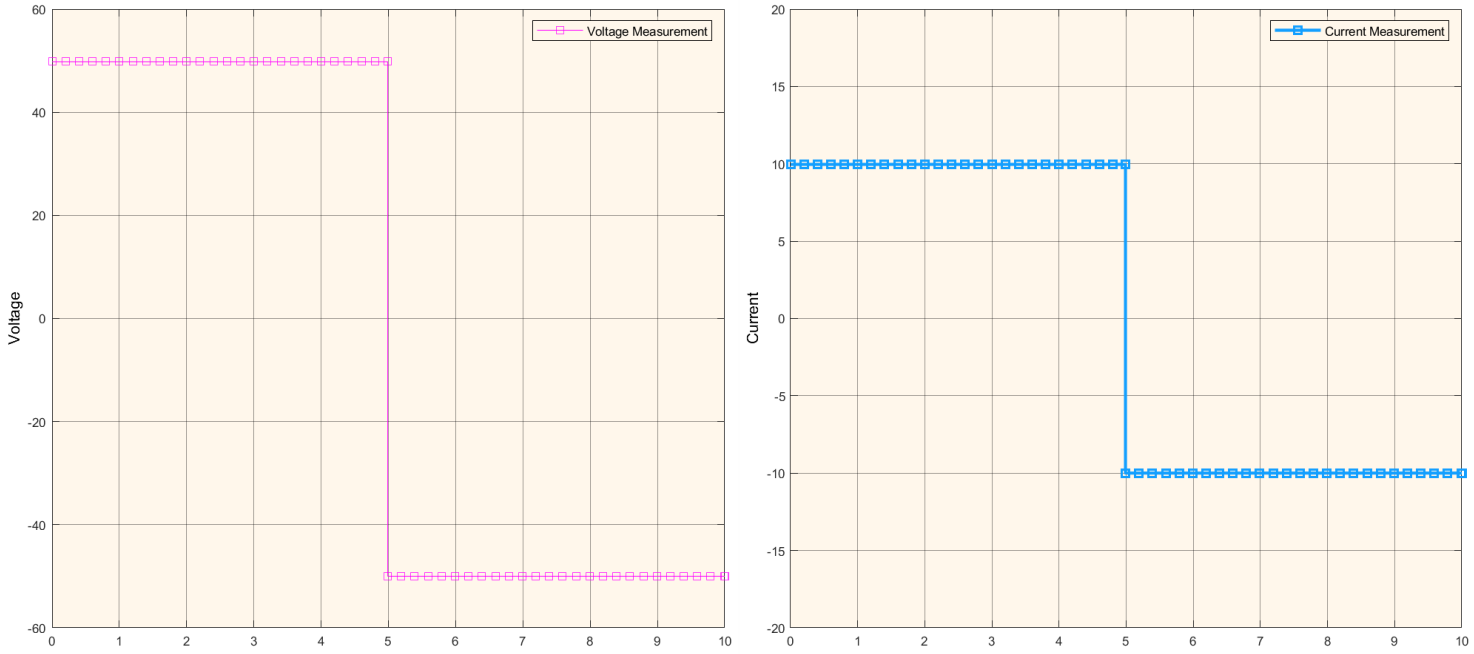

Fig.4a: Voltage Vs Time and Current Vs time Plots

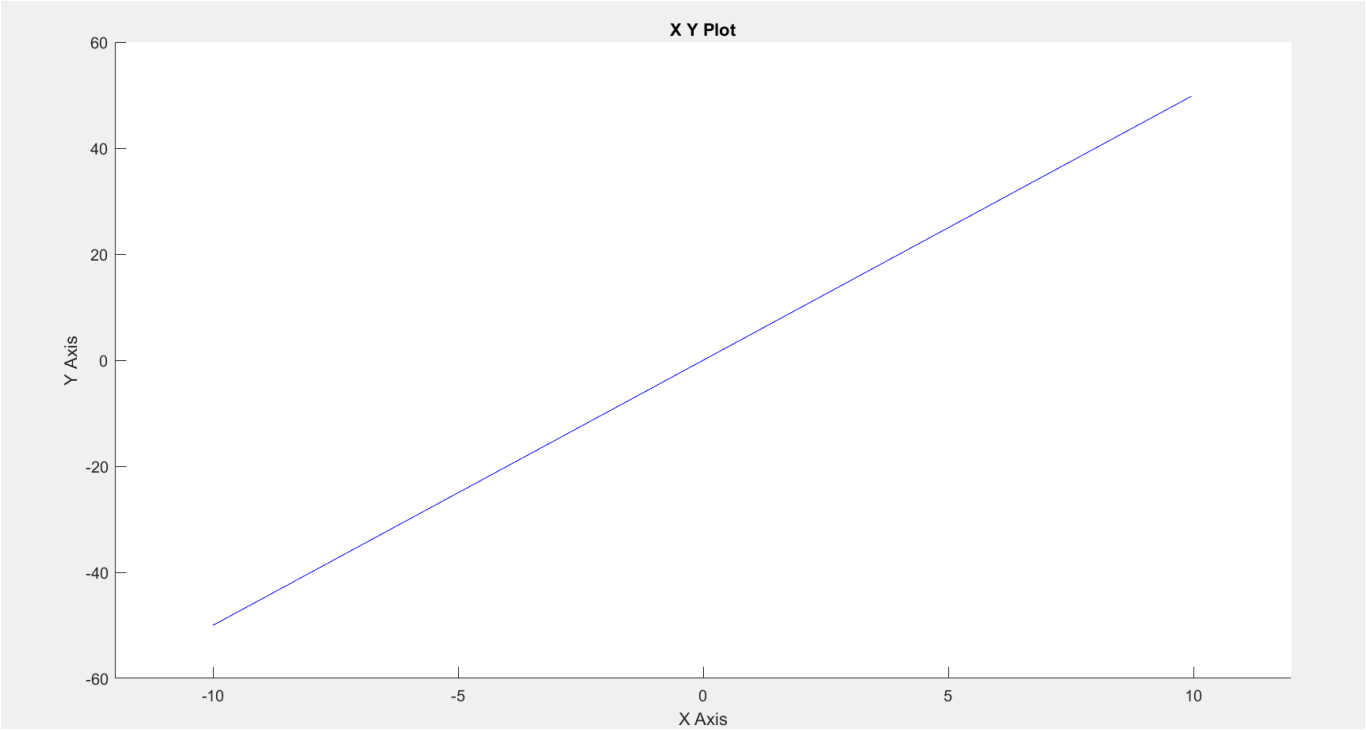

Fig4b: V-I Characteristics

Inferences: From the output, it can be inferred that, as the input voltage is fixed at 50V in first half of simulation, the current remained fixed at 10A and in the second half as the input voltage is fixed at -50V the current remained fixed at -10A, keeping the V/I ratio constant throughout the simulation.

