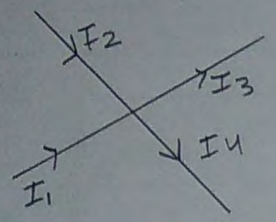
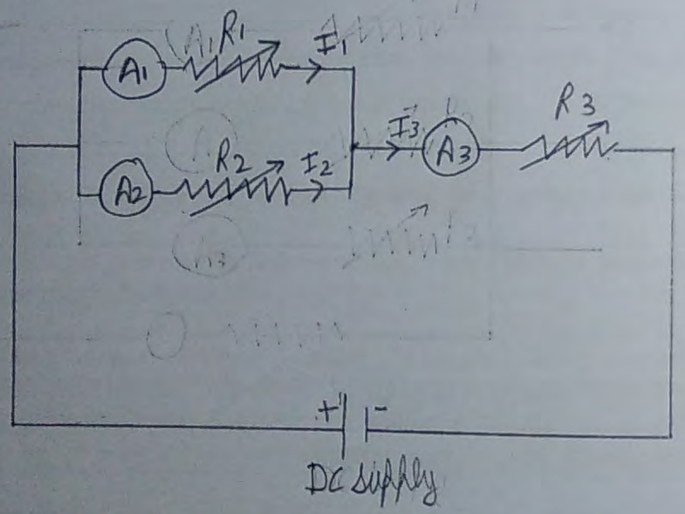


figure-1



Circuit Diagram

Date

Expt. No. .....

Page No. 1

Experiment-1

Aim: To verify Kirchhoff's current law.

Apparatus Required: Ammeter, Rheostat, D.C supply, connecting wires.

Theory: It states that the algebric sum of currents meeting at a junctions of conductors is zero.

In other words, the sum of currents flowing away from a junc^n is equal to the sum of current flowing towards the junction.

In fig-1, I_1, I_2, I_3 & I_4 currents are meeting at a junction.

$I_1 + I_2 = I_3 + I_4$ or $I_1 + I_2 - I_3 - I_4 = 0$ (figure-1)

Observation Table.

S.No.	I_1 (A)	I_2 (A)	I_3 ($I_1 + I_2 = I_3$) (A)
1.	17	4.6	21.6
2.	16.4	5.1	21.5
3.	21.7	6.3	28

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Date

Expt. No. Page No. 2

Calculations.

On adding the reading from A_1 & A_2, we get it equal to the reading of A_3,

$$I_1 + I_2 = I_3 \quad \text{or} \quad I_1 + I_2 - I_3 = 0.$$

Result.

Kirchhoff's Current law is verified, since the algebraic sum of currents at junction is equal to zero.

Precautions:

(i) All the connections should be tight.

(ii) Befor operating the circuit, and taking readings, check the zero reading of the ammeter

Teacher's Signature :

Expt. No. _____ Date _____

Page No. 3

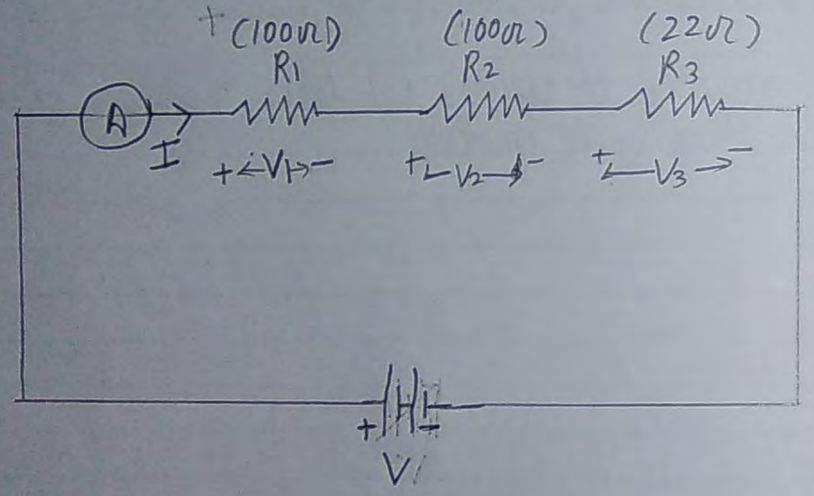
Experiment-2.

Aim: To verify Kirchhoff's Voltage Law.

Apparatus Required: Voltmeter, ~~Ammeter~~ Ammeter (Variable), Resistors, D.C. Power Supply.

Theory: According to this law, "the algebric sum of voltage around a close loop is zero".

It can be also stated as "In any closed circuit, the algebric sum of the products of current and Resistant in each of the conductor is equal to the algebric sum of emf of the batteries.



Circuit diagram.

