Expt. No. 1. VERIFICATION OF OHM'S LAW & KIRCHHOFF'S LAW

1. (a) Verification of ohm's law

Aim:- To Verify ohm's law for a given resistive network

Apparatus Required:

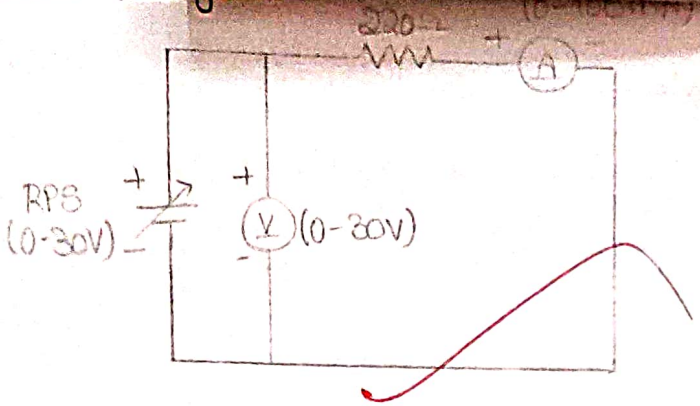
S.No.	APPARATUS NAME	RANGE	QUANTITY
1.	Dc Regulated Power Supply	(0-30)V	1
2.	Ammeter	(0-200)mA	1
3.	Voltmeter	(0-30)V	1
4.	Resistor	(1KΩ)	1
5.	Rheostat	300Ω/2A	1
6.	Bread board & Connecting Wires	--	Required

Procedure:

1. Make the connections as per circuit diagram
2. Switch "on" the power supply to RPS and apply a voltage (Say 10V) and take the reading of voltmeter and ammeter.
3. Adjust the rheostat in steps and take down the readings of ammeter and voltmeter.
4. Plot a graph will be with V along X-axis and I along Y-axis.
5. The graph will be a straight line which verifies ohm's law.
6. Determine the slope of the V-I graph. The reciprocal of the slope gives resistance of the wire.

Result:- Thus the ohm's law is verified for the given circuit.

Circuit Dia



Observations

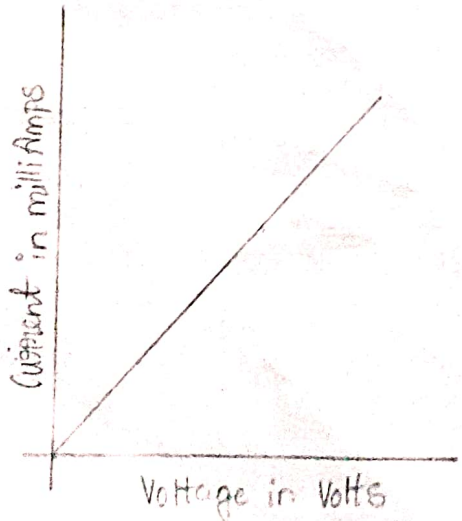
Resistance = 220Ω

S.No	Voltage (V)	Current (mA)	Resistance (Ω)
1	3	16.5	181.8
2.	6	32	187.5
3.	9	47.5	189.4

Average $R = \frac{R_1+R_2+R_3}{3} \Rightarrow R = \frac{181.8+187.5+189.4}{3} = \frac{558.7}{3}$

