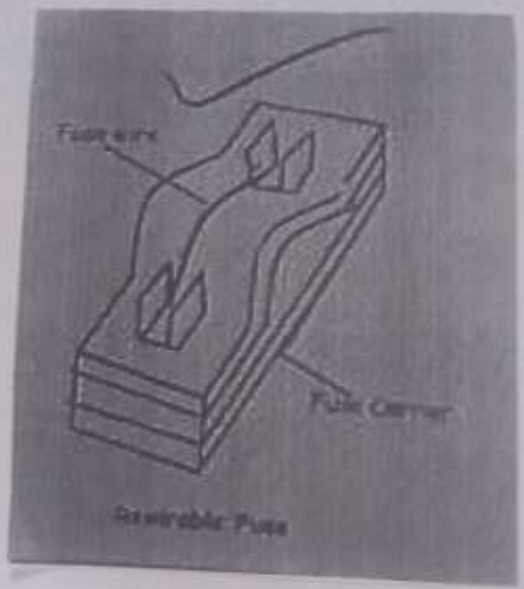
Fuse



Rewirable Fuse

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Unit - 3

Protective Devices And wiring circuits.

Necessity of protective devices.

Protective devices are necessary to protect electrical appliance or equipment against.

a) Short circuit.
b) Abnormal variations in the supply voltage
c) overloading of equipment
d) To protect operator against accidental contact with the faulty equipment. failing which The operator may get a Severe shock.

Types of protective devices.

The different types of the protective device that are commonly used in electrical and electronic circuit are

1. Fuse
2. MCB - Miniature circuit breaker
3. ELCB - Earth leakage circuit Breaker.
4. Earthing or Grounding

Fuse

Fuse is a safety device which protects electrical and electronic circuit against the over loads, Short circuit and earth faults. Fuse is generally a fuse wire which placed in a fuse holder.

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Rating of Fuse :-

The maximum current that a fuse can carry, without being burnt is called rating of the Fuse. It is expressed in Amps. Ex. 2A fuse. 5A Fuse. 10A fuse etc.

Types of Fuse

Fuse are mainly classified into

1) Rewirable fuse
2) Cartridge Fuse
3) High Rupturing capacity (HRC) Fuse.

Miniature circuit Breaker (MCB)

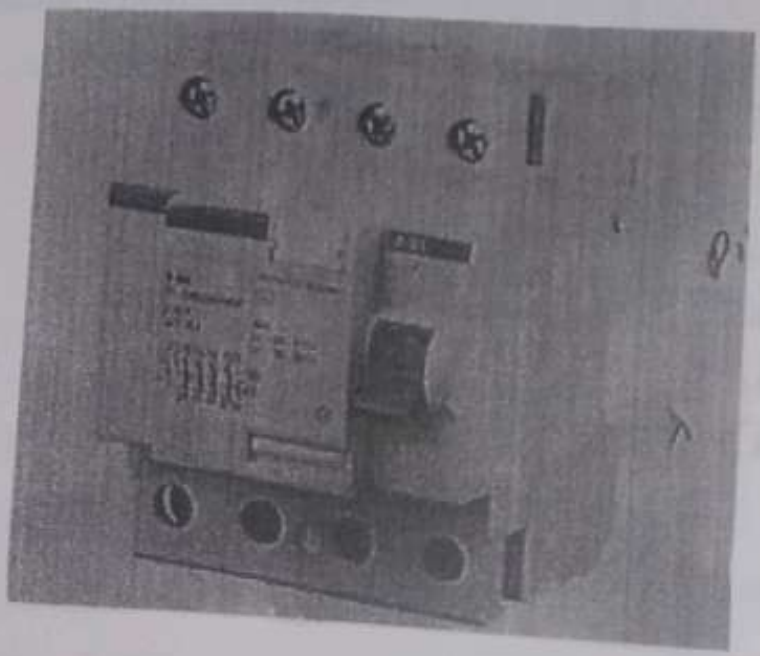
It is a safety device which works on magneto. Thermal release principle. It is connected in the phase, between supply and the load. It is manufactured in standard ratings of 6A to 100A.

When the current drawn by the load exceeds the rated value it acts and trips the circuit thus protecting the apparatus, operator and the appliances.

Advantages of MCB

1) They act and open the circuit in less than 5 milliseconds.

Earth Leakage circuit Breaker (ELCB)



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2) Automatic Switch off under over load of short circuit condition.
3) no fuse to replace or re-wire
4) Supply is restored by resetting it again

Earth Leakage Circuit Breaker (ELCB)

This is domestic safety device which trips the circuit when there is a small leakage to earth on body of the appliance. Thus it protects the operator from shocks and accidents. This is connected in the circuit of the appliance to be protected.

Earthing:-

Connecting the metal body of an appliance, machinery or an electrical installation to earth through a low resistance wire is called Earthing or grounding.

Necessity of Earthing:-

Earthing is necessary for all domestic, commercial and industrial installations to safe guard the operator and buildings and machinery against lightning.

- Metal body of all the electrical appliances, equipments and machinery. The earth points of all the 3 pin sockets and the body of the energy meter are connected to earth through a thick wire.

Experiment No. _____ Date

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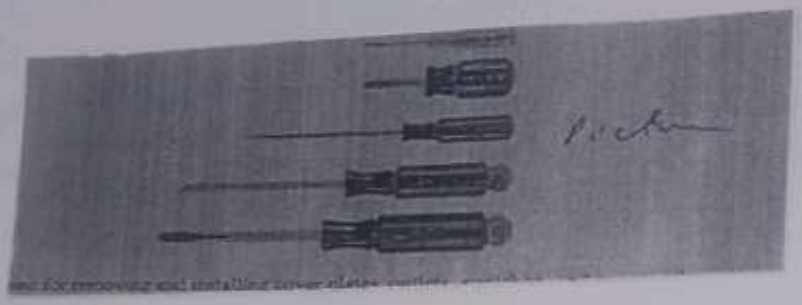
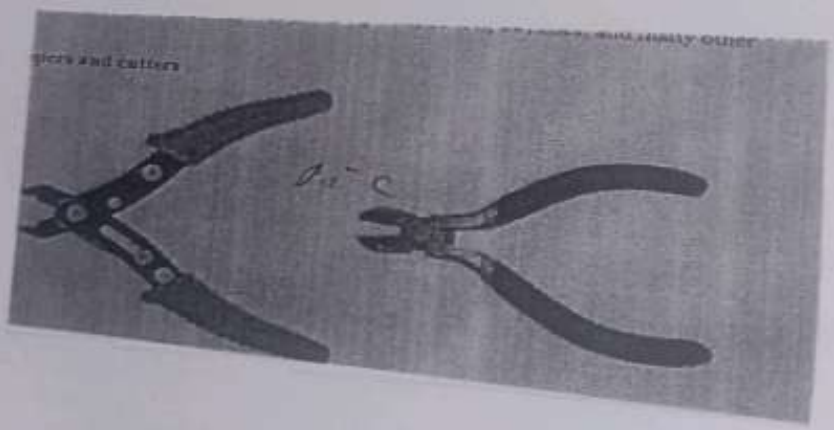
- Whenever a live wire comes in contact with the body of the appliance. it is directly connected to the earth through the grounding wire and hence the body earth through the grounding wire and hence the body voltage comes to zero. Therefore the operator does not get any shock.

Screw Drivers



Wire Strippers and cutters



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Unit :- 04

ELECTRICAL MACHINES, BATTERIES AND UPS.

working principle of transformer.

