SRI SHANMUGHA COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, Accredited by NAAC and Affiliated to Anna University)

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GE 8261 ENGINEERING PRACTICES LABORATORY

LAB MANUAL

Dept : All Branches

Department of Electronics and Communication Engineering

GE8261 – ENGINEERING PRACTICES LABORATORY

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 10

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE 13

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency)using CRO and Multimeter.
2. Study of logic gates AND, OR, NOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR

STUDY OF ACCESSORIES, TOOLS USED IN WIRING &SAFETY PRECAUTIONS

AIM

To study the various types of accessories and tools used in house wiring. To study safety precautions for electrical engineering practice

ACCESSORIES REQUIRED

Switch, Lamp Holder, Lamp holder adopter, Ceiling roses, Mounting blocks, Socket outlets, Plugs, Main switch, Distribution fuses boards.

TOOLS REQUIRED

Cutting pliers, Flat nose pliers, Screwdriver, Neon tester, Hammer, knife, Poker, Pincer, Center punch, twist drill, Soldering rod.

ACCESSORIES

Switch

A switch is used to make or break an electric circuit. Under some abnormal conditions it must retain its rigidity and keep its alignment between switchblades and contacts correct to a fraction of centimeter.

Lamp Holders

A lamp holder is used to hold the lamp required for lighting purposes.

Lamp Holder Adopter

It is used for tapping temporary power for small portable electric appliances from lamp holders. Such a practice is not advised.

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Ceiling Roses

It is an end point of an electrical wire, which provides a cover to the wire end. These are used to provide a tapping to the lamp holder through the flexible wire or a connection to a fluorescent tube or a ceiling fan. It consists of a circular base and a cover made of bakelite. One end of the plates is connected to supply and the other end to a flexible wire connected to appliances.

Mounting Blocks

These are nothing but wooden round blocks. They are used in conjunction with ceiling roses, batten holder, surface switches, ceiling switches, etc.

Plugs

These are used for tapping power from socket outlets. Two-pin plugs and three-pin plugs are commonly available.

Socket Outlets

It is a wiring accessory to which electrical appliances are connected for power supply. These have insulated base with molded or socket base having three terminal sleeves. The two thin terminal sleeves are meant for making connection to the load circuit wires and the third terminal sleeve, larger in cross section, is used for an earth connection.

Main Switch

This is used at the consumer's premises so that he may have self-control of the entire distribution circuit. This switch is a master control of all the wiring circuit made in the building. The different classifications are double poled and triple poled switches.

Distribution Fuse Boards

In industries or in very big buildings, where a number of circuits are to be wired, distribution fuse boards are used. They are usually iron clad and are designed with a large space for wiring and splitting the circuits. The fuse bank in the distribution board can easily be removed.

Fuse

A fuse is a protective device, which is connected such that the current flowing through the protected circuit also flows through the fuse. There is a resistive link inside the fuse body that heats or melts up when current flows through it. If the current is beyond the permissible limit, the resistive link burns open, which stops all current to flow in the circuit. At this condition we say that the fuse is blown.

Earthing

When a wire is connected from the ground to the outer metal casing of the electrical appliances, then it attain zero potential and the appliance is saidto be earthed and this process is known as earthing.

Purpose of Earthing

Under normal condition, there is no electrical potential is available in the outer metal casing of the electrical appliances. When some fault develops in the appliances, then electrical potential leaked to the metal casing causes heavy current flow due to earthing. This heavy current blows the fuse and cutoff electrical supply to the appliances. Thus earthing provides protection to human being and electrical appliances.

TOOLS

Cutting Pliers

They are used to cut the wires, nipping by hand and twisting the wires and also to hold them. Long nose pliers are used to hold the wires in small space and also to tighten and loosen small nuts.

Nose Pliers

Long nose pliers are used to hold the wires in small space andalso to tighten and loosen small nuts.

Screw Driver

They are used to drive and tighten screws into pointed holes in theswitches and electrical machines. They are generally insulated.

Hammer

Ball peen and claw hammers are commonly used in electrical work wheregreater power is required in striking. It is best suited for riveting purposesin sheet metal works.

Line Tester

It is used to check the electric supply in the line or phase wire. It has asmall neon bulb, which indicates the presence of power supply. It can alsobe used as a screw driver.

Knife

It is generally used for removing the insulation from the wire. The closingtype knife is always preferred.

Poker

It is a long sharp tool used for making pilot holes in wood before fixingand tightening wood screws.

Pincer

The pincer is used for extracting nails from the wood.

Center Punch

When a hole is to be drilled in a material, the center punch is alwaysused for making the starting hole.

Twist Drill

It is used for drilling holes into metals and woods

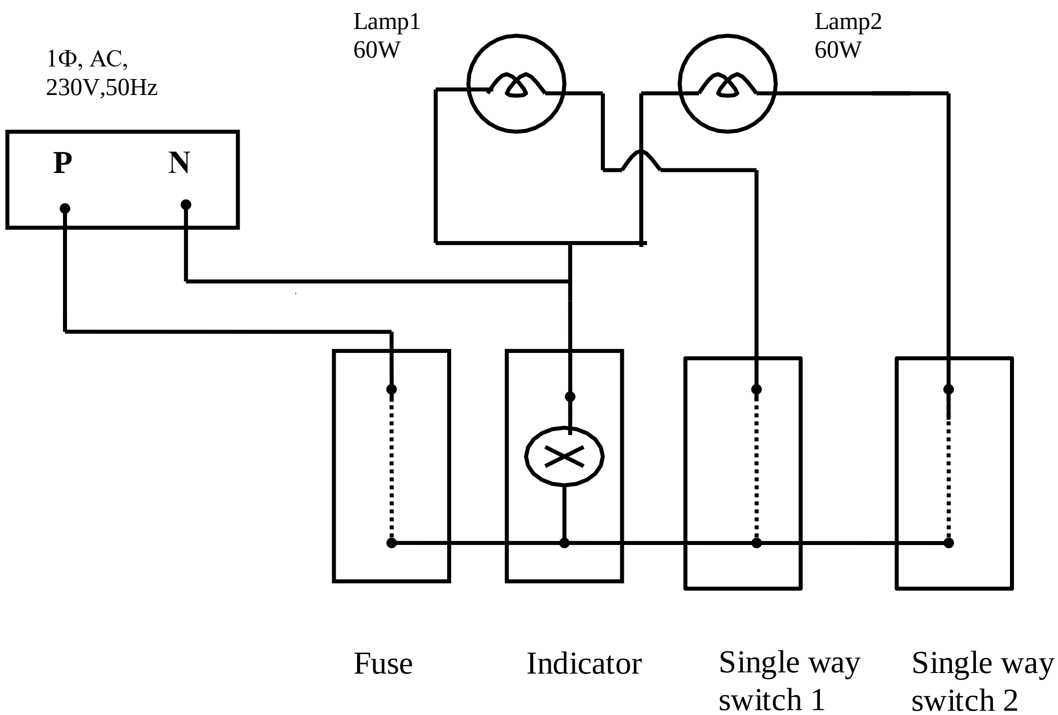
SAFETY PRECAUTIONS

1. While work on electrical installations, wear always rubber shoes and avoid loose shirting.
2. Use wooden or PVC insulated handle screwdrivers when working on electric circuits.
3. Do not touch bare conductors
4. Replace or remove fuses only after switching OFF the circuit switches.
5. Do not connect earthing to the water pipe lines.

RESULT

Thus a study on the various types of accessories, tools used in house wiring and safety precautions for electrical engineering practice was performed.

CIRCUIT DIAGRAM



Exp.No:1
Date:

RESIDENTIAL HOUSE WIRING

AIM

To construct Residential House wiring using switches, fuse, indicator lamp and Energy Meter.

MATERIALS REQUIRED

Sl.No	Name of the apparatus	Range / Type	Quantity
1	Switch	SPST, 5A	2 Nos.
2	Incandescent Lamp	60W	2 No.
3	Lamp Holder	Batten	2No.
4	Screws	1inch	As per required
5	Wires	1/18SWG	As per required
6	Switch Board	12″″x 8″″	1No.
7	Main switch Box	1ph,300V , 16A	1No.

TOOLS REQUIRED

Sl.No	Name of the tools	Quantity
1	Combination Pliers	1 No.
2	Connector screw driver	1 No.
3	Screw driver	1 No.
4	Electrician knife	1 No.

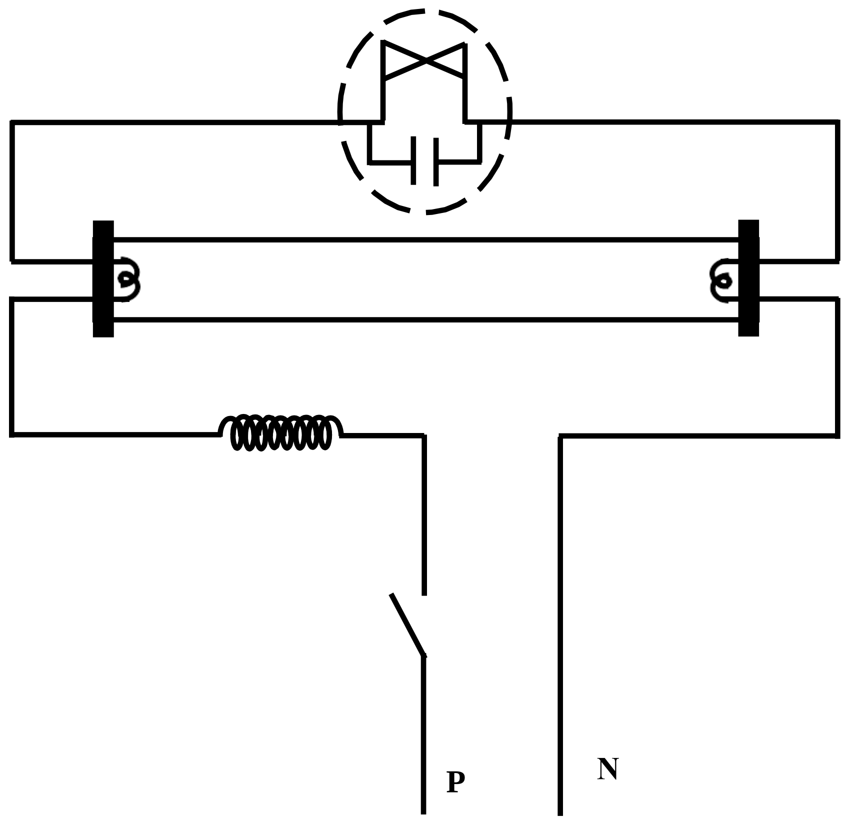
PROCEDURE

1. As per the circuit diagram, make the location points for energy meter, main switch box, switchboard, lamp and ceiling rose.
2. Draw the lines for wiring on the wooden board.
3. Place the wires along with the line and fix.
4. Fix the bulb holder, Switches, Ceiling rose, Socket in marked positions on the wooden board.
5. Connect the energy meter and main switch box in marked positions on the wooden board.
6. Give a supply to the wires circuit.
7. Test the working of light and socket.