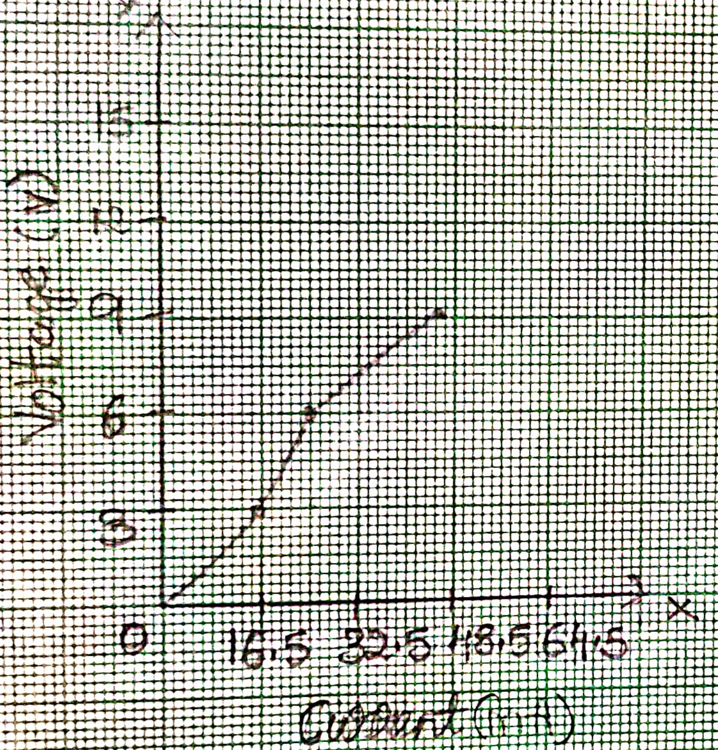
Average R = 186.2Ω

Model Graph



Theoretical calculations	20	20
Observation	20	20
Execution & Practice	30	30
Viva	10	9
Record	20	20
Total Score	100	99
Date of Experiment		29/01/2025
Date of record submission		Faculty Signature

Y axis – 1 unit = 3cm
X axis – 1 unit = 16.5cm



Page No.

1. (b) Verification of Kirchhoff's Current law

Aim:- To Verify Kirchhoff's Current law for the given Circuit

Apparatus Required:-

S.No	APPARATUS NAME	RANGE	QUANTITY
1.	DC Regulated power Suffly	(0-30)V	1
2.	Ammeter	(0-100)mA	3
3.	Resistor	470Ω, 330Ω	2
4.	Bread board & Connecting wires	--	Required

Statement:

KCL: The algebraic Sum of the currents meeting at a node/Junction is equal to zero.

Procedure:-

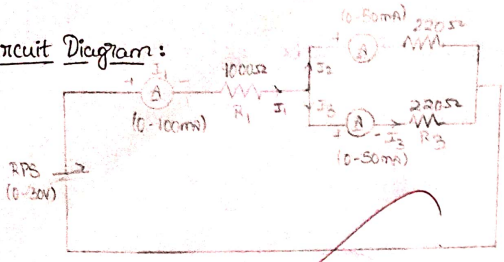
1. Give the Connections as per the Circuit diagram
2. Set a particular value in RPS
3. Note Down the Corresponding ammeter reading
4. Repeat the same for different Voltages

Marks Obtained:

Theoretical calculations	20	20
Observation	20	20
Execution of Practice Examples	30	30
Viva	10	9
Record	20	20
Total Score	100	99
Date of Experiment		29/11/2025
Date of record Submission		Faculty Signature

Result:- Thus the Kirchhoff's Current law is verified for a given Circuit

Circuit Diagram:



KCL - Theoretical Values

Sl. No	Voltage (E) Volts	Current I_1 mA	I_2 mA	I_3 mA	$I_1 = I_2 + I_3$ mA
1.	5	0.005	2.5×10^{-3}	2.5×10^{-3}	0.005
2.	10	0.01	5×10^{-3}	5×10^{-3}	0.01
3.	15	0.015	7.5×10^{-3}	7.5×10^{-3}	0.015

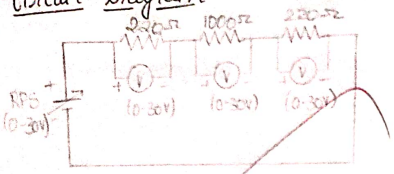
KCL - Practical Values

Sl. No	Voltage (E) Volts	Current I_1 mA	I_2 mA	I_3 mA	$I_1 = I_2 + I_3$ mA
1.	5	4	2	2	4
2	10	8	4	4	8
3.	15	12	6	6	6

Calculations

- 5 volts
  $I_1 = V/R = 5/1000 = 5 \times 10^{-3} A \rightarrow I_2 = 5/220 = 2.5 \times 10^{-3} A$
- 10 volts
  $I_1 = V/R = 10/1000 = 0.01 A \rightarrow I_2 = 10/220 = 5 \times 10^{-3} A$
- 15 volts
  $I_1 = V/R = 15/1000 = 0.015 A \rightarrow I_2 = 15/220 = 7.5 \times 10^{-3} A$