Transformer work on the principle of mutual induction whenever an alternating current passed through a primary winding it produces alternating flux. This flux linking with secondary winding and induces emf in it. This induced emf is proportional to the rate of change of flux (θ) produced by the coil and the number of turns (N)

$$E = N \frac{d\theta}{dt}$$

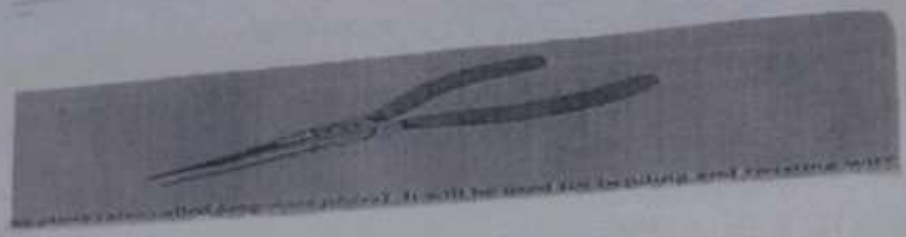
Transformer Ratio

$$\frac{E1}{E2} = \frac{N1}{N2} = \frac{I2}{I1}$$

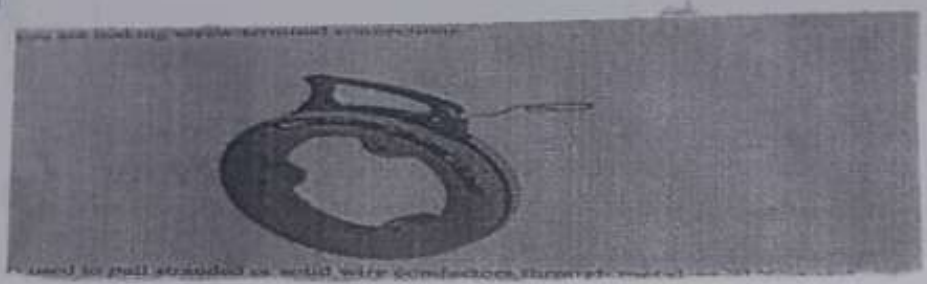
Where, E1 = Primary voltage
E2 = Secondary voltage
N1 = Primary turns
N2 = Secondary turns
I1 = Primary current
I2 = Secondary current

Applications of transformer.
It is used to
1. To step-up or step-down the voltage or current.
2. For isolation The circuits.

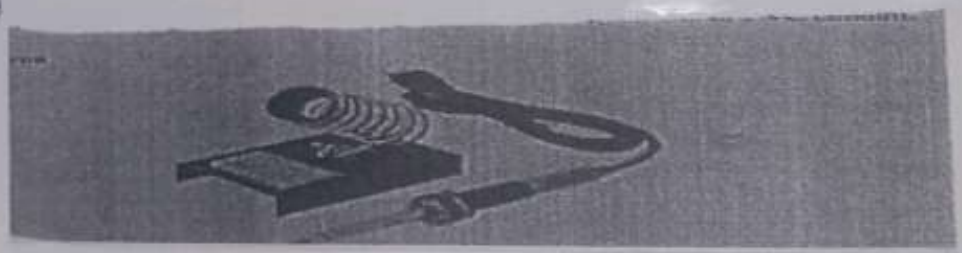
Nose pliers



Fish Tape



Soldering Iron



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3) The transformers transmits electrical energy through wires over long distances.
4) Transformers are used as voltage regulators,
5) Acts as coupling device.

Working principle.

The motor works on the principle of electromagnetic induction. In which the electromotive force induces across the electrical Conductor when it is placed in a rotating magnetic field.

Batteries.

A cell is an electro chemical device which converts chemical energy into electrical energy and viceversa. It store electrical energy in the form of chemical energy. It is classified into
- Primary cells
- Secondary cells.

1. Primary cells:-

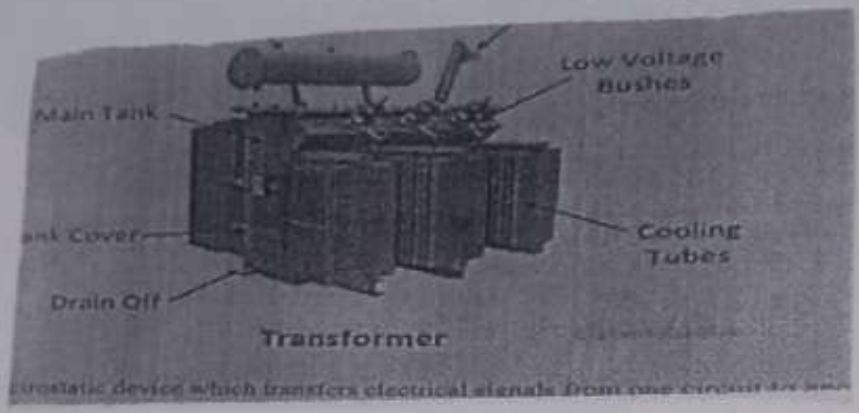
The cells which cannot be recached and reduced after discharge are called primary cells.

Ex: All dry cells like torch cells, radio cells.

2. Secondary cell:-

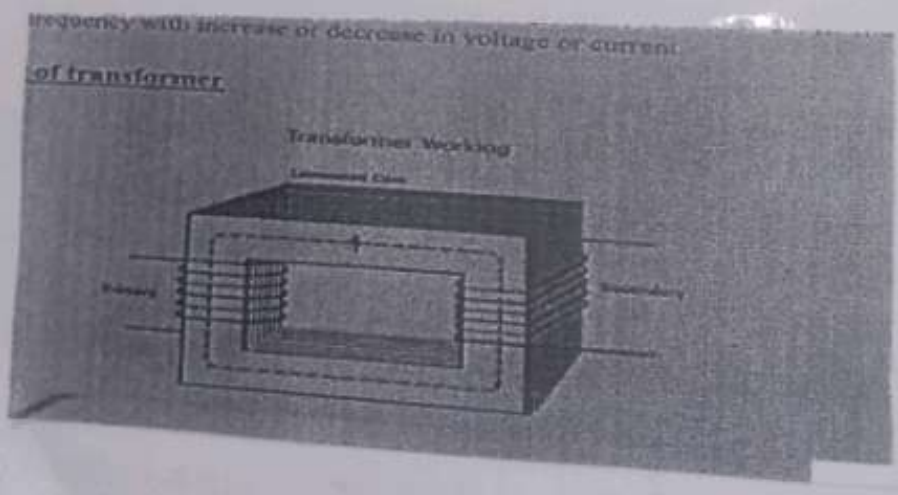
The cell which can be recharged and reused after discharge are called Secondary cells. Ex:- lead acid cell.

Transformer



static device which transfers electrical signals from one

working principle of transformer



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Battery:-

It is the combination of two or more cells connected in either series or parallel or series parallel combination to get higher voltage or higher current.

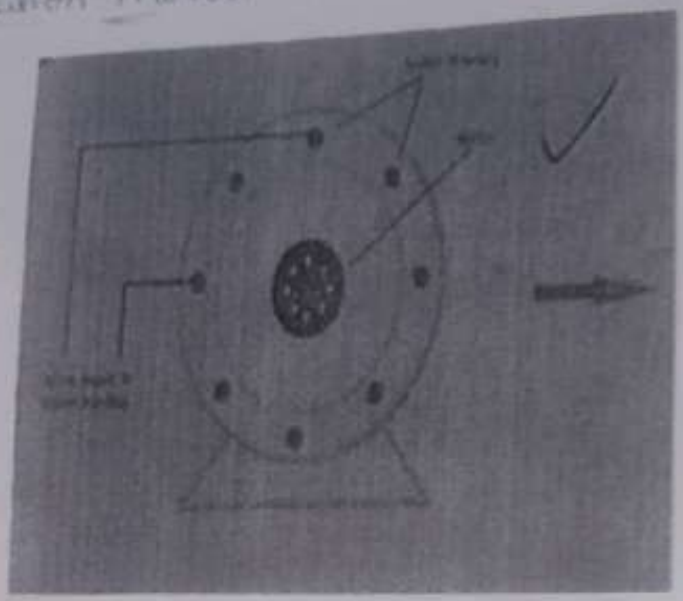
UPS (Uninterrupted power supply)

As the name itself indicates an UPS is an electrical device that provides continuous uninterrupted power supply to the load even when the primary source of power supply fails.