RESULT

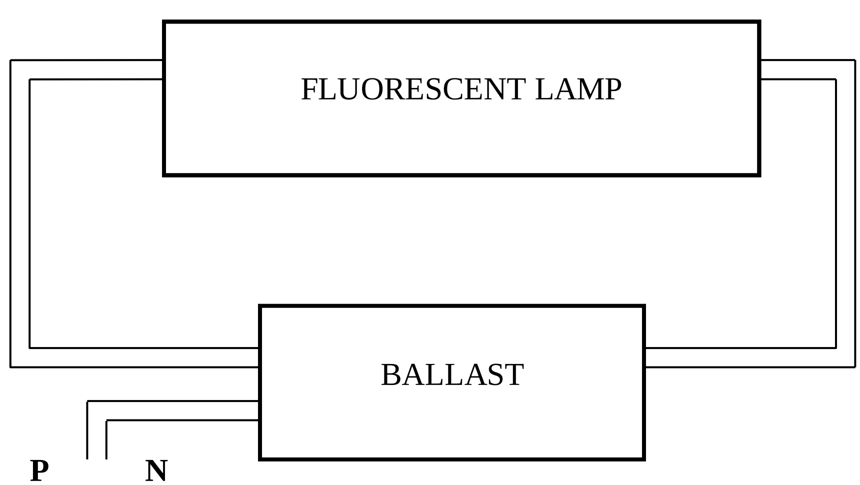
Thus the residential wiring is connected and tested.

CIRCUIT DIAGRAM WITH ELECTRICAL CHOKE



1Φ, AC Supply,230V,

CIRCUIT DIAGRAM WITH ELECTRONICS BALLAST



1Φ, AC Supply,230V, 50Hz

Exp.No:2

Date: **FLUORESCENT LAMP WIRING**

AIM

To make and check the fluorescent lamp wiring

MATERIALS REQUIRED

S.No.	Name of the apparatus	Range / Type	Quantity
1	fluorescent lamp fixture	4 ft	1 No.
2	fluorescent lamp	40W	1 No.
3	Choke	40W, 230V,	1 No.
4	Starter		1 No.
5	wires	1/18”	As per requirement

TOOLS REQUIRED

Sl.No	Name of the tools	Quantity
1	Combination Plier	1 No.
2	Connector screw drivers	1 No.
3	Screw driver	1 No.
4	Electrician knife	1 No.

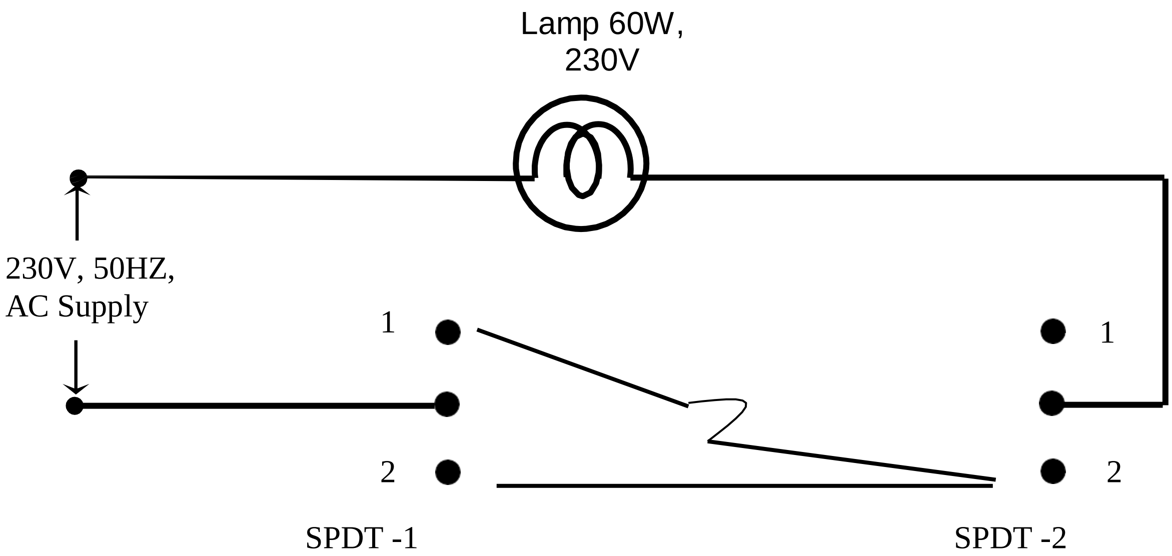
PROCEDURE

1. Give the connections as per the circuit diagram as shown in the circuit diagram
2. Fix the tube holder and the choke in the tube.
3. The phase wire is connected to the choke and neutral directly to the tube
4. Connect the starter in series with the tube.

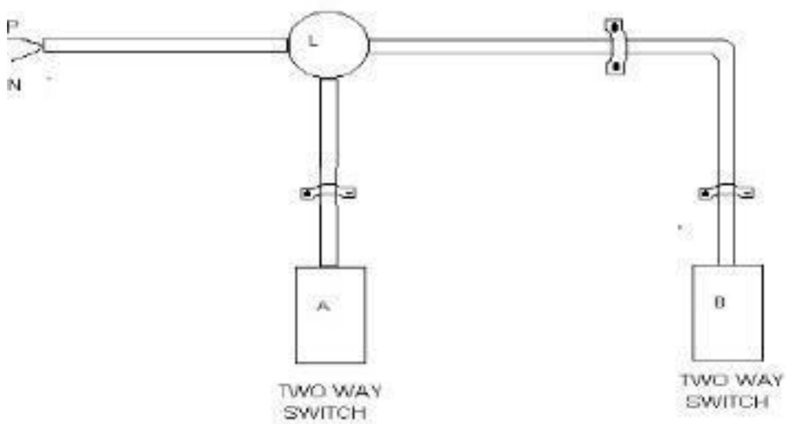
RESULT

Thus the fluorescent lamp wiring is connected and tested.

CIRCUIT DIAGRAM



Layout



SWITCH POSITION TABLE

Sl.No	SPDT1	SPDT2	Lamp
1	1	1	
2	1	2	
3	2	1	

4	2	2	

Exp.No: 3

Date: **STAIR CASE WIRING**

AIM

To control the status of the given lamp by using two – way switches.

MATERIALS REQUIRED

Sl.No	Name of the apparatus	Range / Type	Quantity
1	Incandescent Lamp	100W	1 No.
2	Lamp Holder	Pendent Type	1 No.
3	SPDT Switch	230V,5A	2 Nos
4	Wires	1/18"	As per requirement
5	P.V.C Pipe	1/4"	As per requirement
6	Wooden Board	-	1 No.
7	Round block	-	1 No.

TOOLS REQUIRED

Sl.No	Name of the tools	Quantity
1	Combination Plier	1 No
2	Connector screw drivers	1 No
3	Screw driver	1 No
4	Electrician knife	1 No