Circuit Diagram



KVL- Theoretical Values

S.No	RPS Voltage V	V_1	V_2	V_3	KVL = $V = V_1+V_2+V_3$
1.	5	0.7634	3.47	0.7634	4.99
2.	10	1.5268	6.94	1.5268	9.99
3.	15	2.288	10.4	2.288	14.97

KVL - Practical Values

S.No	RPS Voltage V	V_1	V_2	V_3	KVL = $V = V_1+V_2+V_3$
1.	5	0.5	3	0.5	4
2.	10	1	6	1	8
3.	15	1.5	9	1.5	12

Calculations

$Req = 220 + 1000 + 220 = 1440\Omega$

$I_1 = \frac{5}{1440} = 3.47mA$, $I_2 = \frac{10}{1440} = 6.94mA$

$I_3 = \frac{15}{1440} = 10.4mA$

- 5 volt

$V_1 = 3.47\times10^{-3}\times220 = 0.7634V$

$V_2 = 3.47\times10^{-3}\times1000 = 3.47V$

$V_3 = 3.47\times10^{-3}\times220 = 0.7634V$

- 10 volt

$V_1 = 6.94\times10^{-3}\times220 = 1.5268V$

$V_2 = 6.94\times10^{-3}\times1000 = 6.94V$

$V_3 = 6.94\times10^{-3}\times220 = 1.5268V$

15 volt

$V_1 = 10.4\times10^{-3}\times220 = 2.288V$

$V_2 = 10.4\times10^{-3}\times1000 = 10.4V$

$V_3 = 10.4\times10^{-3}\times220 = 2.288V$

Page No.

1. (a) Kirchhoff's Voltage law

Aim: To Verify Kirchhoff's Voltage law for the given Circuit.

Apparatus Required:

S.No	APPARATUS NAME	RANGE	QUANTITY
1.	DC Regulated Power Supply	(0-30)V	2
2.	Volt meter	(0-30)V	3
3.	Resistor	1KΩ-220Ω,330Ω	Each one
4.	Bread board & Connecting wires	--	Required

Statement:

KVL: In any closed path/mesh, the algebraic sum of all voltages is zero.

Procedure:

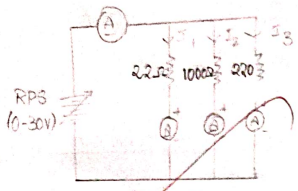
1. Give the connections as per the circuit diagram.
2. Set a particular value in RPS
3. Note all the voltage reading
4. Repeat the same for different voltages.

Marks Obtained

Theoretical calculations	20	20
Observation	20	20
Execution of Practice Exercise	30	30
Viva	10	9
Record	20	20
Total Score	100	99
Date of Experiment		30/01/2025
Date of record submission		Faculty Signature

Result: Thus Kirchhoff's Voltage law is verified for the given Circuit.

Circuit Diagram



Observations

S.No	Voltage (V)	Current (mA)			
		I_1	I_2	I_3	I_4
1	5	21	4	21	46
2	10	44	6	44	98

Expt.No.2. VERIFICATION OF CURRENT AND VOLTAGE DIVISION RULES

Aim: To calculate the individual branch currents and total current drawn from the power suffply using current and voltage division rules

Apparatus Required:

S.No	APPARATUS NAME	RANGE	QUANTITY
1.	Dc Regulated Suffply	(0-30)V	1
2.	Ammeter	(0-200)mA	4
3.	Resistor	1KΩ-220Ω	Each two
4	Bread board and Connecting wires	--	Required

Procedure:

1. Give the connections as per the circuit diagram
2. Set a particular value in RPS.
3. Note down the corresponding ammeter reading
4. Repeat the same for different voltages

Marks Obtained:

Theoretical calculations	80	20
Observation	20	20
Execution of Practice Examples	20	20
Viva	10	9
Record	20	10
Total Score	100	99
Date of Experiment		20/01/2025
Date of record Submission		

Result: Thus the individual branch currents and total current drawn from the power suffply are calculated using current and voltage division

Page No.