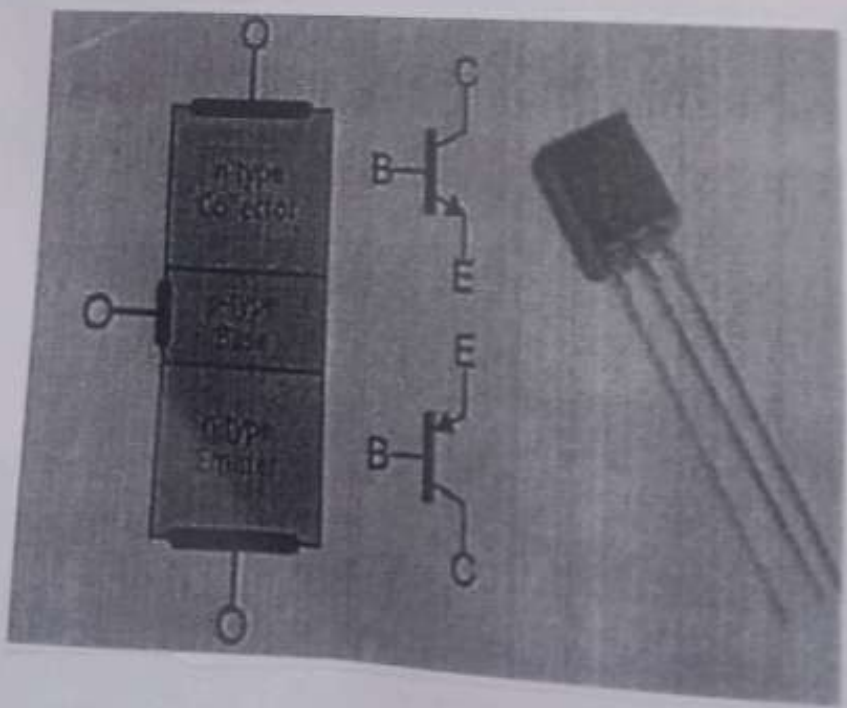
Need for UPS

- It ensures continuous functioning of the equipment even when power fails.
- This improves efficiency of the machines.
- This prevents loss of data.
- It protects equipment against surge voltages.

Induction Motor



Transistors



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Unit-5

Electronic Devices And Digital Electronics.

Compare conductors, Insulators and Semiconductors.

Sl.no	Conductors	Semiconductors	Insulators.
1)	Easily Conducts the electrical current.	Conducts the electric current less than conductor & greater than insulator	Does not conduct any current.
2)	Has only one valence electron in its outermost orbit.	Has four valence electron in its outermost orbit	Has eight valence electron in its outermost orbit.
3)	Conductors formed using metallic bonding.	Semiconductors are formed due to covalent bonding	Inductors are formed due to ionic bonding
4)	Valence and Conduction bands are overlapped	valence & Conduction bands are separated by forbidden energy gap of 1 ev	Valence and Conduction bands are separated by forbidden energy gap of 6 to 10 eV.
5)	Resistance is very small	Resistance is high	Resistor is very high
6)	It has positive temperature coefficient	It has negative temperature coefficient	It has negative temperature coefficient.

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Ex:- Copper, aluminum etc	Ex:- silicon, germanium, etc	Ex. Mica, paper etc.

PN Junction Diode.

Diode is a two terminal single junction Semiconductor device in which current flows in one direction only.
when a p-type Semiconductor material is suitable joined with n-type Semiconductor. PN junction diode is formed

The process of applying voltage to the PN junction diode is called Biasing. To make diode forward bias, positive terminal of the battery is connected to the p-type (Anode) and negative terminal of the battery connected to n-type (cathode) material. During forward bias current flows through the circuit.

Rectifier

Rectifier is a circuit which convert AC into pulsating DC. Filters are used to convert pulsating DC into pure DC.
Rectifiers are classified into two types

- Half wave rectifier
- Full wave rectifier.

Experiment No. _____ Date

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Transistor

Transistor is a three terminal three layer two junction Semiconductor material

Emitter:- It is heavily dopped region. The function of emitter is to emit electrons

Base:- It is lightly dopped region. The function of base to transfer electrons from emmitter region to collector.

Collector:- It is moderately dopped region. The function of collector is to collect the emitted electrons.

Applications of Transistor.

- It is used as amplifier
- It is used as Switch
- Communication Systems.

Comparison b/w Analog and Digital signal

Signal	Analog signal is a continuous signal which represents Physical measurements.	Digital Signals are discrete time signals generated by digital modulation.
Waves	Denoted by sine waves	Denoted by Square waves.

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Representation	Uses continuous range of values to represent information.	Denoted by square waves, uses discrete or discontinuous values to represent information.
Example	Human voice in air, analog electronic devices.	Computers, CDs, DVDs and other digital electronic devices.
Uses	can be used in analog devices only. Best suited for audio & video transmission	Best suited for computing and digital electronics.
Applications	Thermometer	PCs, PDAs.

Sensors.

A Sensor converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) into a signal which can be measured electrically.

Criteria to Choose a Sensor.

There are certain features which have to be considered when we choose a Sensor. They are as given below:

1. Accuracy
2. Environmental condition - usually has limits for temperature / humidity

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3. Range - Measurement limit of sensor.
4. Calibration - Essential for most of the measuring devices as the readings changes with time
5. Resolution - Smallest increment detected by the sensor
6. Cost
7. Repeatability - The reading that varies if repeatedly measured under the same environment.

Actuators.

An actuator is a device used to move or control a body or mechanism in a linear or rotatory direction using a control signal.

Types of Actuators.

- According to type of Motion.

1. Linear
2. Rotary actuator.

- According to type of power used.

1. Hydraulic
2. Pneumatic
3. Electrical
4. Magnetic
5. Mechanical Actuator.

Experiment No. 1 Date

Title of Experiment Page No.

Ohm's Law

AIM: To practicing of identification and connection of voltmeter and ammeter

Apparatus:

S.No	Components	specifications	Quantity
1.	Power Supply	0-30V	1
2.	Voltmeter	0-20/200V	1
3.	Ammeter	0-200/2000A	1
4	Resistor	1Kohm	1

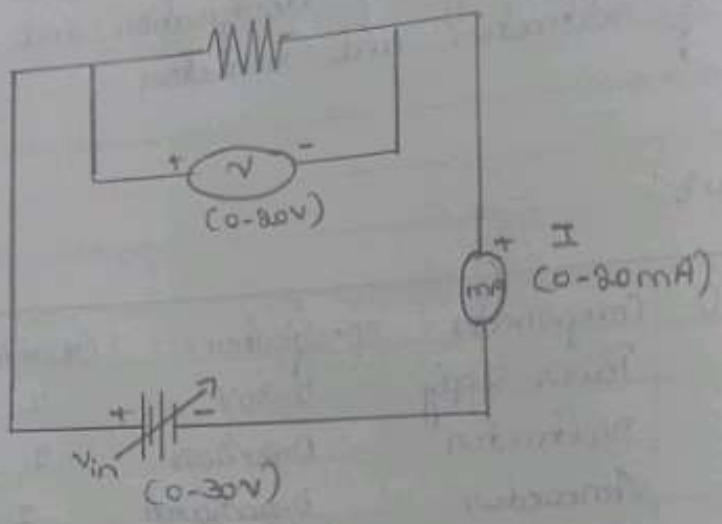
Theory:

Ohm's Law ~~states~~ that at constant temperature, the current flowing through a conductor is directly proportional to the potential difference between the ends of the conductor and inversely proportional to the resistance.

Procedure:

1. Rig up the circuit as shown in the diagram.
2. Switch on the power supply
3. Increase the power supply in steps and note down the corresponding voltage and current readings.

Circuit Diagram;



Tabular column:

Sl No.	Input voltage, V_{in} in volts	voltage across Resistor, V_{in} volts	Current through Resistor, I_{in} milli Amps	Resistance, $R = V/I$ ohms
1)	1V	0.98	1mA	$\frac{0.98}{1\times10^{-3}} = 0.98k\Omega$
2)	2V	1.99	2.03mA	$\frac{1.99}{2.03m} = 0.98k\Omega$
3)	3V	3.14	3.19	$\frac{3.14}{3.19} = 0.98\,K\Omega$
4)	4V	4.18	4.25	$\frac{4.18}{4.25} = 0.98\,K\Omega$

Result: The resistor value is $1K\Omega$

Experiment No. _____ Date

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Title of Experiment _____

4. Record these data in the tabular column.
5. Calculate the practical resistance value by using formula.
6. Compare practical and theoretical values

Experiment No. 2 Date

Title of Experiment Page No.

I. RESISTANCE IN SERIES

AIM: To determine the equivalent Resistance in series Connection.

Apparatus:

Sl.no	Components	Specifications	Quantity
1.	Power Supply	0-30V	1
2.	voltmeter	0-30/300V	1
3.	Ammeter	0-30/300mA	1
4.	Resistors		3nos.