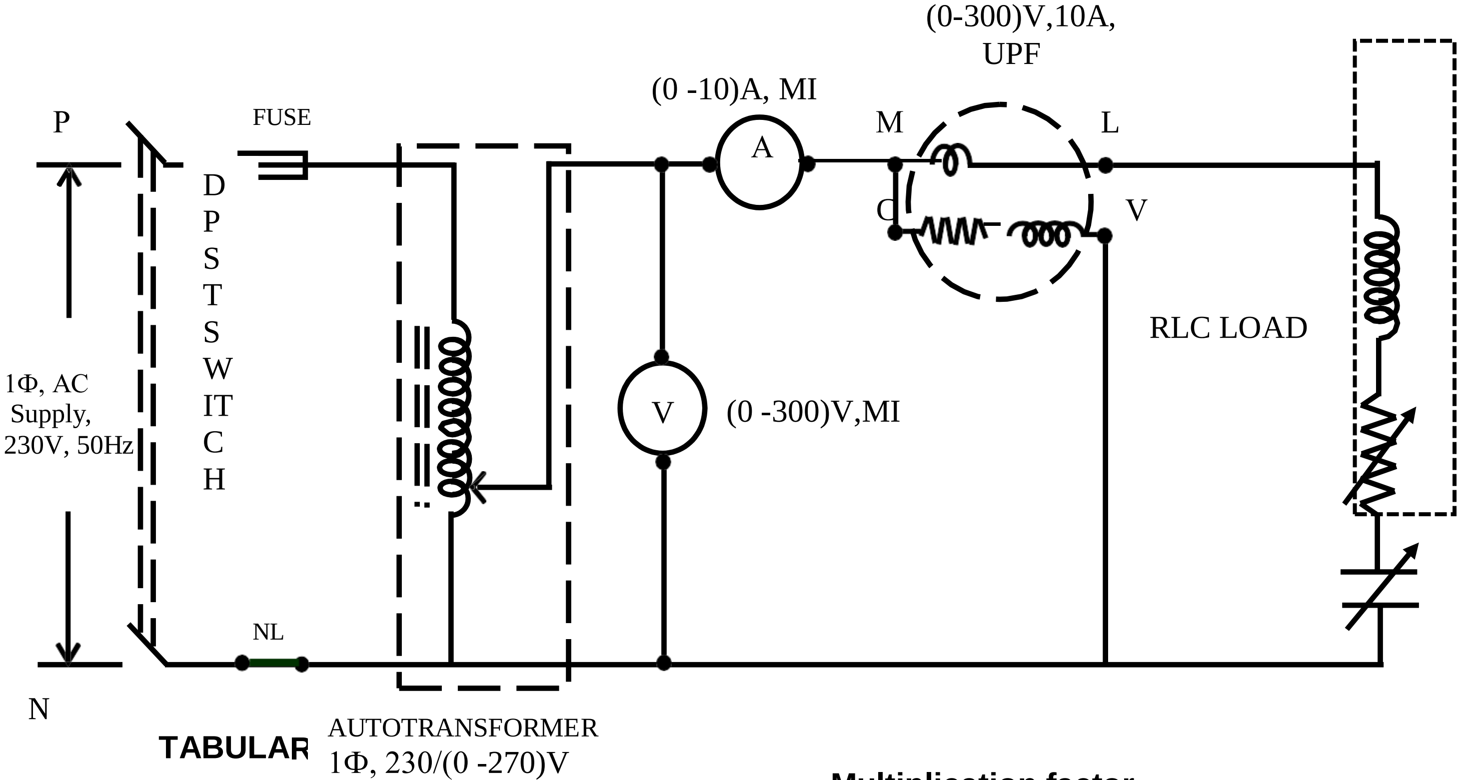
PROCEDURE

1. Place the accessories on the wiring board as per the circuit diagram.
2. Place the P.V.C pipe and insert two wires into the P.V.C pipe.
3. Take one wire connect one end to the phase side and other end to the middle point of SPDT switch 1
4. Upper point of SPDT switch 1 is connected to the lower point of SPDT switch2.
5. Lower point of SPDT 1 is connected to the upper point SPDT switch2.
6. Another wire taken through a P.V.C pipe and middle point of SPDT switch 2 is connected to one end of the lamp holder.
7. Another end of lamp holder is connected to neutral line.
8. Screw the accessories on the board and switch on the supply.
9. Circuit is tested for all possible combination of switch positions.

RESULT

Thus the staircase wiring is connected and tested.

CIRCUIT DIAGRAM



TABULAR

Multiplication factor

Sl.No	Voltage V (V)	Current I (A)	Wattmeter Reading (watts)		Actual Power W (watts)	Power Factor cos ϕ
			Observed	Actual		

FORMULAE

Actual power = W x Multiplication factor

Apparent power = VI watts

cos ϕ = Actual power / Apparent power

Exp.No: 4

Date: **MEASURMENT OF VOLTAGE, CURRENT, POWER AND POWER FACTOR USING RLC LOAD**

AIM

To measure voltage, current, power and power factor in RLC circuit.

APPARTUS REQUIRED

SL.No	Name of the Apparatus	Range / Type	Quantity
1	Voltmeter	(0-300V) MI	1 No.
2	Ammeter	(0-10A) MI	1 No.
3	Wattmeter	300V,10A,LPF	1 No.
4	RLC Load	5kW	1 No.
5	Connecting Wires	1/18 SWG	As per requirement

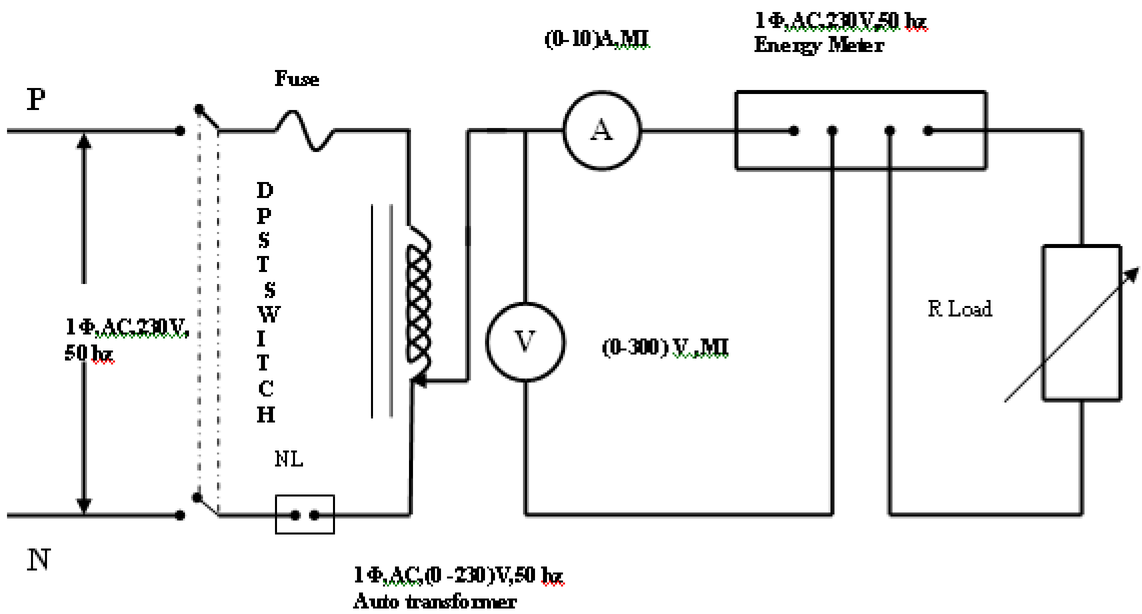
PROCEDURE

1. Connect the circuit as shown in the circuit diagram.
2. Initially no load is applied.
3. Autotransformer is set to minimum voltage position before switching on the power supply.
4. Set the rated voltage by using the autotransformer. Measure and record the values of voltmeter, ammeter and wattmeter on no load condition. Also carefully note the multiplication factor of the wattmeter that is mentioned in the wattmeter itself.
5. Apply the load by adjusting RLC load.
6. Measure and record the values of voltmeter, ammeter and wattmeter.
7. Repeat the steps 5 and 6 until the ammeter reading reaches 10A.
8. After taking all the readings, reduce the load slowly to the minimum and bring the voltage to minimum in the autotransformer. Switch off the power supply.
9. Calculated the Indicated power by the given formula.
10. Calculate the power factor by the given formula.

RESULT

Thus the voltage, current, power and power factor in RLC circuit are measured.

CIRCUIT DIAGRAM



TABULAR COLUMN

Sl. No.	Supply Voltage V	Load Current I (A)	Wattmeter Reading P (W)	Time t (sec)	True Energy p x t / 1000 x 3600 (kWh)	Measured energy n / 1200 (kWh)

FORMULAE

Energy meter specification = 1200 rev / kWh

True energy (ws) = Power (P) x time (s) = P x t

= P x t / 3600 x 1000 kWh

Measured energy = n / 1200 kWh

where n - number of revolutions/ sec

Exp.No: 5

Date: **MEASURMENT OF ENERGY USING SINGLE PHASE ENERGYMETER**

AIM

To measure the energy in a single in a phase circuit using direct loading

APPARTUS REQUIRED

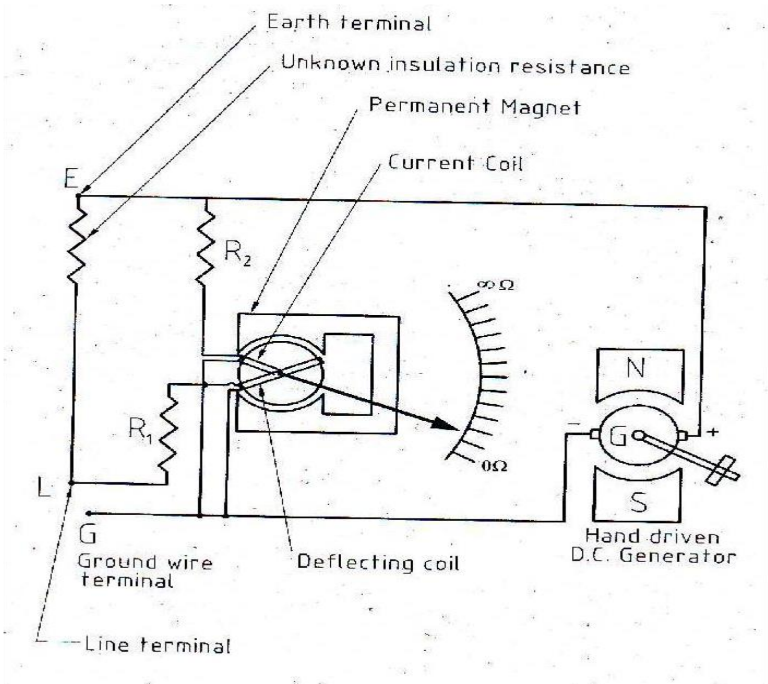
S.No.	Name of the Apparatus	Range / Type	Quantity
1	Single phase Energy meter	1200 rev / kWh, 240V, 50Hz	1No.
2	Wattmeter	300V, 10A, UPF	1No.
3	Voltmeter	300V, MI	1No.
4	Ammeter	10A, MI	1No.
5	Load	Resistive, 5kW	1No.
6	Wires	1 / 18 SWG	As per requirem

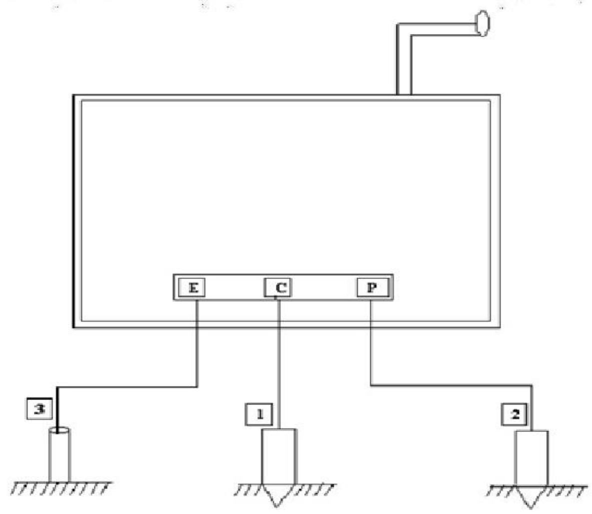
PROCEDURE

1. Connections are made as per the circuit diagram.
2. Supply is given to the switch by closing the DFST switch.
3. By adjusting the voltage is brought to the rated voltage.
4. Load is switched ON.
5. Time taken for five revolutions in the energy meter is noted and the corresponding ammeter and voltmeter reading are noted.
6. The above procedure is repeated for different load current and for fixed number of revolutions.
7. Then the load is gradually released and supply is switched OFF.