Expt. No. 3. VERIFICATION OF STAR DELTA TRANSFORMATION

Aim:- To calculate the Equivalent Circuit resistance Using Star delta transformation technique

Apparatus Required:-

S.No	Apparatus Name	Range	Quantity
1	Resistor		
2	Bread Board & Connecting	--	Required

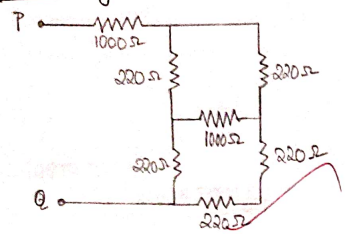
Procedure:-
1. Give the connections as per the Circuit diagram
2. Determine the Equivalent resistance of the Circuit between P and Q Using Star-delta transformation technique
3. Verify the same by connecting multimeter across PQ.

Marks obtained:

Theoritical Calculations	20	
Observation	20	20
Execution of practice Examples	30	30
Viva	10	9
Record	20	20
Total Score	100	99
Date of Experiment		30/1/2025
Date of record Submission		

Result:-
Thus the Equivalent Circuit resistance is obtained using Star de... transformation technique.

Circuit Diagram

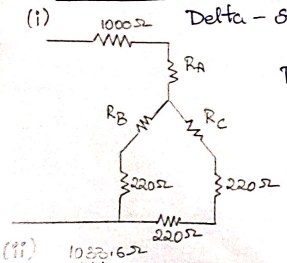


Observation

S.No	Theoretical Value (R_{PQ}) in Ohm	Measured Value (R_{PQ}) in ohm
1	1.2 kΩ	1.4 kΩ

Calculation

(i) Delta – Star transformation

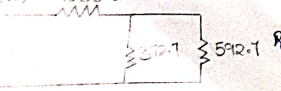


$$R_A = \frac{R_{AB} R_{CA}}{R_{AB}+R_{BC}+R_{CA}} = \frac{220\times220}{220+1000+220} = \frac{48400}{1440} = 33.61\,\Omega$$

$$R_B = \frac{R_{AB}+R_{BC}}{R_{AB}+R_{BC}+R_{CA}} = \frac{220\times1000}{1440} = \frac{220000}{1440} = 152.7\,\Omega$$

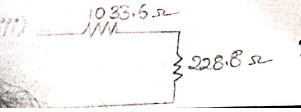
$$R_C = \frac{R_{CA}+R_{BC}}{R_{AB}+R_{BC}+R_{CA}} = \frac{220\times1000}{1440} = \frac{220000}{1440} = 152.7\,\Omega$$

(ii)



$$R_{eq} = \frac{592.7\times312.7}{592.7+312.7} = \frac{220899.29}{965.4} = 228.8\,\Omega$$

(iii)



$$R_{eq} = 1033.6 + 228.8 = 1262.4\,\Omega = 1.2\,k\Omega$$

Page No.

Expt:No.4. VERIFICATION OF THEVENIN'S AND NORTON'S THEOREMS

Aim:- To Verify the Equivalent Circuit parameters of Thevenin's and Norton's Theorems

Apparatus Required:-

S.No	Apparatus Name	Range	Quantity
1.	DC Regulated Power Supply	(0-30)V	1
2.	Voltmeter	(0-30)V	1
3.	Ammeter	(0-200)mA	1
4	Resistor	330Ω, 220Ω	Each two
5.	Multimeter	-	1
6.	Bread Board & Connecting	-	Required

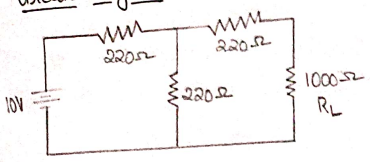
Procedure:- [Thevenin's Theorem]

1. Give the connections as per the circuit diagram.
2. Measure R_{th} using a multimeter
3. Measure V_{th} across 220Ω (R_2)
4. Measure load current I_L through R_L

Procedure:- [Norton's Theorem]

1. Give the connections as per the circuit diagram
2. Measure R_{th} using a multimeter
3. Measure I_N
4. Measure load current I_L through R_L

Circuit Diagram



Calculation

Thevenin's Theorem:

Find R_{Th}

$\frac{1}{R_{eq}} = \frac{1}{220} + \frac{1}{220} = \frac{2}{220}$

$R_{eq} = \frac{220}{2} = 110\Omega$

$R_{eq} = 110 + 220 = 330\Omega$

$\therefore 330\Omega \Rightarrow R_{Th}$

Find V_{Th}

$R_{eq} = 220 + 220 = 440\Omega$

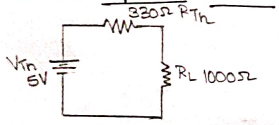
$I = V/R = \frac{10}{440} = 0.022A$

$V_{OC} = 0.022 \times 220 = 4.84 \rightarrow$ approx $\rightarrow 5V \quad \therefore 5V - V_{Th}$

Find I_L

$I_L = \frac{5}{330+1000} = \frac{5}{1330} = 3.76\,mA$

Thevenin's Equivalent Circuit



Observation:-

S.No	Supply Voltage (V)	Theoretical Values			Measured Values		
		R_{Th}(Ω)	V_{Th}(V)	I_L(mA)	R_{Th}(Ω)	V_{Th}(V)	I_L(mA)
1	10V	330Ω	5	3.76	320	4.5	3.4

Calculation:

Norton's theorem

Find R_N

$\frac{1}{R_{eq}} = \frac{1}{220} + \frac{1}{220} = \frac{2}{220}$

$R_{eq} = \frac{220}{2} = 110\,\Omega$

$R_{eq} = 110 + 220 = 330\,\Omega$

$R_N = 330\,\Omega$

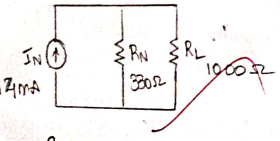
Find I_N

$I_N = 14\,mA$

Find I_L

$I_L = \frac{I_N \times R_N}{R_N + R_L} = \frac{14 \times 10^{-3} \times 330}{330 + 1000} = \frac{4.62}{1330} = 3.47\,mA$

Norton's Equivalent circuit



Observations

S.No	Supply Voltage (V)	Theoretical Values			Measured Values		
		$R_N(\Omega)$	I_N (mA)	I_L(mA)	$R_N(\Omega)$	I_N(mA)	I_L(mA)
1	10V	330	14	3.47	330	13.5	3.34

Page No.

Marks obtained:

Theoretical Calculations	20	20
Observation	20	20
Execution of prctice Example	30	30
Viva	10	9
Record	20	20
Total Score	100	99
Date of Experiment		1/21/2025
Date of record Submission		

Result :-

Thus the Equivalent Circuit parameters are obtained using Thevenin's and Norton's theorem.

Expt.No.05. VERIFICATION OF MAXIMUM POWER TRANSFER THEOREM AND SUPERPOSITION THEOREM

5(a) Verification of maximum power transfer Theorem

Aim:- To verify maximum power transfer Theorem

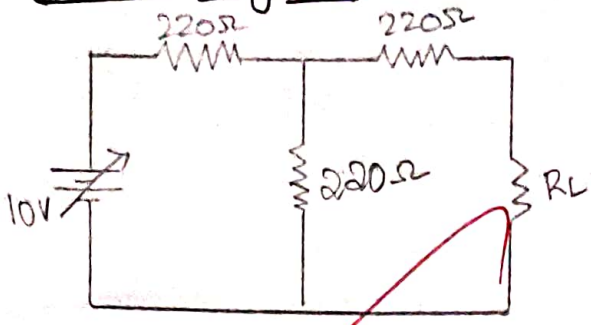
Apparatus Required:

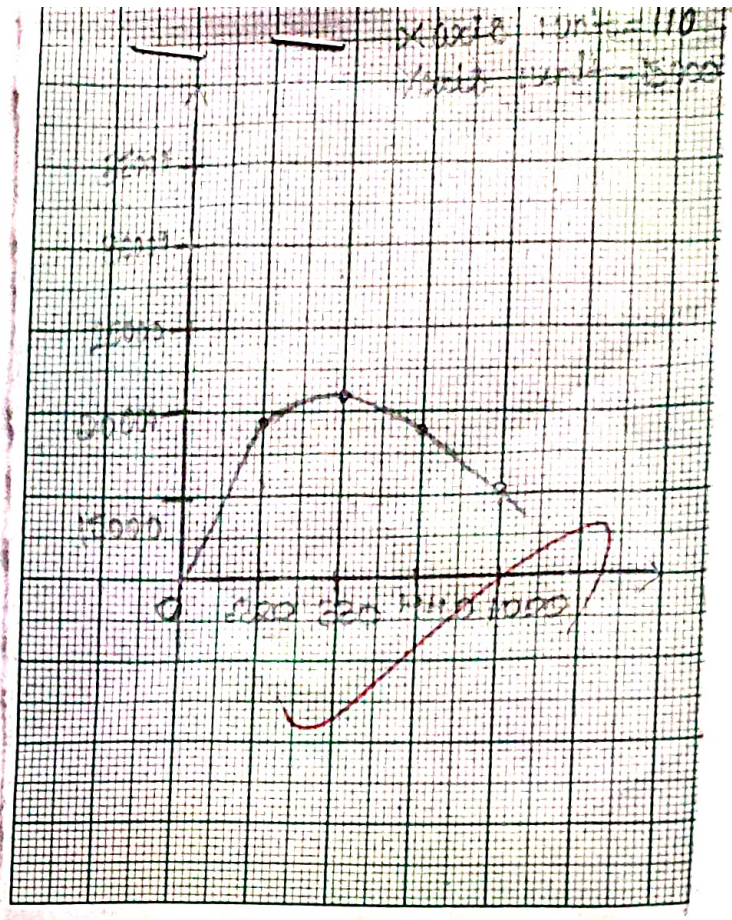
S.NO	APPARATUS NAME	RANGE	QUANTITY
1	Dc Regulated Power Supply	(0-30)V	1
2.	Voltmeter	(0-30)V	1
3	Ammeter	(0-200)mA	1
4	Resistor	330Ω, 220Ω	Each two
5	Multimeter	-	1
6	Bread Board & Connecting	-	Required

Procedure:

1. Give the connections as per the circuit diagram.
2. Measure R_{th} using a multimeter
3. Measure V_{th} across 220Ω (R_2)
4. Measure load current I_L through R_L
5. calculate the maximum power transferred to the load

Circuit diagram





Calculation

Find Rth:

$$\frac{1}{Req} = \frac{1}{220} + \frac{1}{220} = \frac{2}{220}$$

$$Req = \frac{220}{2} = 110$$

$$Req = 110 + 220 = 330\,\Omega$$

Find I_L:

$$I_L = 8A$$

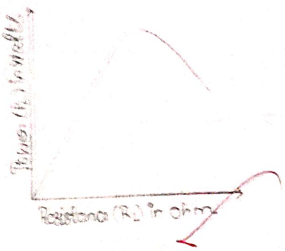
Find Pmaxc:

$$P_{maxc} = I_L^2 \times R_L = 8 \times 8 \times 330 = 64 \times 330 = 21120 \text{ watts}$$

observations

S.NO	Supply Voltage (V)	Measured Values R_L (Ω)	Measured Values I_L (mA)	Maximum Power $P_{max} = I_L^2 R_L$ (watts)
1.	10	220Ω	9.5	19855
2.	10	330Ω	8	21120
3.	10	440Ω	6.5	18590
4.	10	1000Ω	4	16000

Model graph



Page No.

Marks obtained		
Theoretical Calculations	20	20
Observation	20	20
Execution of Practice Examples	20	20
Viva	10	9
Record	20	20
Total Score	100	1
Date of Experiment		1/11/2025
Date of record Submission		

Result:
Thus the Maximum power transfer theorem is verified

5(b) Verification of Superposition Theorem

Aim: To determine the current flow through the load resistor using Superposition Theorem

Apparatus Required:

S.No	Apparatus Name	Range	Quantity
1	DC Regulated Power Supply	(0-30)V	2
2	Voltmeter	(0-30)V	1
3	Ammeter	(0-200)mA	1
4	Resistor	1kΩ, 220Ω, 330Ω	Each one
5	Multimeter	-	1
6	Bread board & Connecting Wires	-	Required

Procedure:

1. Give the connections as per the circuit diagram.
2. Measure current flow through 220Ω by connecting both the supplies.
3. Short circuit 15V source
4. Measure current flow through 220Ω by connecting 20V supply.
5. Short circuit 20V source
6. Measure current flow through 220Ω by connecting 15V supply.
7. Verify the net current through 220Ω resistor.