b. Consider the Ramp function varying from 0-200 V as input with R = 50Ω

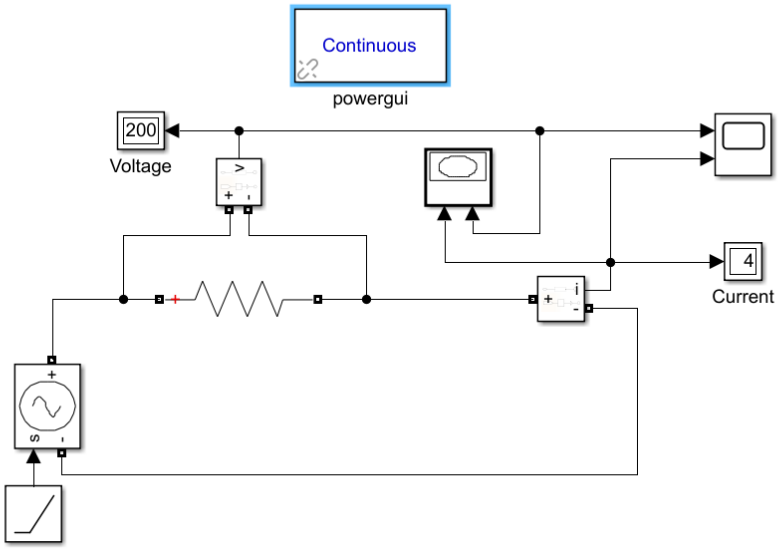

Fig5a: Circuit connections in Simulink

Procedure:

1. The mentioned Simulink blocksets are connected as shown in Figure 5a.
2. Connect the ramp blockset with the controlled voltage source to apply the specified voltage across the specified resistance.
3. Measure the current flowing through the resistor.
4. V-t, I-t and V-I plots are generated.