RESULT

Thus the energy in a single phase is measured using energy meter.





1. CURRENT ELECTRODE
2. POTENTIAL ELECTRODE
3. EARTH

TABULAR COLUMN:

S.No	Distance Between Electrode(Feet)	Resistance(Ohms)

Exp.No: 6

Date: **MEASURMENT OF RESISTANCE OF EARTH OF ELECTRICAL EQUIPMENT**

AIM

To measure the resistance to earth / insulation resistance of the order of mega ohms.

THEORY

For this experiment we have to use the Megger. Is is an instrument for testing the
insulation resistance of the order of mega ohms.

PRINCIPLE

A Megger consists of an emf source and a voltmeter. The voltmeter scale is
calibrated in ohms. In measurement, the emf of the self-contained source should be equal that of the source used in calibration. The deflection of the moving system depends on the ratio of the currents in the coils and is independent of the applied voltage. The value of unknown resistance can be found directly from the scale of the instrument. Figure shows detailed diagram of a Megger. It consists of a hand driven dc generator a emf about 500v.the permanent dc meter has two moving coils. First one is deflecting coil and another another one is controlling coil. The deflecting coil is connected to the generator through a resistor R2. The torque due to the two coils opposes each other. It consists of three terminals E (earth terminal) and L (line terminal) and G (guard wire terminal).

OPERATION

When the terminals are open circuited, no current flows through the deflecting coil. The torque to the controlling coil moves the pointer to one end of the scale. When the terminals are short circuited, the torque due to the controlling coil and the pointer is
deflected to the other end of the scale i.e. zero mark. In between the two extreme positions the scale is calibrated to indicate the value of unknown resistance directly.

The unknown insulation resistance is the combination of insulation volume resistance and surface leakage resistance. The guard wire terminal makes the surface leakage current to by pass the instrument hence only insulation resistance is measured.

RESULT

Thus the measured value of the resistance to earth / insulation resistance of the unknown material is = MΩ.

Notes

Exp.No.1

Exp.No.2

Exp.No.3

Exp.No.4

Exp.No.5

Exp.No.6

Exp No: 1 **A) STUDY OF ELECTRONICS COMPONENTS**
Date :

AIM

To study about the resistor and its types and to find the value of given resistor using color coding chart and study of different types of capacitors and Inductors.

TYPES OF ELECTRONIC COMPONENTS

ACTIVE COMPONENT

Definition:

Active components are those that require electrical power to operate. This could include the power supply, fans, storage device, transistors, diodes and other integrated circuits.

PASSIVE COMPONENTS

Definition:

A passive component is a module that does not require energy to operate, except for the available Alternating Current (AC) circuit that it is connected to. A passive module is not capable of power gain and is not a source of energy. A typical passive component would be a chassis, inductor, resistor, transformer, or capacitor.

Types of active and passive components

Sl.No	Active Components	Passive Components
1	Transistors	Resistor
2	Op-Amps	Capacitor
3	Diodes	Inductor

PASSIVE COMPONENTS

RESISTORS

Resistors are the most common components in electronic circuits. Its main function is to reduce the high current to the desired value and also to provide desired voltage in the circuit. The resistors are manufactured to have a specific value in ohm. The physical size of resistor determines how much power can be dissipated in the form of heat. However there is co-relation between resistor physical sizes and its resistance value. They are manufactured in variety of standard values and power settings.

There are two types of resistors:

- Fixed resistor
- Variable resistor

Fixed resistor has a resistance value that does not change where as a variable resistor having variable resistance range with 4 lines or color code. They indicate the resistance value in ohms out on a larger resistor; the resistance value is printed on the body of the resistor.

The important feature of resistor is that its effect is same for both AC and DC circuits.

TYPES OF RESISTORS

- Wire wand resistors
- Carbon Composition resistors
- Film resistors
- Surface mount resistors
- Fusible resistors

RESISTOR COLOUR CODING

COLOUR	VALUE
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

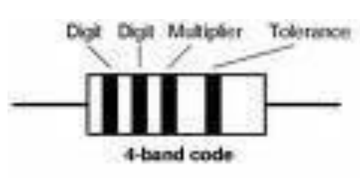
The color coding is standardized by Electronics Industries Association (EIA).

RESISTOR COLOUR STRIPS

The use of band on strips is a common system for color coding carbon resistors, color strips are printed at one end of the insulating body which is usually band reading from left to right. The first band gives the first digit of the numeric value of R. The second band gives the second digit. The third band gives the decimal multiples of the color, which gives the number of zeros after the second digit. Thr unit of resistance is ohm and it is denoted as Ω.

For example, if the first band is red with value 2, the next band with green of value 5, and the third band with red of value 2, which means that the value of the resistor,

$$R=25*10^2= 2500\Omega$$



The second strip is either gold or silver indicating a fractional decimal multiplier. When the strip is gold, multiply the value by 0.05.If the strip is silver, multiply the value by 0.1.

Gold and silver columns are used most often in fourth strip to indicate how the value of R is determined using the resistance tolerance.

RESISTANCE TOLERANCE

The amount by which the actual resistance can be different from colour coded value. This tolerance is given in percentage.

For example, a 2000Ω resistor with ±10% tolerance can be a resistance 10% above or below the coded value. The resistance ranges between 1800Ω to 2200Ω.
The tolerance for gold is 5% and the tolerance for silver is 10%.

CAPACITOR

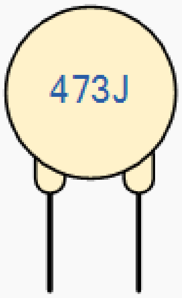
A capacitor is a passive two terminal component which stores electric charge. This component consists of two conductors which are separated by a dielectric medium. The potential difference when applied across the conductors polarizes the dipole ions to store the charge in the dielectric medium. The unit of capacitance is Farad and it is denoted as F. The circuit symbol of a capacitor is shown below:

Symbolic representation

Disc capacitor

Polarity representation

Consider the capacitor below:



The capacitor on the left is of a ceramic disc type capacitor that has the code 473J printed onto its body. Then the 4 = 1st digit, the 7 = 2nd digit,

the 3 is the multiplier in pico-Farads, pF and the letter J is the tolerance and this translates to:

47pF * 1,000 (3 zero's) = 47,000 pF , 47nF or 0.047 uF

the J indicates a tolerance of +/- 5%

The capacitance or the potential storage by the capacitor is measured in Farads which is symbolized as ‘F’. One Farad is the capacitance when one coulomb of electric charge is stored in the conductor on the application of one volt potential difference.

The charge stored in a capacitor is given by

$$\mathbf{Q = CV}$$

Where Q - charge stored by the capacitor

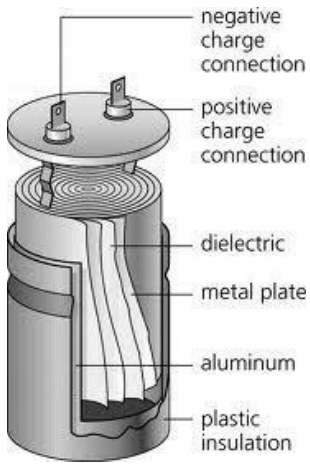
C - Capacitance value of the capacitor

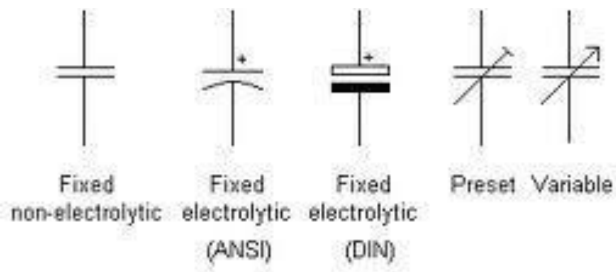
V - Voltage applied across the capacitor

TYPES OF CAPACITORS

- Ceramic capacitor
- Electrolytic capacitor
- Tantalum capacitor
- Silver Mica Capacitor
- Polystyrene Film Capacitor
- Polyester Film Capacitor

- Metalized Polyester Film Capacitor
- Polycarbonate capacitor
- Polypropylene Capacitor
- Glass capacitors





Design of capacitor

Symbolic representations

INDUCTOR

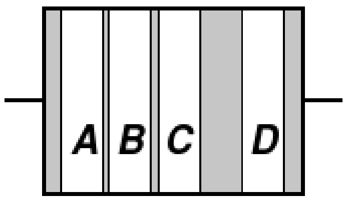
An inductor (also choke, coil or reactor) is a passive two-terminal electrical component that stores energy in its magnetic field. For comparison, a capacitor stores energy in an electric field, and a resistor does not store energy but rather dissipates energy as heat. The unit of inductance is Henry and it is denoted as H.