Theory:

When resistors connected in series the effective resistance is given by Sum of all resistance

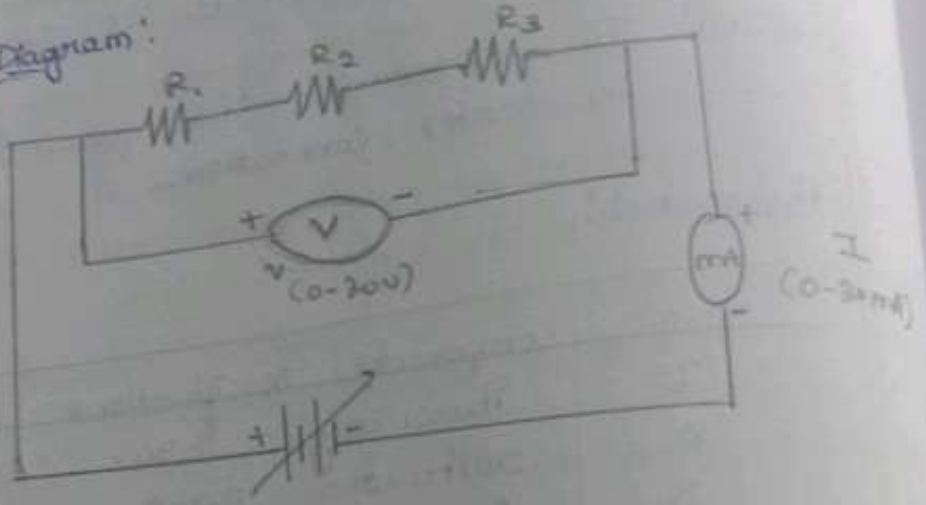
$$R_t = R_1 + R_2 + R_3 \ldots + R_n$$

In Series Combination the current is same through all the resistance and the voltage are different across each resistance.

Procedure:

1. Calculate the resistance value by using color code chart and find out the Theoretical total resistance value.

Circuit Diagram:



Tabular column:

Sl no.	Input voltage Vin in Volts	Voltage across Resistor, Vin volts	Current through Resistor, I in milli Amps	Practical Resistance, R=V/I in ohms	Theoretical Resistance
1)	2V	1.59V	0.53m	3KΩ	3 KΩ
2)	4V	3.17V	1.06 m	2.99K Ω	
3)	6V	4.73V	1.57m	2.99K Ω	
4)	8V	6.87V	2.09m	3K Ω	

Result:- The theorotical value is 3K Ω

The practical value is 2.99K Ω

Experiment No. _____ Date

Title of Experiment _____ Page No.

2. Rig up the circuit as shown in the diagram by soldering.
3. Switch on the power supply.
4. Increase the power supply in steps and note down the corresponding voltage and current readings.
5. Calculate the practical resistance value by using formula.
6. Compare practical and theoretical values.

Experiment No. 3 Date

Title of Experiment Page No.

Resistance In Parallel

AIM: To determine equivalent resistance in Parallel Connection.

Apparatus:

Sl No.	Components	specifications	Quantity
1.	Power Supply	0-30V	1
2.	Voltmeter	0-20/200V	1
3.	Ammeter	0-20/200mA	1
4.	Resistors		2nos.

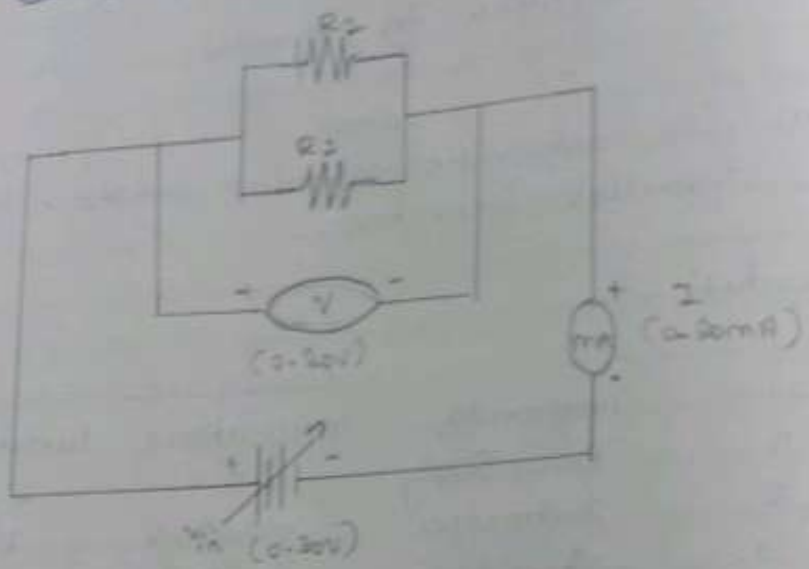
Theory:

When resistors connected in parallel the effective resistance is given by

$$\frac{1}{Rt} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} \ldots\ldots + \frac{1}{Rn}$$

In parallel combination the voltage is same across all the resistance and the currents are different through each resistance.

Circuit diagram:



Tabular Column:

Sl. No	Input voltage V_{in} in volts	Voltage across Resistor, V_{in} volts	Current through Resistor, I in milli Amps	Practical Resistance R in ohms	Theoretical Resistance
1)	2V	1.98V	1.22 m	R=1.622 KΩ	1.66KΩ
2)	4V	3.97	2.44 m	R_p = 1.633 KΩ	
3)	3V	3.00	1.84	R_p = 1.630 km	
4)	1V	0.99	0.61	R_p = 1.622 km	

Result: The Theoretical value is 1.68 KΩ
The practical value is 1.65 KΩ

Experiment No. ..... Date

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Procedure:

1. Calculate the resistance value by using color code chart and find out the Theoretical total resistance value.
2. Rig up the circuit as shown in the diagram by soldering.
3. Switch on the power supply.
4. Increase the power supply in steps and note down the corresponding voltage and current readings.
5. Calculate the practical resistance value by using formula.
6. Compare practical and theoretical values.

Experiment No. 4 Date

Title of Experiment Page No.

Color Code Chart

AIM: To determine the value of resistance by color code and compare it with multimeter readings.

Apparatus:

Sl.no	Components	specifications	Quantity
1	Resistors	220 Ω, 1KΩ	1
2	Multimeter	—	1

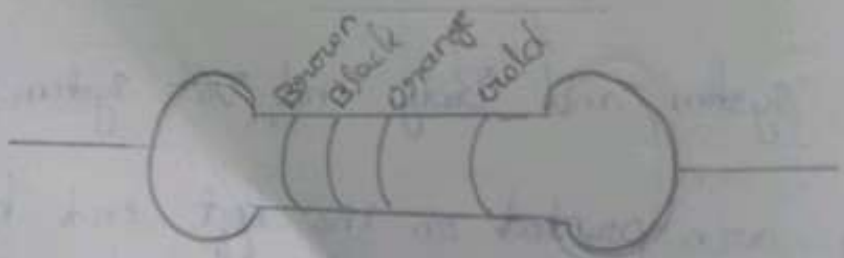
Theory:

Resistors are manufactured in different sizes and shapes. Some are big enough to print their resistance value on their bodies. Some are too small to print their resistance value. Hence Electronics Industries Association has adopted two standard color coding methods to know their values. Color.

Band System and Body end Dot System

bands are printed on the left end body of the resistor The resistance value of the resistor is found by reading the color bands

Example diagram:-



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from left to right and using the corresponding values given in the color code table as shown. The procedure to be followed is given below.

* Hold the resistor so that the color bands are always towards your left hand side.
* Read the colors of the color bands from left to right in the order.
* First band color gives the first digit of the resistance value.
* Second band color gives the second digit of the resistance value.
* Third band color gives the multiplying factor or number of zeros to be added after second digit.
* The fourth band color gives the tolerance in percentage.

