ST. ANNE'S COLLEGE OF ENGINEERING AND TECHNOLOGY

ANGUCHETTYPALAYAM, PANRUTI- 607 106

DEPARTMENT OF ELECTRONICS
&
COMMUNICATION ENGINEERING

Lab Manual

GE8261: ENGINEERING PRACTICES LABORATORY

(ELECTRONICS ENGINEERING PRACTICE)

LABORATORY PRACTICE

SAFETY RULES

1. SAFETY is of paramount importance in the Laboratories.

2. Electricity NEVER EXECUSES careless persons. So, exercise enough care and attention in handling electrical & electronic equipment and follow safety practices in the laboratory. (Electricity is a good servant but a bad master).

3. Avoid direct contact with any voltage source and power line voltages. (Otherwise, any such contact may subject you to electrical shock)

4. Wear rubber-soled shoes. (To insulate you from earth so that even if you accidentally contact a live point, current will not flow through your body to earth and hence you will be protected from electrical shock).

5. Wear laboratory-coat and avoid loose clothing. (Loose clothing may get caught on an equipment/instrument and this may lead to an accident particularly if the equipment happens to be a rotating machine)

6. Girl students should have their hair tucked under their coat or have it in a knot.

7. Do not wear any metallic rings, bangles, bracelets, wristwatches and neck chains. (When you move your hand/body, such conducting items may create a short circuit or may touch a live point and thereby subject you to electrical shock)

8. Be certain that your hands are dry and that you are not standing on wet floor. (Wet parts of the body reduce the contact resistance thereby increasing the severity of the shock)

9. Ensure that the power is OFF before you start connecting up the circuit.(Otherwise you will be touching the live parts in the circuit)

10. Get your circuit diagram approved by the staff member and connect up the circuit strictly as per the approved circuit diagram.

11. Check power chords for any sign of damage and be certain that the chords use safety plugs and do not defeat the safety feature of these plugs by using ungrounded plugs.

12. When using connection leads, check for any insulation damage in the leads and avoid such defective leads.

13. Switch on the power to your circuit and equipment only after getting them checked up and approved by the staff member.

14. Do not make any change in the connection without the approval of the staff member.

15. In case you notice any abnormal condition in your circuit (like insulation heating up, resistor heating up etc.), switch off the power to your circuit immediately and inform the staff member.

16. Keep hot soldering iron in the holder when not in use.

17. After completing the experiment show your readings to the staff member and switch off the power to your circuit after getting approval from the staff member.

18. Some students have been found to damage meters by mishandling in the following ways:

   i. Keeping unnecessary material like books, lab records, unused meters etc. causing meters to fall down the table.
   ii. Putting pressure on the meter (specially glass) while making connections or while talking or listening somebody.

1. The students will be split in batches. After splitting the batches they should do the experiments only with their batch members till the end of semester unless there is a change made by the staff. They should not mingle with other batch mates unless the staff asks them to do so.
2. Manual is only for the reference purpose. The experiments reading should be noted down only in the observation notebook.

3. The students should maintain an observation note book separately which should be brought to every lab class without fail. No students will be allowed to enter the lab class without observation note book and record note book.
4. The experiments will be splitted up as Cycle-I & Cycle-II. The students must write well in advance all the experiments of that particular cycle of which they are going to begin.
5. The students must come to lab class by preparing for the particular experiment they do for that day and the experiment should well be written in the observation before they come to the lab class.
6. Each experiment will be awarded an assessment marks. Total of 10 marks will be assigned as assessment mark for each experiment out of which 5 marks will be awarded based on the number of days of which the students gets their experiment corrected in the observation notebook. The mark will be awarded as follows:

   Getting signed on the day of experiment - 5 Marks

   1 day from the day of experiment - 5 Marks

   2 days from the day of experiment - 4 Marks

   3 days from the day of experiment - 3 Marks

   4 days from the day of experiment - 2 Marks

   5 days from the day of experiment - 1 Mark

   These days are exclusive of Sundays and public holidays.

   After 5 days no observation will be signed by the staff member.