Any conductor has inductance. An inductor is typically made of a wire or other conductor wound into a coil, to increase the magnetic field.

When the current flowing through an inductor changes, creating a time-varying magnetic field inside the coil, a voltage is induced according to Faraday's law of electromagnetic induction, which by Lenz's law opposes the change in current that created it. Inductors are one of the basic components used in electronics where current and voltage change with time, due to the ability of inductors to delay and reshape alternating currents.

Color Code Markings

Inductors can be marked by colored bands or colored dots. Each color represents a value.



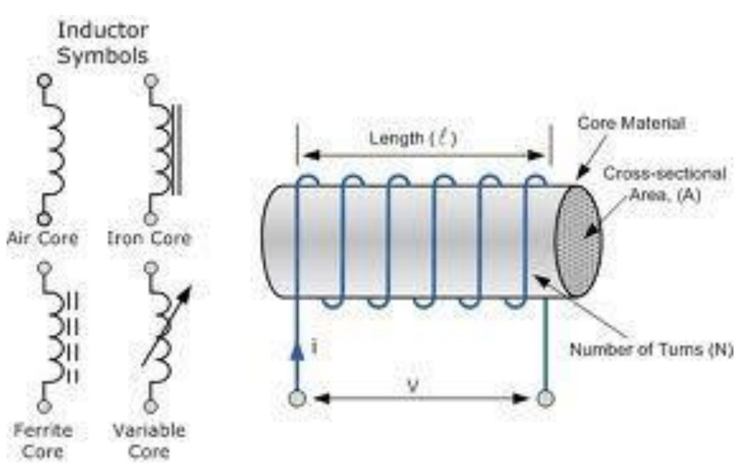
Band A	Band B	Band C	Band D
1st Digit	**2nd Digit**	**Multiplier**	**Tolerance**
		Silver 10^{-2} (0.01 µH)	Gold 5%
		Gold 10^{-1} (0.1 µH)	Silver 10%
	Black 0	Black 10^{0} (1 µH)	Black 20%
Brown 1	Brown 1	Brown 10^{1} (1 µH)	
Red 2	Red 2	Red 10^{2} (100 µH)	
Orange 3	Orange 3	Orange 10^{3} (1000µH)	
Yellow 4	Yellow 4	Yellow 10^{4} (10000 µH)	
Green 5	Green 5		
Blue 6	Blue 6		
Violet 7	Violet 7		
Gray 8	Gray 8		
White 9	White 9		

Example

- Band colors:
  - 1st band: yellow=4
  - 2nd band: violet=7
  - 3rd band: black=10^0=1
- Inductor value = 47x10^0 µH = 47 µH
  - 3rd band: silver = 10% tolerance
  - inductance=47+-10

TYPES OF INDUCTORS

- Air core inductor
- Radio frequency inductor
- Ferromagnetic core inductor
- Laminated core inductor
- Ferrite-core inductor
- Toroidal core inductor
- Variable inductor



Design and Symbolic representation

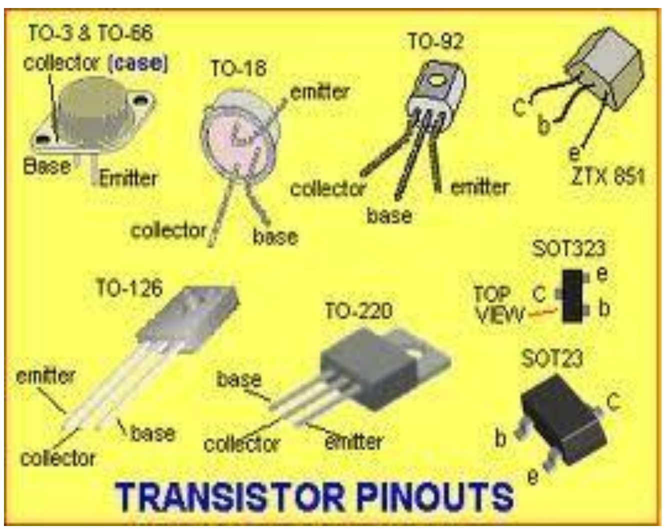
ACTIVE COMPONENTS

TRANSISTORS

A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals.

TYPES OF TRANSISTORS

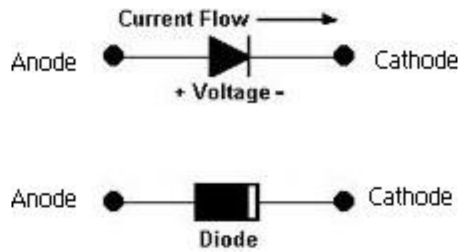
1. Bipolar Junction Transistor
2. Field Effect Transistor



Types of transistors

DIODES

An electronic device with two active terminals, an anode and a cathode, through which current passes more easily in one direction (from anode to cathode) than in the reverse direction. Diodes have many uses, including conversion of AC power to DC power, and the decoding of audio-frequency signals from radio signals.



Pictorial Representation

TYPES OF DIODES

1. PN Junction Diode
2. PIN Diode
3. Zener Diode
4. Tunnel Diode

RESULT:

The value of given

Resistors =

Capacitors =

EXP No: 1 **B (i) STUDY OF CRO**
Date :

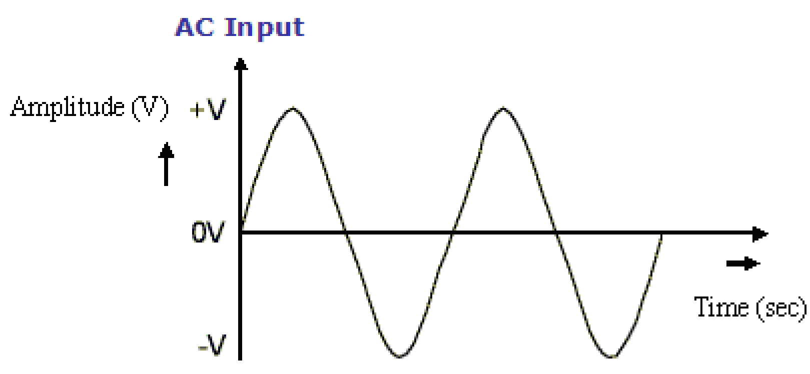
AIM:

To measure AC signal parameter and RMS period using Cathode Ray Oscilloscope (CRO).

SINE WAVE (AC SIGNAL)

The voltage wave form shown in the diagram is called as sine wave or sinusoidal wave or sinusoid because the amount of included voltage is proportional to the sine of the angle of the rotation in a circular motion producing the voltage. The sine is a trigonometric function of an angle and it is equal to the ratio of opposite side to the hypotenuse in a right triangle. The numerical rotation increases from zero for 0^0 to a maximum value of one for 90^0, as the sides opposite the angle becomes larger.

The alternating sine wave of voltage or current has many instantaneous changes throughout the cycle, it is convenient to define specific magnitude for comparing one wave with the other. The peak value, the average values are the above said values which can be used either for current or voltage.



Sinewave signal

TABULATION:

Amplitude Peak to peak Value (in volts)	Time period (in sec)	

Vrms =

F=1/Time Period =

PEAK VALUE

Peak value is the maximum value in Voltage (V_m) or Current (I_m). For example, Sine wave having a peak of 170 volts, states that the highest value the sine wave can reach. All other values during the cycle follow the sine wave and the peak value applies to either the positive peak value or the negative peak value.

Peak to peak value is the addition of both the peak values. For example, 170+170=340 volts is the peak to peak value for a symmetrical wave.

AVERAGE VALUE

This is an arithmetic average of all the values in a sine wave for one alternative or half cycle. The half cycle is used for the average because, over a full cycle, the average value is zero. The peak value of the sine function is 1 and the average equals 0.637.

Average value=0.637* Peak value

EFFECTIVE VALUE

This value is also called as the Root Mean Square (Rms) value. The method of showing the amount of sine wave of voltage or current is by relating it to the voltage or current that will produce the same heating effect called Root Mean Square value.

V_{rms}=0.707*Peak value

I_{rms}=0.707*Peak value

FREQUENCY

The number of cycles per second is called the frequency (Unit= Hertz). For a given frequency of 1 Hz, if the loop set through 60 complete revolution or cycles during 1 second, the frequency generated voltage is 60 cycles per second. The diagram shows only one cycle of sine wave form instead of 60 cycles because the time interval is 1/ 60 seconds For higher frequencies, more number of cycles per second can be seen.

One complete cycle is measured between the two successive points that have the same value and direction. The amplitude has no relation to frequency.

$$F=1/T \quad \text{(in hz)}$$

For a frequency of 100Hz, the time period is 0.01 second.

RESULT:

The following ac parameter of the sine wave was measured.

1) Peak to peak Value =
2) Time period =
3) Frequency=
4) Vrms =

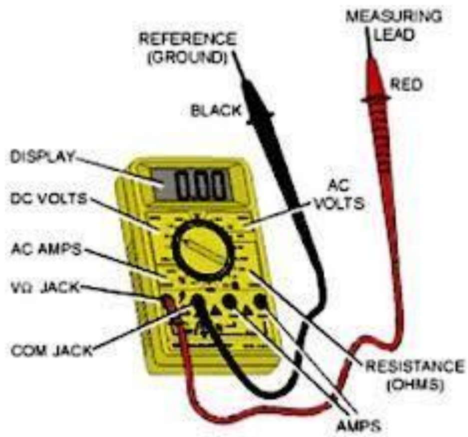
EXP No : 1 **B (ii) STUDY OF MULTIMETER**
Date :

AIM

To measure the voltage and current of a given component by using Multimeter.