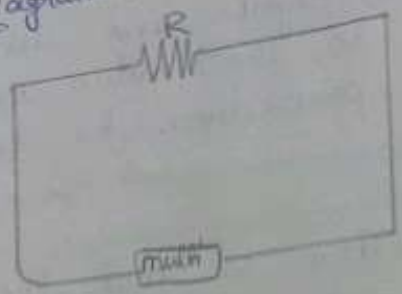
Example:-

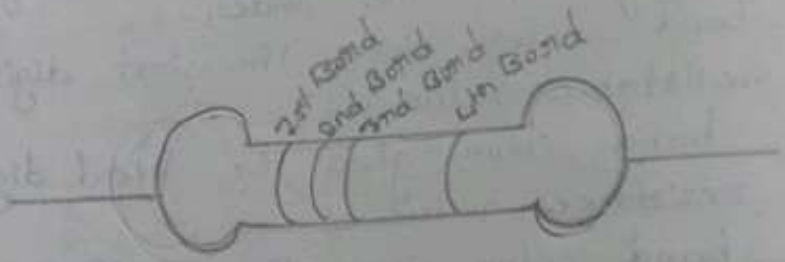
First Band – Brown – gives the first digit – 1
Second Band – Black – gives the second digit – 0
Third Band – Orange – gives the multiplying factor – 10^3
Fourth Band – Gold – gives the tolerance – 5%
Therefore the Resistance value is $R = 10 \times 10^3 \Omega \pm 5\% = 10k\Omega \pm 5\%$

Experiment No. .....

Title of Experiment .....

Circuit Diagram :





Sl. No	Band color	1st Band	2nd Band	3rd Band/ multiplicon	4th Band/ Tolerance
1.	Black	0	0	10^0	1%
2.	Brown	1	1	10	2%
3.	Red	2	2	10^2	
4.	Orange	3	3	10^3	
5.	Yellow	4	4	10^4	
6.	Green	5	5	10^5	
7.	Blue	6	6	10^6	
8.	Violet	7	7	10^7	
9.	Grey	8	8	10^8	
10.	White	9	9	10^9	
11.	Gold				5%
12.	Silver				10%
13.	No color				20%
14.	Pink				High stability

Experiment No. 5 Date

Title of Experiment Page No.

Logic gates

AIM:- To verify the truth table of logic gates.

Apparatus:

Sl.no	Components	Quality
1	Digital IC Trainer kit	1
2	IC 7408, IC 7432, IC 7404, IC 7400 IC 7408, IC 7486	1each
3	Patch chords	10

Procedure:-

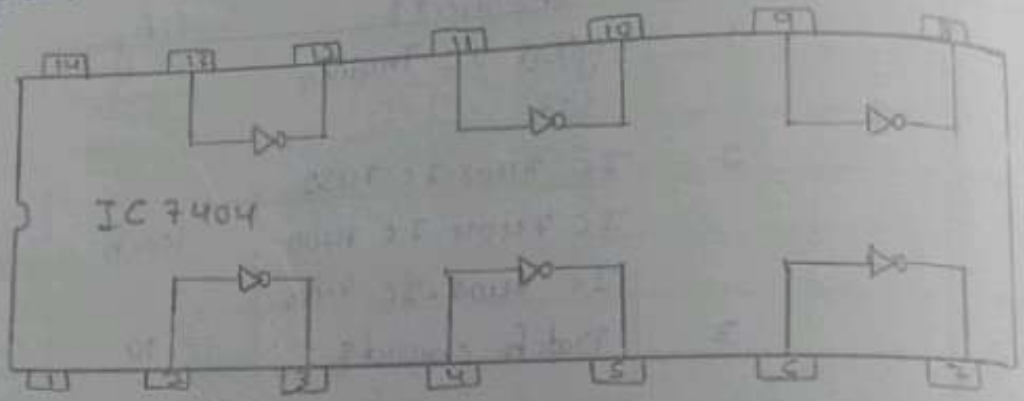
1. Check the IC on IC tester.
2. Insert IC on IC trainer kit in proper position.
3. make the necessary connection.
4. Apply the possible inputs and note down the corresponding output.

1. NOT Gate - IC 7404

Logic Symbol

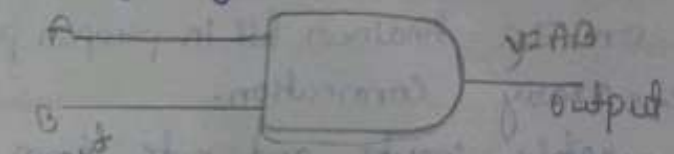
Truth	table
I/P	O/P
A	$y = \bar{A}$
0	1
1	0

Pin diagram

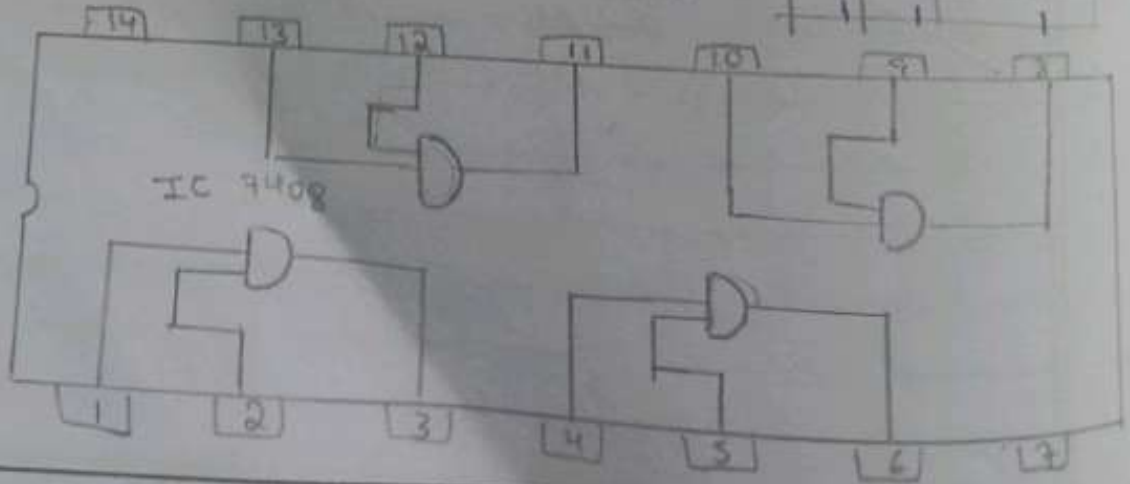


2. AND Gate - IC 7408

Logic Symbol



Truth		table
I/P		O/P
A	B	y = AB
0	0	0
0	1	0
1	0	0
1	1	1



Experiment No. _____ Date [ ][ ][ ][ ][ ][ ][ ][ ]

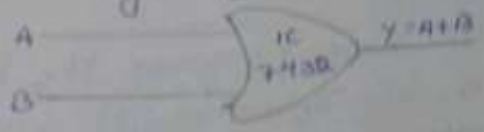
Title of Experiment _____ Page No. [ ]

NOT Gate :- The NOT Gate performs the basic logical operation known as Inverter. It has single input and single output. It converts HIGH level input to LOW level output and low level input to HIGH level output.

AND Gate: The AND Gate performs logical multiplication. It has two or more inputs and only one output. The output is HIGH when all the inputs are HIGH and output is low when all the input are HIGH and output is low when any one of the input is low.