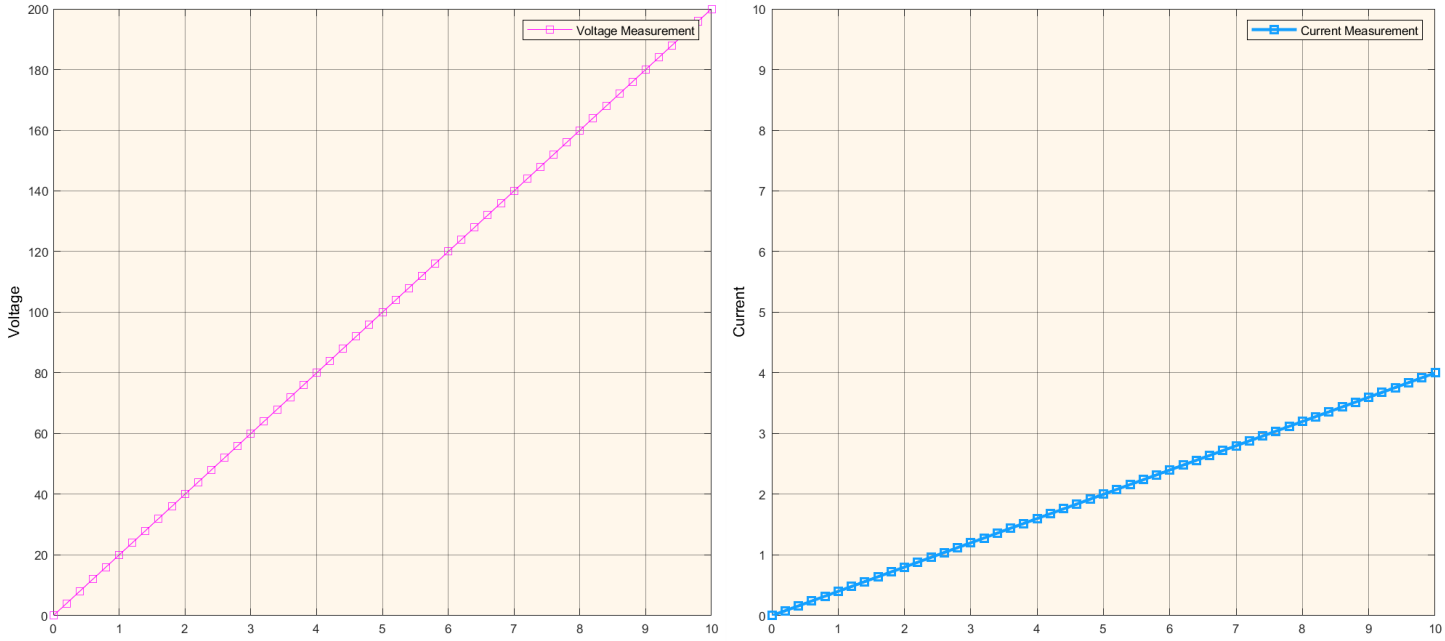

Fig:4a: Voltage Vs Time and Current Vs time Plots

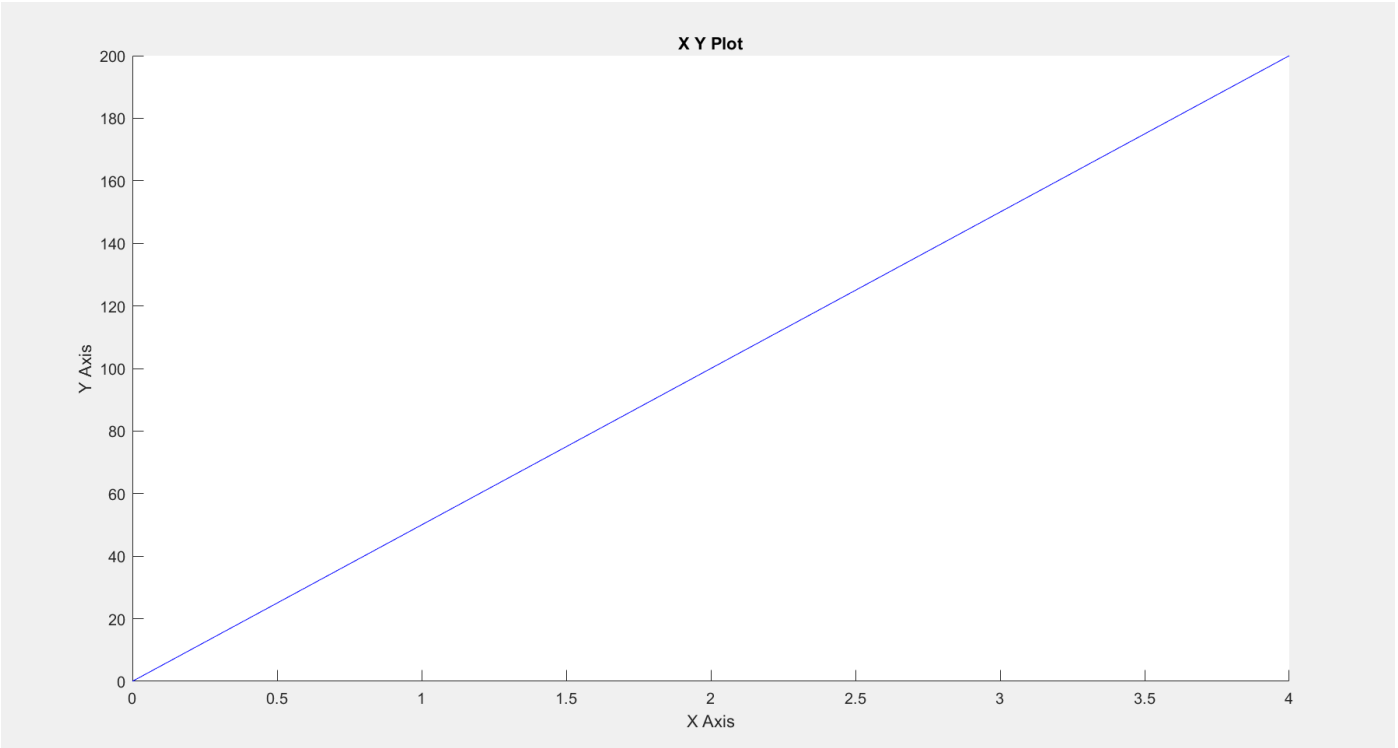

Fig4b: V-I Characteristics

Inferences: From the output, it can be inferred that as the input ramp is varied from 0-200 V, the current through the resistance varies from 0-4 A.