MULTIMETER

A multimeter is used to make various electrical measurements, such as AC and DC voltage, AC and DC current, and resistance. It is called a multimeter because it combines the functions of a voltmeter, ammeter, and ohmmeter. Multimeters may also have other functions, such as diode and continuity tests.



Multimeter

TABULATION

Voltage	Current

V=IR

I=V/R

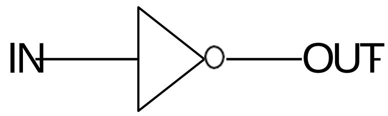
SAFETY INFORMATION

1. Be sure the test leads and rotary switch are in the correct position for the desired measurement.
2. Never use the meter if the meter or the test leads look damaged.
3. Never measure resistance in a circuit when power is applied.
4. Never touch the probes to a voltage source when a test lead is plugged into the 10 A or 300 mA input jack.
5. To avoid damage or injury, never use the meter on circuits that exceed 4800 watts.
6. Never apply more than the rated voltage between any input jack and earth ground (600 V for the Fluke73).
7. Be careful when working with voltages above 60 V DC or 30 V AC rms. Such voltages pose a shock hazard.
8. Keep your fingers behind the finger guards on the test probes when making measurements.
9. To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.

RESULT:

The voltage and current in a circuit is tabulated.

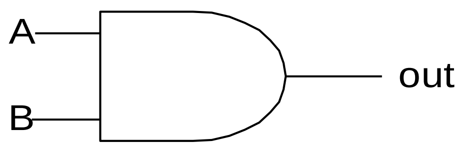
NOT gate (7404)



TRUTH TABLE

IN	OUT
1	
0	

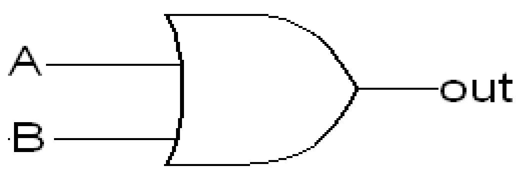
AND gate (7408)



TRUTH TABLE

A	B	OUT
0	0	
0	1	
1	0	
1	1	

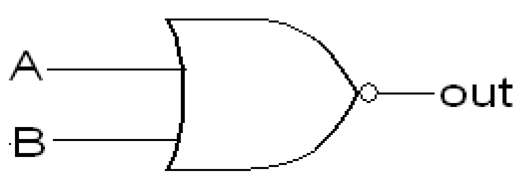
OR gate (7432)



TRUTH TABLE

A	B	OUT
0	0	
0	1	
1	0	
1	1	

NOR gate (7402)



TRUTH TABLE

A	B	OUT
0	0	
0	1	
1	0	
1	1	

Exp No : 2 VERIFICATION OF LOGIC GATES

Date :

AIM

The purpose of this experiment is to get familiar with the elementary Logic gates and to know the use of them for implementing logic circuits.

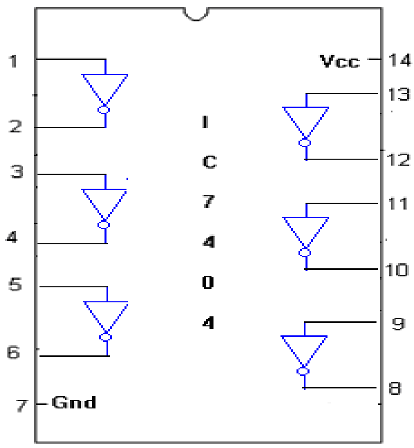
COMPONENTS REQUIRED

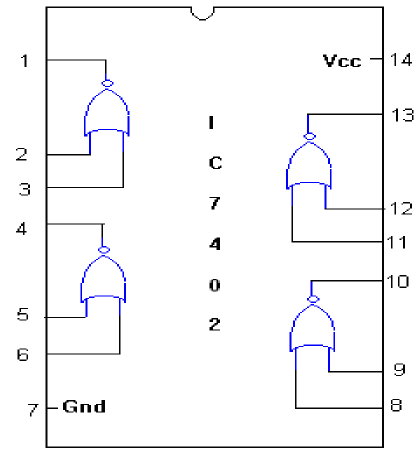
S. No.	COMPONENTS	SPECIFICATION	QTY
1.	AND GATE	IC 7408	1
2.	OR GATE	IC 7432	1
3.	NOT GATE	IC 7404	1
4.	NOR GATE 2 I/P	IC 7402	1
5.	IC TRAINER KIT	-	1
6.	PATCH CORD	-	14

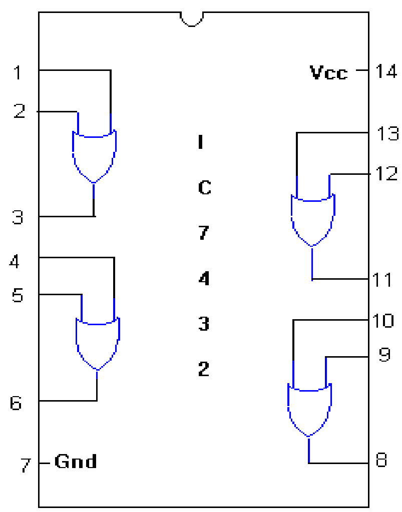
THEORY

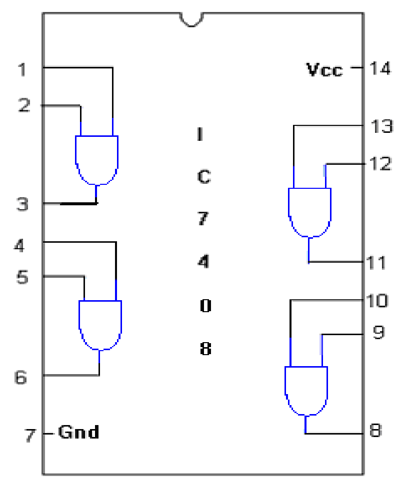
Digital electronics is found in everything from computers to CD players and watches. It is based on the binary number system. Instead of voltages which vary continuously, as in analog electronics, digital circuits involve voltages which take one of only two possible values. In our case these are 0 and 5 volts (TTL logic), but they are often referred to as LOW and HIGH, or FALSE and TRUE, or as the binary digits 0 and 1.The basic building blocks of digital electronics are logic gates which perform simple binary logic functions (AND, OR, NOT, etc.). From these devices, one can construct more complex circuits to do arithmetic, act as memory elements, and so on. In this lab, you will look at a few basic devices to see what they can do. Logic gates and other digital components come in the form of integrated circuits (ICs) which consist of small semiconductor \chips packaged in a ceramic or plastic case with many pins. The ICs are labeled by numbers like 74LSxx, where xx is a number identifying the type of device.

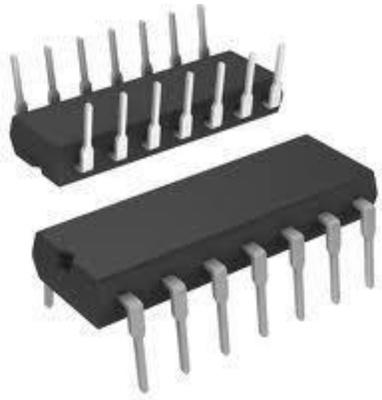
PIN DIAGRAM of IC`s











Picture Representation of an IC

LOGIC GATES

NOT GATE (IC 7404)

In digital logic, an inverter or NOT gate is a logic gate which implements logical negation. The 7404 chip contains six inverters. An inverter simply converts binary 1 to 0 and vice versa.

AND GATE (IC 7408)

The AND gate is a digital logic gate that implements logical conjunction - it behaves according to the truth table to the right. A HIGH output (1) results only if both the inputs to the AND gate are HIGH (1). If neither or only one input to the AND gate is HIGH, a LOW output results. In another sense, the function of AND effectively finds the minimum between two binary digits, just as the OR function finds the maximum.

OR GATE (IC 7432)

The OR gate is a digital logic gate that implements logical disjunction - it behaves according to the truth table to the right. A HIGH output (1) results if one or both the inputs to the gate are HIGH (1). If neither input is HIGH, a LOW output (0) results. In another sense, the function of OR effectively finds the maximum between two binary digits, just as the complementary AND function finds the minimum.

NOR GATE (IC 7402)

The NOR gate is a digital logic gate that implements logical NOR - it behaves according to the truth table to the right. A HIGH output (1) results if both the inputs to the gate are LOW (0). If one or both input is HIGH (1), a LOW output (0) results. NOR is the result of the negation of the OR operator.

PROCEDURE

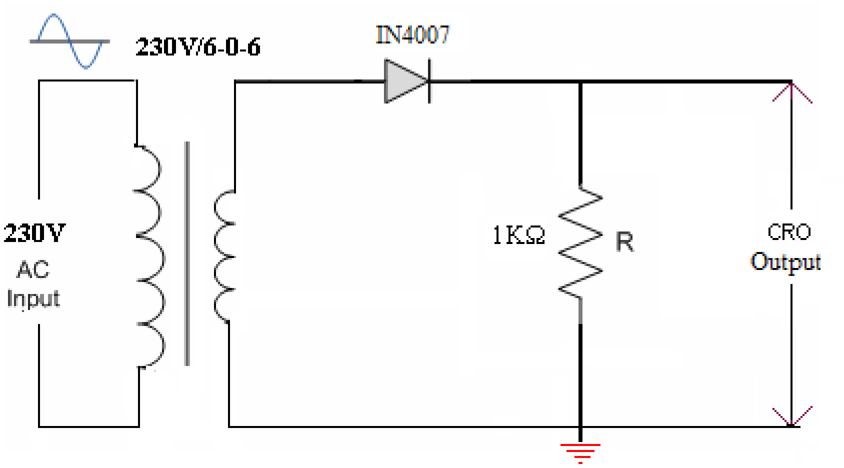
1. Insert a 7404 chip into the breadboard and connect pin 7 to ground and pin 14 to 5V. (Make sure that all of the pins are properly seated in the sockets rather than bent underneath.)
2. Connect one input to a switch, so you can easily set it to 1 or 0.
3. Connect the corresponding output to a LED indicators provided.
4. Verify the truthtable of NOT GATE.
5. Repeat the above procedure for the others gates.