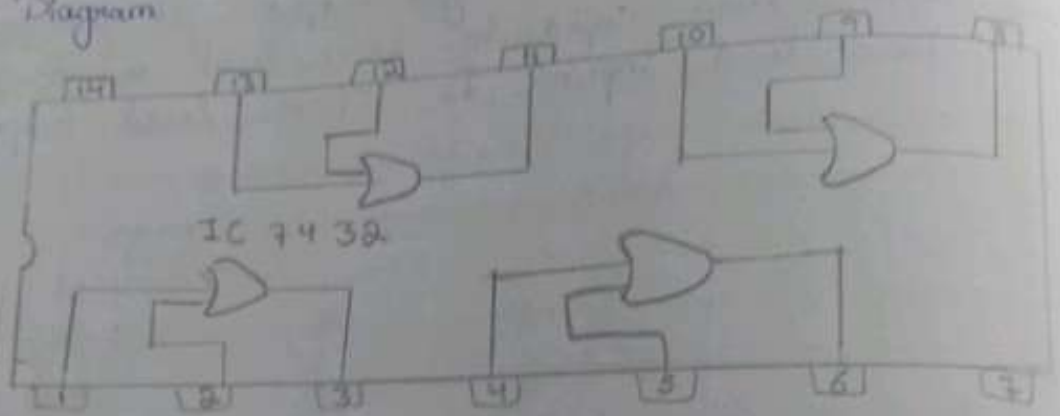
3. OR Gate - IC 7432

Logic Symbol



Truth table		
A	B	Y=A+B
0	0	0
0	1	1
1	0	1
1	1	1

Pin Diagram



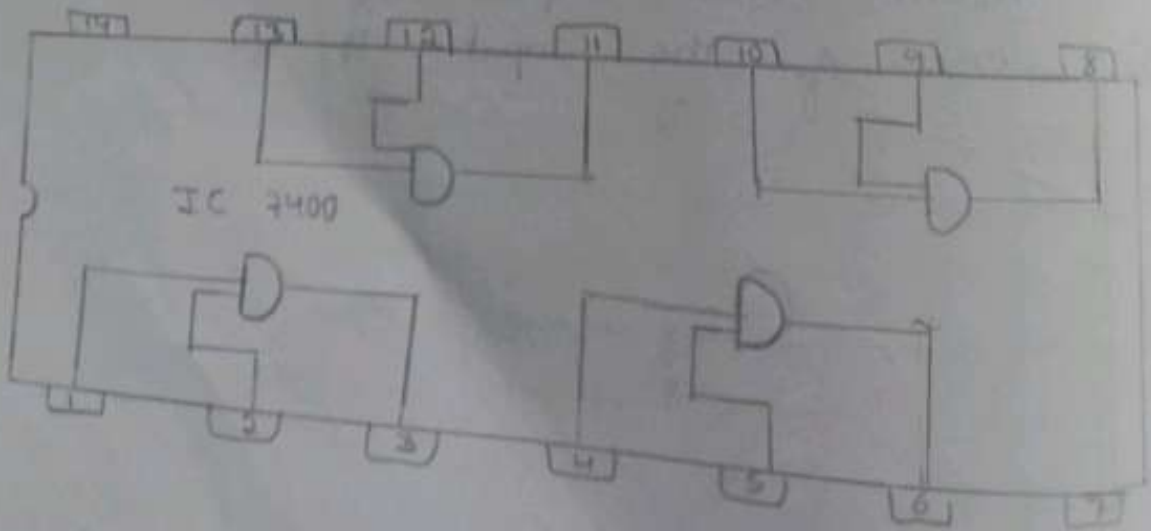
4. NAND Gate - IC 7400

logic Symbol

Truth table

Input		output
A	B	Y=AB
0	0	1
0	1	1
1	0	1
1	1	0

Pin Diagram



Experiment No. ..... Date

Title of Experiment ..... Page No.

OR Gate : The OR Gate performs logical addition operation. It has two or more inputs and only one output. The output is HIGH when any one of the input is HIGH and output is low when any all the inputs are low.

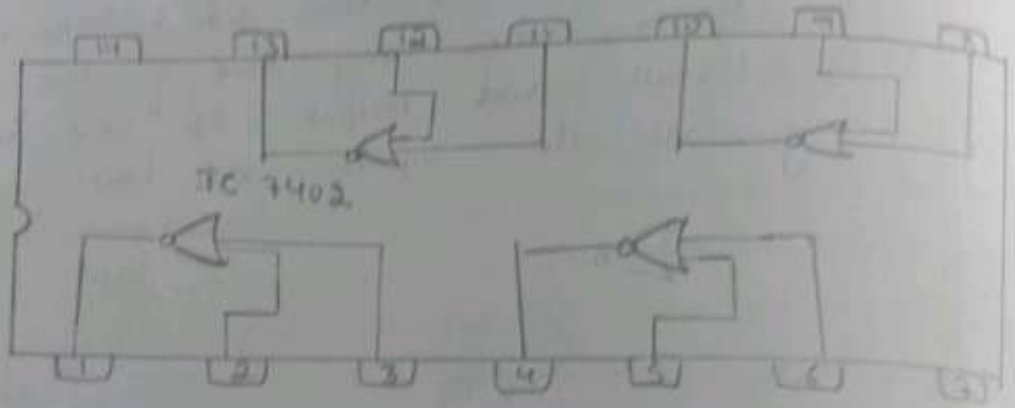
NAND Gate: The NAND Gate performs inverse operation of AND gate followed by an inverter. It has two or more inputs and only one output. The output is HIGH when any one of the input is low and output is low when all the inputs are HIGH.

5. NOR Gate - IC 7402

Logic Symbol

Truth Table

Input		output
A	B	Y = A+B
0	0	1
0	1	0
1	0	0
1	1	0

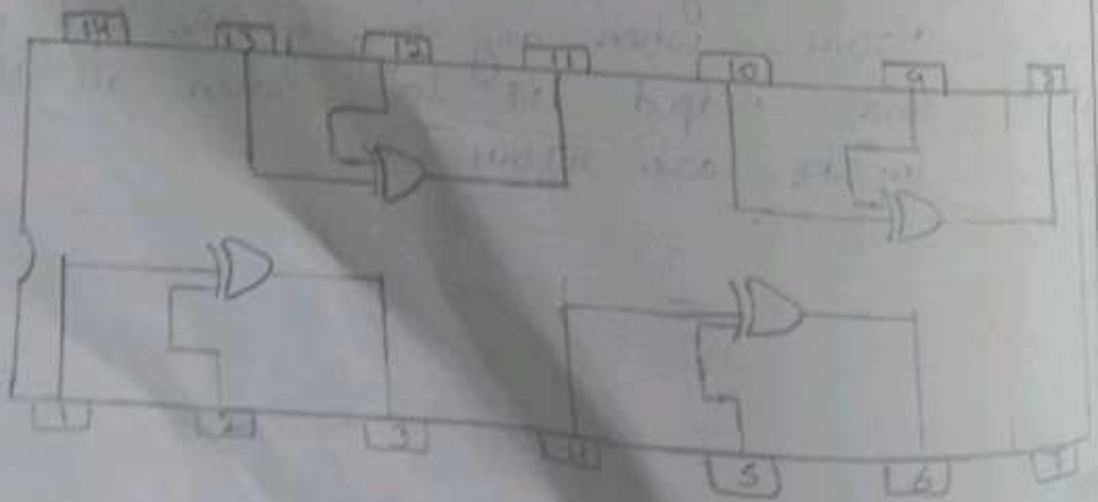


6. Ex-OR Gate - IC 7486 (Exclusive orgate)

Logic Symbol

Truth table

Input		output
A	B	$Y = A \oplus B = \bar{A}B + A\bar{B}$
0	0	0
0	1	1
1	0	1
1	1	0



Experiment No. Date

Title of Experiment Page No.

NOR Gate: The NOR gate performs inverse operation of OR Gate. It is also obtained by an OR gate followed by an inverter. It has two or more inputs and only one output. The output is HIGH when all the inputs is low and output is low when any one of the input is HIGH.

EXOR gate: The exclusive OR gate (Ex-OR) is also obtained by an OR gate followed by an inverter. It has two or more inputs and only one output. The output is HIGH when all the inputs is low and output is low when any one of the input is HIGH.

Experiment No. 6 Date

Title of Experiment Page No.

MEASUREMENT OF AC VOLTAGE BY CRO

AIM: To measure Amplitude, Peak to Peak value, Time period, Frequency and calculate Phase angle by Lissajous figure.

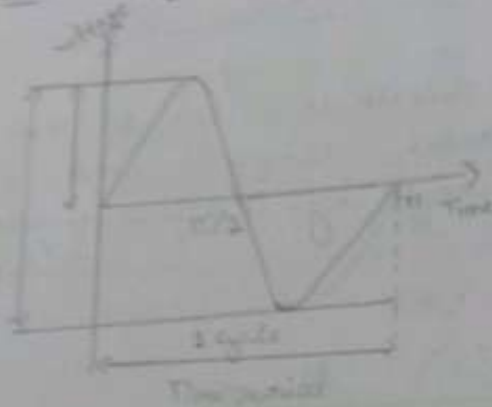
Apparatus:

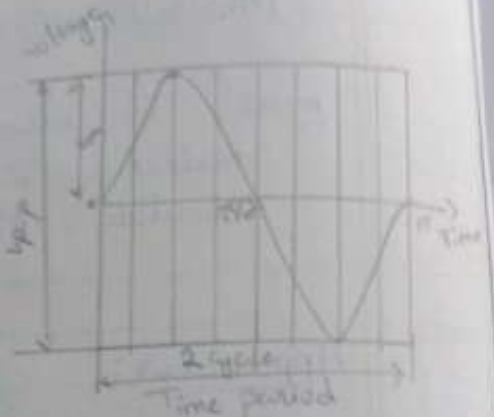
Sl.NO	Components	specifications	Quantity
1.	Signal Generator		1
2.	CRO		1
3.	Resistor	1KΩ, 560Ω	1
4.	Capacitor	0.1uF	1