Observation Table:

S. No.	V volt	I (mA)	V_1 (volt)	V_2 volt	V_3 volt	$V_1+V_2+V_3$
1	10 V	60 mA	5.81 V	2.91 V	1.28 V	10 V
2	12 V	70 mA	6.98 V	3.49 V	1.53 V	12 V
3.	15 V	90 mA	8.72 V	4.36 V	1.92 V	15 V

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Calculations:-

Add the Voltage V_1, V_2 & V_3 recorded from first, second & third voltmeter, record the same in the last column of this table.

Result:

As the voltage V and $V_1 + V_2 + V_3$ are equal, i.e

$$V = V_1 + V_2 + V_3.$$

Kirchhoff Voltage law is verified.

Precautions.

(i) All connections should be tight.

(ii) Before connecting the instrumeal, check their zero reading.

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Date

Expt. No. Page No. 5

Experiment-3.

Aim: To find out efficiency of single phase transformer.

Apparatus Required: Single phase transformer, Auto transformer, Wattmeter, Ammeter, Voltmeter, Connecting wires.

Theory: On a practical transformer there are two types of losses

1. Copper loss
2. Iron loss

Therefore output of transformer is always less than the input of transformer.

~~Here transformer is loaded with variable resistance load. Input to the transformer can be formed out by using attachment and help of wattmeter and ammeter.~~

$$\text{Efficiency of Transformer} = \left(\frac{\text{output power}}{\text{Input power + losses}}\right) \times 100\ \%$$

$$= \frac{V_2 I_2}{\text{Input power + losses}} \times 100\ \%$$

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Date

Expt. No. Page No. 6

Observation Table.

	Rated Voltage	Rated current	Losses
Open circuit	230	4.34	45x2=90 watt
Closed circuit	230	4.34	1.5x4=6 watt

Total losses = 96 watt

Calculations

Efficiency, $\eta = \left(\frac{\text{Output power}}{\text{Input power} + \text{losses}}\right) \times 100\%$

$= \frac{1000}{1096}$

$\eta = \left(\frac{1000}{1000+96}\right) \times 100 = 91.24\%$

Result

Efficiency of the transformer is 91.24%

Precautions

Avoid losse connetions.

Teacher's Signature :

Date _____

Expt. No. _____ Page No. 7

Experiment – 4.

Aim: Starting method of 3-phase Induction motor by star-delta.

Apparatus: Three phase induction motor starter with panel, operating wire, A.C supply.

Theory: A three phase motor gives three times power output when the starter winding are connected in delta. If connected in star, but will take $1/\sqrt{3}$ of the current from the supply when connected in delta. The starting torque depend in in star is 1/3 that times than in delta.

- A two position switch (Manual and automatic) is provided through a timing.

- Starting in star reduce the starting current.

- When motor has accelerated up to speed; and current is reduced to its normal value the starter is moved to run position with the winding now connected in delta.

- More complicated than the DC starter a motor with a star-delta starter may not produce sufficient torque to start against full load. So output is reduced in start position, thus the motor are started under a light load.

Teacher's Signature : _____

Date

Expt. No. Page No. 8

Experiment-5.

Aim: Characteristic of DC compound generator.

Apparatus: Three phase Induction motor, D.C supply load (bulb) connecting wire, fuse.

Theory: In compound wound DC generator both the field winding are combined (series and shunt) either. This type of generator can be used as either long shunt or short shunt compound wound generator.

In both the cases the external characteristics of generator will be nearly same as. The compound wound generators are very rarely used. Electric current in series field also produces more flux and compensate the drop in the voltage. and do operate machine at constant voltage.

The combination of series generators and a shunt generator give the characteristics which are required.

The voltage drop in shunt machine is therefore compensated by the voltage rise in series motor.

Teacher's Signature : _____

Date _____

Expt. No. _____ Page No. 9

Observation Table.

S.No.	Current	Voltage	load
1	0	270	0
2	1	280	200
3	1.8	267	400

Precaution:

- Avoid loose wires, cables and connectors
- Don't wear loose clothes.

Teacher's Signature : _____

Date

Expt. No. Page No. 10

Experiment-6

Aim: External characteristic of DC shunt generator.

Apparatus: Shunt generator, pannel with starter, DC Motor, load connecting wire.

Thory: The external characteristic of a shunt generator is the reaction between terminal voltage V and load current I.

$$V = E - I_a R$$

$$= E - (I_l - I_{sh}) R_a$$

Hence external characteristic curve under internal characteristic curve, terminal voltage will ~~probly~~ properly be maintained constant by adjusting field resistor automatically.

Observation Table:

S.No	Current	Voltage	Load (watt) P=VI
1	0	280	0
2	0.6	270	100
3	1	260	200

Teacher's Signature :

Date _____

Expt. No. _____ Page No. 11

Precautions

1.) Avoid loose wires, cables and connections.

2.) Don't wear loose clothes.

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