RESULT:

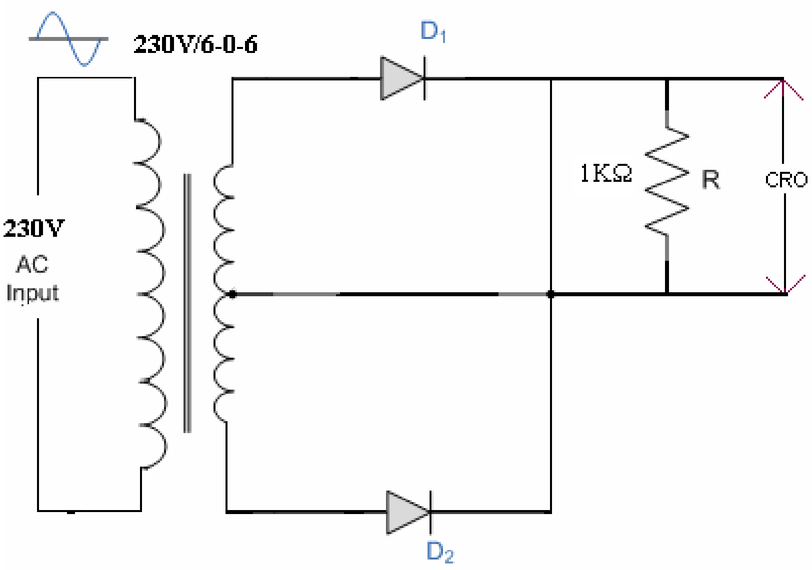
Thus different types of logic gates were studied and its truth table was verified.

CIRCUIT DIAGRAM

Half wave Rectifier



Full wave Rectifier



Ex.No : 3
Date :

MEASUREMENT OF RIPPLE FACTOR FOR HALF WAVE AND FULL WAVERECTIFIER

AIM

To study the characteristics of a half wave and full wave rectifier and to obtain the ripple factor for the same.

COMPONENTS REQUIRED

S.No.	Components	Range	Quantity
1.	Transformer	230 V / 6-0-(-6)	1
2.	Diode	IN4007	2
3.	Resistor	1 kΩ	1
4.	CRO	30 MHz	1
5.	Bread Board		1

THEORY

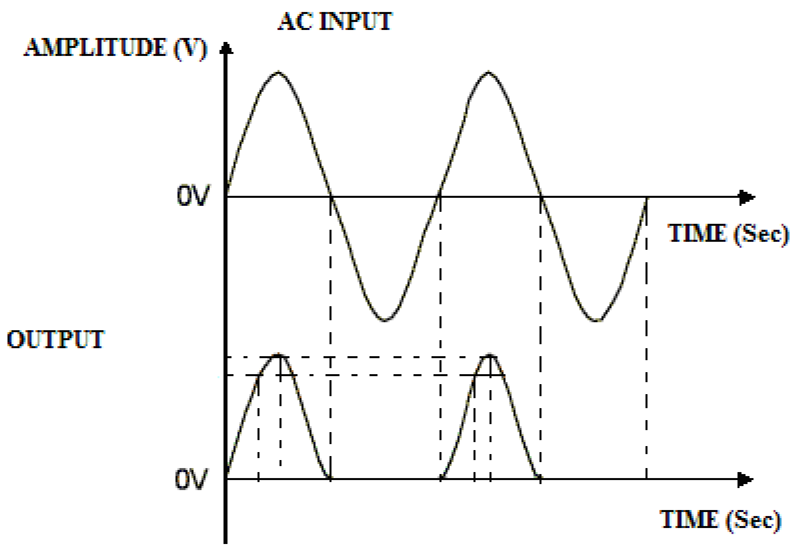
Rectifier is an electronic device that converts an alternating current to a direct current by suppression or inversion of alternate half cycles. Rectifiers are most often made of a combination of diodes, which allow current to pass in one direction only.

Half wave Rectifier

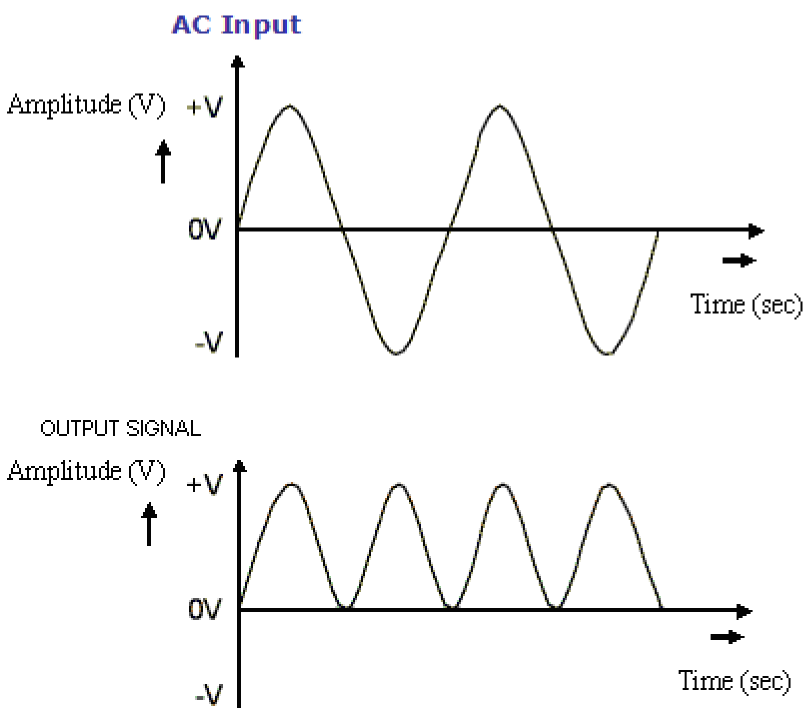
In half wave rectification, the rectifier conducts current only during the positive half cycle of input AC supply. The negative half cycles of AC supply are suppressed no voltage appears across the load. Therefore the current always flows in one direction through the load through every half cycle.

MODEL GRAPH

Half wave Rectifier



Full wave Rectifier



Full wave Rectifier

A full-wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output by reversing the negative (or positive) portions of the alternating current waveform. The positive (or negative) portions thus combine with the reversed negative (or positive) portions to produce an entirely positive (or negative) voltage/current waveform. For single-phase AC, if the transformer is center- tapped, then two diodes back-to-back (i.e. anodes-to-anode or cathode-to-cathode) form a full-wave rectifier.

Full-wave rectification converts both polarities of the input waveform to DC (direct current), and is more efficient. However, in a circuit with a non-center tapped transformer, four diodes are required instead of the one needed for half-wave rectification. This is due to each output polarity requiring two rectifiers each, for example, one for when AC terminal 'X' is positive and one for when AC terminal 'Y' is positive.

Ripple Factor

The output voltage (or load current) of a rectifier consist of two components namely DC component and AC component. The AC component present in the output is called a ripple. Smaller the ripple more effective will be the rectified.

Voltage Regulation

Domestic, commercial and industrial loads demand a nearly constant voltage supply. It is therefore, essential that the output voltage of a transformer stays within narrow limits as load and its power factor vary. The leaky reactance is the chief cause of voltage drop in a transformer and must be kept as low as possible by design and manufacturing techniques.

TABULATION

HWR

V_m (in volts)	Vrms (in volts)	V_{dc} (in volts)	Ripple factor(γ)

FWR

V_m (in volts)	Vrms (in volts)	V_{dc} (in volts)	Ripple factor(γ)

FORMULA USED:

Half wave Rectifier

$$\text{Ripple factor, } \gamma = \sqrt{\left(\frac{Vrms}{Vdc}\right)^2 - 1} \quad \text{(no unit)}$$

where, Vrms=Vm/2 (in volts)

Vdc=Vm/∏ (in volts)

Vm is the peak voltage

Full wave Rectifier

$$\text{Ripple factor, } \gamma = \sqrt{\left(\frac{Vrms}{Vdc}\right)^2 - 1} \quad \text{(no unit)}$$

where, Vrms=Vm/√2 (in volts)

Vdc=2Vm/∏ (in volts)

Vm is the peak voltage

PROCEDURE

1. Connections are given as per the circuit diagram (Half Wave Rectifier) .
2. Note the amplitude and time period of rectified output.
3. Measure Vdc and Vrms.
4. Calculate the ripple factor.
5. Draw the graph for voltage versus time.
6. Repeat the same procedure for Full Wave Rectifier.

RESULT

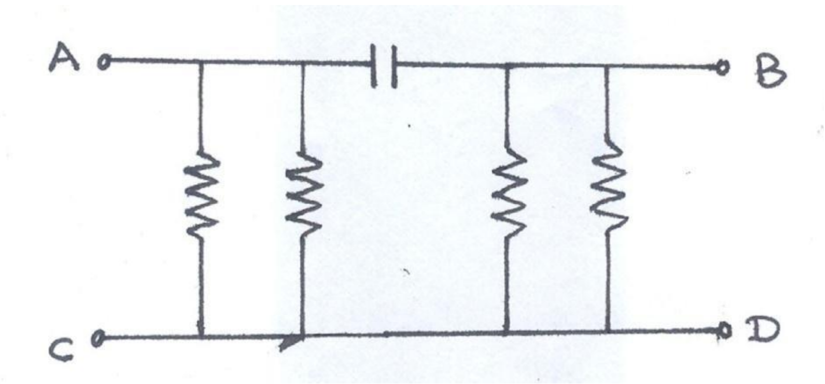
Thus the characteristics of a half wave and full wave rectifier was studied and also the ripple factor was calculated for the same.