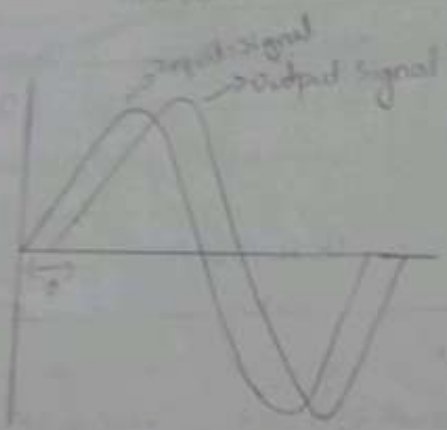
Procedure:

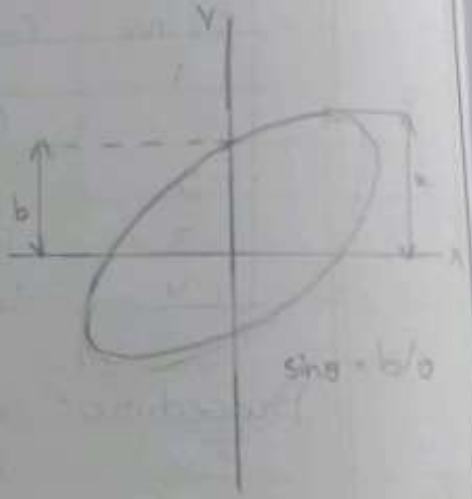
1. Rig up the circuit as shown in the diagram by soldering.
2. Measure Amplitude, Time, Peak to Peak voltage and Frequency.
3. Calculate Phase difference by using Lissajous pattern.

Circuit Diagram









C910

	amplitude	Time period ms	frequency (Hz)
Sin wave	1.4×5 = 7V	1.6×0.5 = 0.8m	$\frac{1}{0.8m}$ = 1.25 K Hz
Square wave	1.2×5 = 6V	1.8×0.5 = 0.9m	$\frac{1}{0.9m}$ = 1.11k Hz
Triangular wave	1.6×5 = 8V	1.8×0.5 = 0.9m	$\frac{1}{0.9m}$ = 1.11k Hz

Experiment No.

Title of Experiment

Date

Page No.

Theory:

Amplitude of an alternating quantity (voltage or current) is the instantaneous value of that alternating quantity when it reaches its maximum value, either in the positive direction or negative direction.

Time Period

The time taken by an alternating quantity to complete one cycle is called Time period. It is denoted by T and measured in seconds.

Frequency:

The number of cycles per second is called frequency. It is denoted by F and measured in Hertz.

Cycle:

An alternating quantity is said to have completed one cycle when it passes through one set of positive and one set of negative values, consecutively.

Experiment No. _____ Date

Title of Experiment _____ Page No.

Phase Difference:

Phase difference between any two alternating quantities is the angular displacement, by which the two alternating quantities reach their maximum or zero values in the same direction during a period of one cycle.

Experiment No. 7

Title of Experiment

Date

Page No.

VI CHARACTERISTICS OF PN JUNCTION DIODE

AIM: To verify and plot the VI characteristics of PN junction diode in forward bias condition.

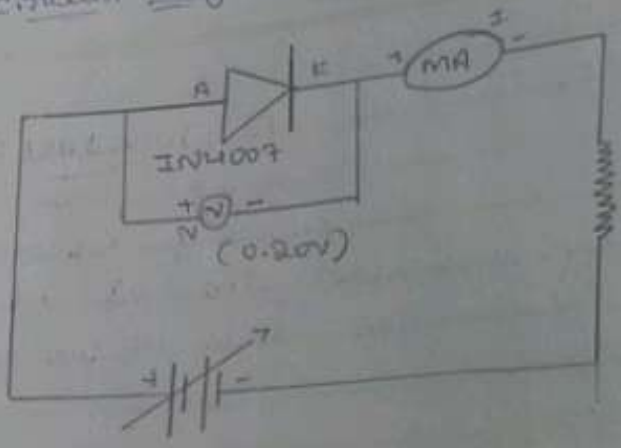
APPARATUS:

Sl.no	Components	Specifications	Quantity
1	Diode	IN4007	1
2	Resistor	560Ω	1
3	Voltmeter	0-30V	1
4	Ammeter	0-30mA	1
5	Power supply	0-30 V	1

Procedure:

1. Rig up the circuit as shown in the diagram by soldering.
2. Switch on the power supply
3. Observe the output waveform on the CRO.

Circuit diagram;



Tabular Column:

Sl No	Input voltage V_{in} in volts	Voltage across Diode V in volts	Current through Diode I in milli Amps
1.	0.1	0.16	0.00
2.	0.2	0.24	0.00
3.	0.3	0.39	0.00
4.	0.4	0.41	0.00
5.	0.5	0.43	0.03 mA
6.	0.6	0.49	0.05 mA
7.	1.0	0.52	0.33 mA
8.	1.5	0.59	1.34 mA
9.	2.0	0.60	2.27 mA

Experiment No. 3

Date

Title of Experiment

Page No.

Control of single lamp from Two Place Independently

AIM: To control single lamp from two place independently.

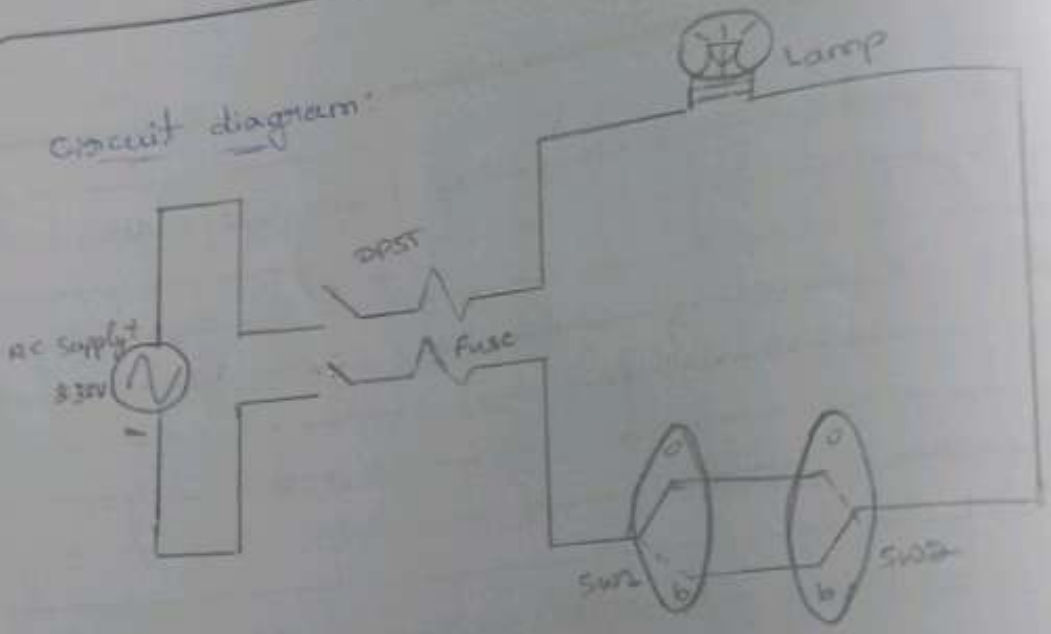
Apparatus:

Sl. NO	Components	Specifications	Quantity
1.	Lamp	100 W	1
2.	Switch	Two way	1
3.	Lamp holder		1
4.	Connecting wire		

Procedure:

1. Rig up the circuit as shown in the diagram.
2. Switch on the single phase power supply with certain Switch combination.
3. Observe the lamp.
4. Tabulate the result obtained.

Circuit diagram:



Tabular Column:

Sl No.	SW1	SW2	Lamp
1	C_1	C_1	ON
2	C_1	C_2	OFF
3	C_2	C_1	OFF
4	C_2	C_2	ON

Experiment No. 7 Date

Title of Experiment Page No.