Ripple factor for Half Wave Rectifier =

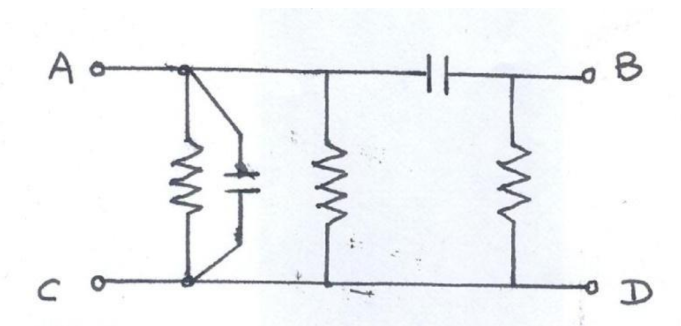
Ripple factor for Full Wave Rectifier =

DRAWING

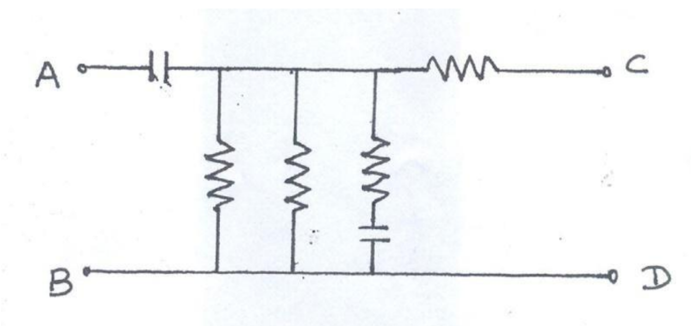
Given Circuit 1



Circuit 2



Circuit 3



Exp No : 4 **SOLDERING AND DESOLDERING PRACTICE**
Date :

AIM

To practice soldering and desoldering for the electronic circuit by assembling and disassembling the resistor R_1 and R_2 and capacitor C_1 in the given Printed Circuit Board (PCB).

COMPONENT REQUIRED

S.No	Component	Range	Quantity
1	PCB board for given circuit	10w(or)35w	1
2	Soldering iron	60/40 grade	1
3	Solder		1
4	Flux		1
5	Electrician's Knife		1
6	Nose plier		1
7	Resistors	10kΩ	4
8	Capacitor	0.01µF	2

PROCEDURE

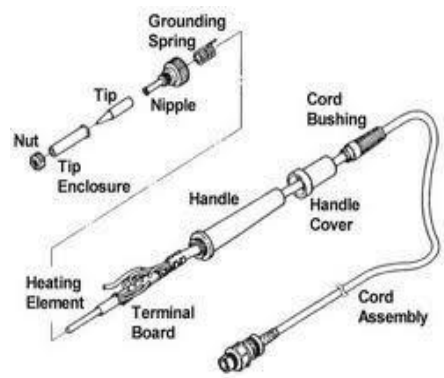
Soldering

1. Study the given electronic circuit.
2. Clean the given PCB board.
3. Clean the tip of the soldering iron before heating and also the resistor, capacitor which are to be soldered.
4. Heat the soldering iron and apply solder to the tip as soon as it is hot to melt on it.
5. Bend the resistor (R_1) leads to fit into the holes on the board. Insert the resistor, R_1 as per the circuit shown in the figure and bend the leads.
6. Apply the hot tips to the joints and apply the solder.
7. Remove the soldering tip and hold the resistor tightly until the solder has cooled and set.
8. Trim excess component lead with side cutter.
9. Repeat the above steps to fix the resistor R_2 and capacitor, C_1 as shown.

De-soldering

1. Hold the resistor R_1 to be unsoldered by the nose plier.
2. Place the tip of the soldering iron on the joint until the solder is melt.
3. When the solder is melted, remove the resistor R_1 a tweezen and trash away the molten solder.
4. Repeat the above steps to remove resistor R_2 and capacitor C_1.
5. Clean the resistors and capacitors, so that they can be used to make other circuits.

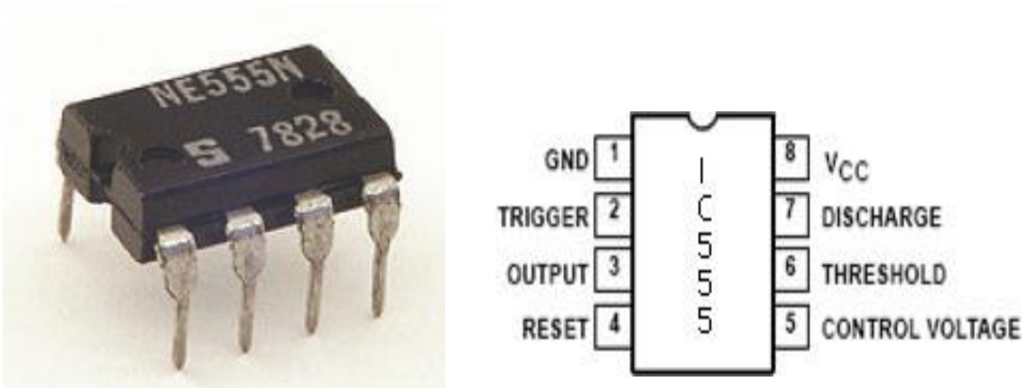
Soldering way



Solder gun

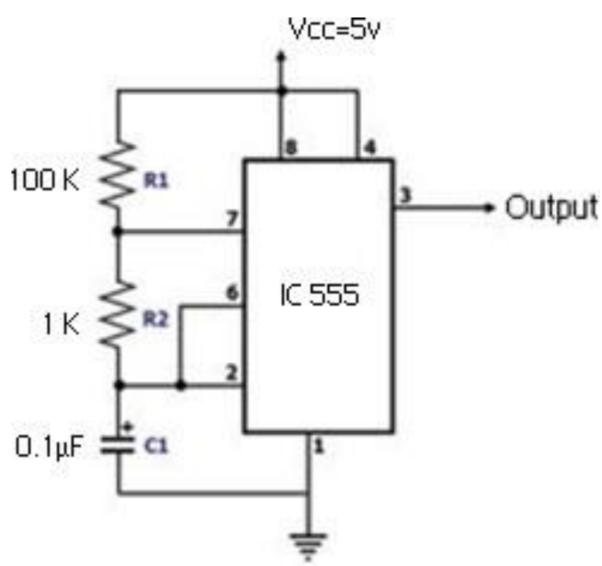
RESULT

Thus the soldering and de-soldering practice was done for the given electronic circuit.



Schematic representation and Pin configuration

CIRCUIT DIAGRAM



Exp No : 5 GENERATION OF CLOCK SIGNAL

Date :

AIM

To generate the clock signal of square waveform using IC 555 timer and to calculate the frequency of the given circuit.

COMPONENTS REQUIRED

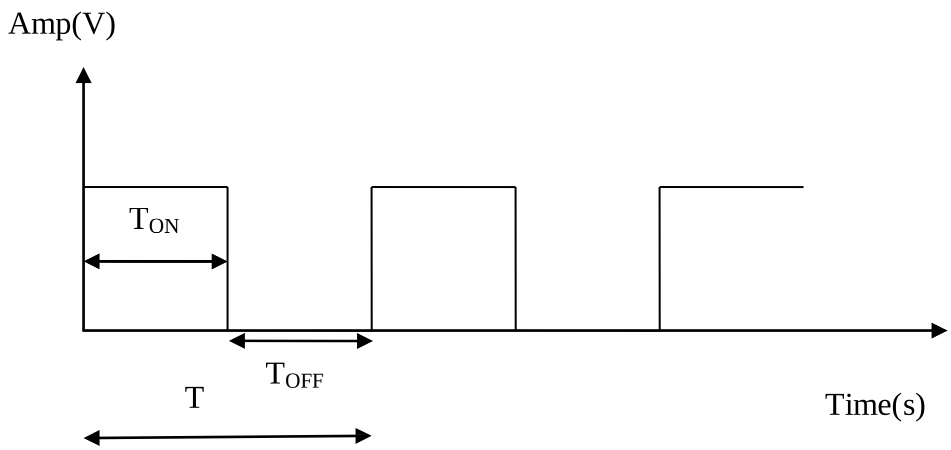
S.No	Components	Range	Quantity
1	Digital IC Trainer kit	-	2
2	CRO	30Mhz	1
3	Connecting wires	-	As required

THEORY

The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package.

The 555 operation is very simple. It uses a capacitor and one or two resistors to generate the pulses in 4 steps. To describe those steps, first you should take a closer look to the following drawing, demonstrating the 555 exposed and the minimum external parts required so that the 555 will generate pulses. Those pulses are generated on the pin number 3 (right side of the drawing). The three basic parts needed are connected on the left side of the 555 drawing. Those parts are the R1, the R2 and the capacitor C, and they define the so called 'RC network.

MODEL GRAPH



TABULATION

Amplitude (in volts)	Time period (in sec)	
	Ton	Toff

FORMULA USED

$T = T_{ON} + T_{OFF}$

$$f = \frac{1}{T}$$

where T = Time period

T_{ON} = ON Time

T_{OFF} = OFF Time

f = frequency

PROCEDURE

1. Connections are made as per the circuit diagram.
2. Switch ON the power supply
3. Note down amplitude and time period of output waveform.
4. Calculate the frequency of the given circuit using the formula.
5. Plot the graph.

RESULT

Thus the clock signal of square waveform was generated using IC 555 Timer and the frequency of the given circuit was found to be

frequency =