Full Wave Bridge Rectifier

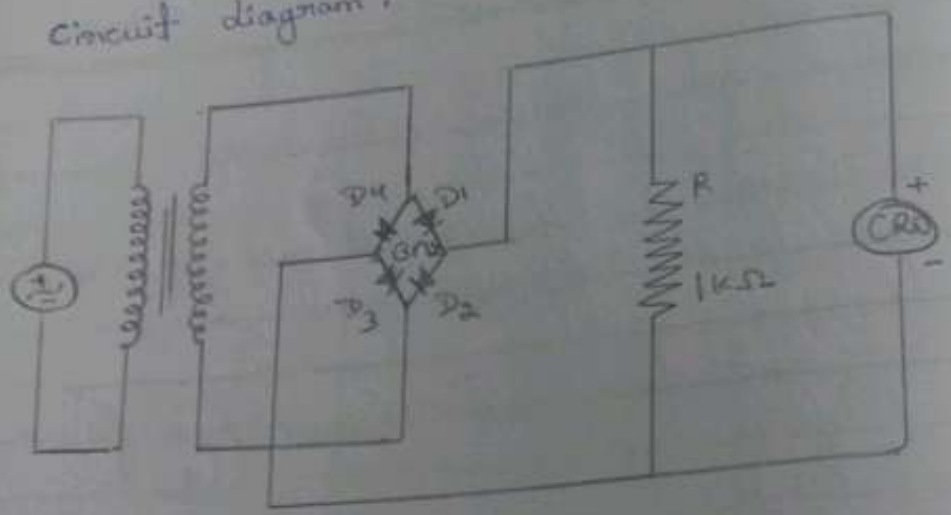
AIM: To Construct Full wave rectifier using diode and rectifier IC.

Sl No	Components	Specifications	Quantity
1.	Diode	IN4001/BY127	4
2.	Resistor	1KΩ	1
3.	Transformer	Stepdown	1
4.	CRO		1

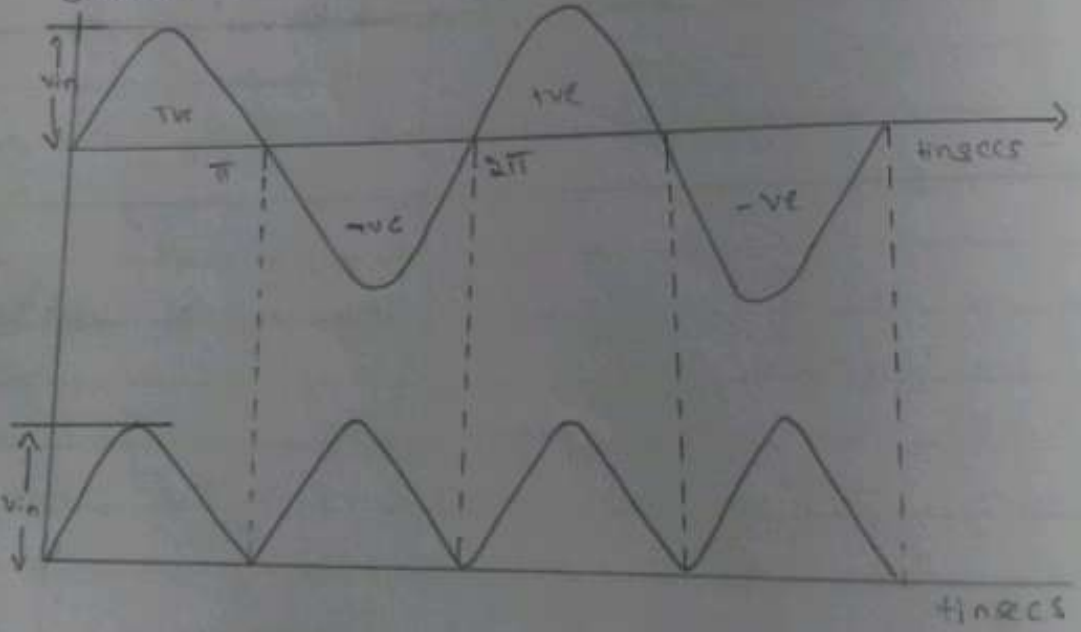
Procedure:

1. Rig up the circuit as shown in the diagram by soldering
2. Switch on the power supply.
3. Observe the output waveform on the CRO.

Circuit diagram:



Circuit wave forms:



Experiment No. 12

Title of Experiment

Date

Page No.

Identify the terminals of a Diode and test the Diode for its condition

AIM: Identify the terminals of a diode and test the diode for its condition

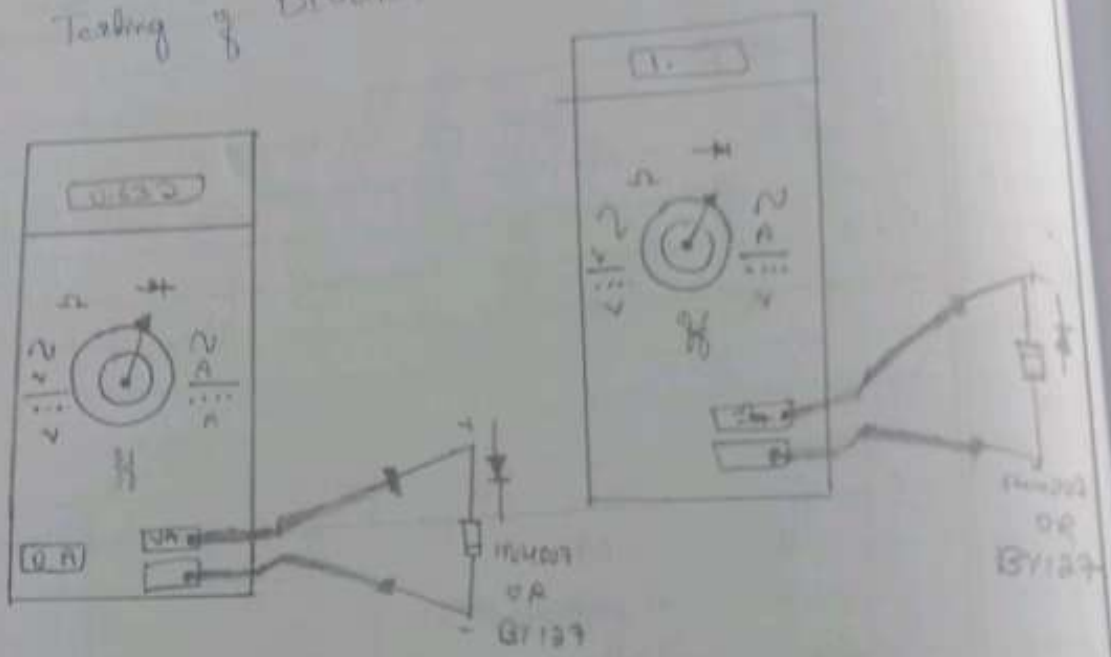
Apparatus Required:-

Sl No	Name	Type	Rang/specification	Qty
1	D.M.M			1
2	Test probes	~~DIODE~~		1
3	Diode	BY127	1A, 1000 V	1

Terminal Identification:

=> Before testing of the diode we have to identify the terminals of the diode that is anode and cathode. Most of the PN diode have the white-band on its body and this white-band side terminal is the cathode. And the remaining one is anode. Some diodes may have a different colour band, but the colour band side terminal is the cathode.

Testing of DIODE:



Tabular Column:

Sl no	Multimeter Connection with Diode	Reading	Remarks
1.	Red to Anode Black to Cathode	595Ω	Diode is working
2	Red to Cathode, Black to Anode	1 (open)	

595Ω

638Ω

Experiment No.

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Procedure:

① Keep the digital multimeter (DMM) in diode checking mode by rotating the central knob to the place where the diode symbol is indicated. In this mode multimeter is capable to supply a current of 2mA approximately between the lead leads.

② Connect the red probe to the anode and black probe to the cathode. This means diode is forward-biased.

③ Observe the reading on meter display. If the displayed voltage value is in between 0.6 to 0.9 (since it is Silicon diode) then the diode is healthy and perfect. For germanium diodes this value is in between 0.25 to 0.3.

④ Now reverse the terminals of the meter that means connect the red probe diode where no current flows through it. Hence the meter should read OL (as it is equivalent to flows through it. Hence the meter should read OL (which is equipment to open circuit) if the diode is healthy.