   The remaining 5 marks will be awarded based on how the student he/she answers the Viva- Voice question which will be asked at the beginning and end of each experiment.
7. The students can get sign in the observation note book only from the in charge staff or from assist staff.
8. If the student does not get the particular experiment signed on the observation, they should not write that particular experiment in their record notebook and they will also not be given any assessment marks for that particular experiment.
9. The circuit diagrams should be drawn only using HB pencil, Scale, Pro circle, etc. No rough diagrams are entertained.
10. At the end of each experiment completed on that particular day Viva Voice questions will be asked by the staff members. The Viva voice questions can be from any part of that particular subject.

11. No student should take leave on the day of Lab class unless for the case of emergency. In case they absent themselves, the particular student he/she will not be allowed to repeat the experiment for which they absent.
12. The Student who absent themselves for the lab class will be allowed to enter the lab only after getting their leave form signed from the Class In charge and the HOD of their respective department.
13. No repetition classes for any student will be allowed unless the staff asks them to do so.

GUIDELINES FOR LABORATORY NOTEBOOK

The laboratory notebook is a record of all work pertaining to the experiment. This record should be sufficiently complete so that you or anyone else of similar technical background can duplicate the experiment and data by simply following your laboratory notebook. Record everything directly into the notebook during the experiment. Do not use scratch paper for recording data. Do not trust your memory to fill in the details at a later time.

Organization in your notebook is important. Descriptive headings should be used to separate and identify the various parts of the experiment. Record data in chronological order. A neat, organized and complete record of an experiment is just as important as the experimental work.

1. Heading:

The experiment identification (number) should be at the top of each page. Your name and date should be at the top of the first page of each day's experimental work.

2. Object:

A brief but complete statement of what you intend to find out or verify in the experiment should be at the beginning of each experiment

3. Diagram:

A circuit diagram should be drawn and labeled so that the actual experiment circuitry could be easily duplicated at any time in the future. Be especially careful to record all circuit changes made during the experiment Equipment List:

List those items of equipment which have a direct effect on the accuracy of the data. It may be necessary later to locate specific items of equipment for rechecks if discrepancies develop in the results.

4. Procedure:

In general, lengthy explanations of procedures are unnecessary. Be brief. Short commentaries along side the corresponding data may be used. Keep in mind the fact that the experiment must be reproducible from the information given in your notebook.

5. Data:

Think carefully about what data is required and prepare suitable data tables. Record instrument readings directly. Do not use calculated results in place of direct data; however, calculated results may be recorded in the same table with the direct data. Data tables should be clearly identified and each data column labeled and headed by the proper units of measure.

6. Calculations:

Not always necessary but equations and sample calculations are often given to illustrate the treatment of the experimental data in obtaining the results.

7. Graphs:

Graphs are used to present large amounts of data in a concise visual form. Data to be presented in graphical form should be plotted in the laboratory so that any questionable data points can be checked while the experiment is still set up. The grid lines in the notebook can be used for most graphs. If special graph paper is required, affix the graph permanently into the notebook. Give all graphs a short descriptive title. Label and scale the axes. Use units of measure. Label each curve if more than one on a graph.

8. Results:

The results should be presented in a form which makes the interpretation easy. Large amounts of numerical results are generally presented in graphical form. Tables are generally used for small amounts of results. Theoretical and experimental results should be on the same graph or arrange in the same table in a way for easy correlation of these results.

9. Conclusion:

This is your interpretation of the results of the experiment as an engineer. Be brief and specific. Give reasons for important discrepancies.

TROUBLE SHOOTING HINTS

1. Be Sure that the power is turned ON
2. Be sure the ground connections are common
3. Be sure the circuit you build is identical to your circuit diagram (Do a node by node check)
4. Be sure that the supply voltages are correct
5. Be sure that the equipment is set up correctly and you are measuring the correct parameters
6. If steps I through 5 are correct then you probably have used a component with the wrong value or one that doesn’t work. It is also possible that the equipment does not work (although this is not probable) or the protoboard you are using may have some unwanted paths between nodes. To find your problem you must trace through the voltages in your circuit node by node and compare the signal you expect to have. Then if they are different use your engineering judgment to decide what is causing the different or ask your lab assistant

List of Experiments

Group B (Electrical & Electronics)

ELECTRICAL ENGINEERING PRACTICE 13

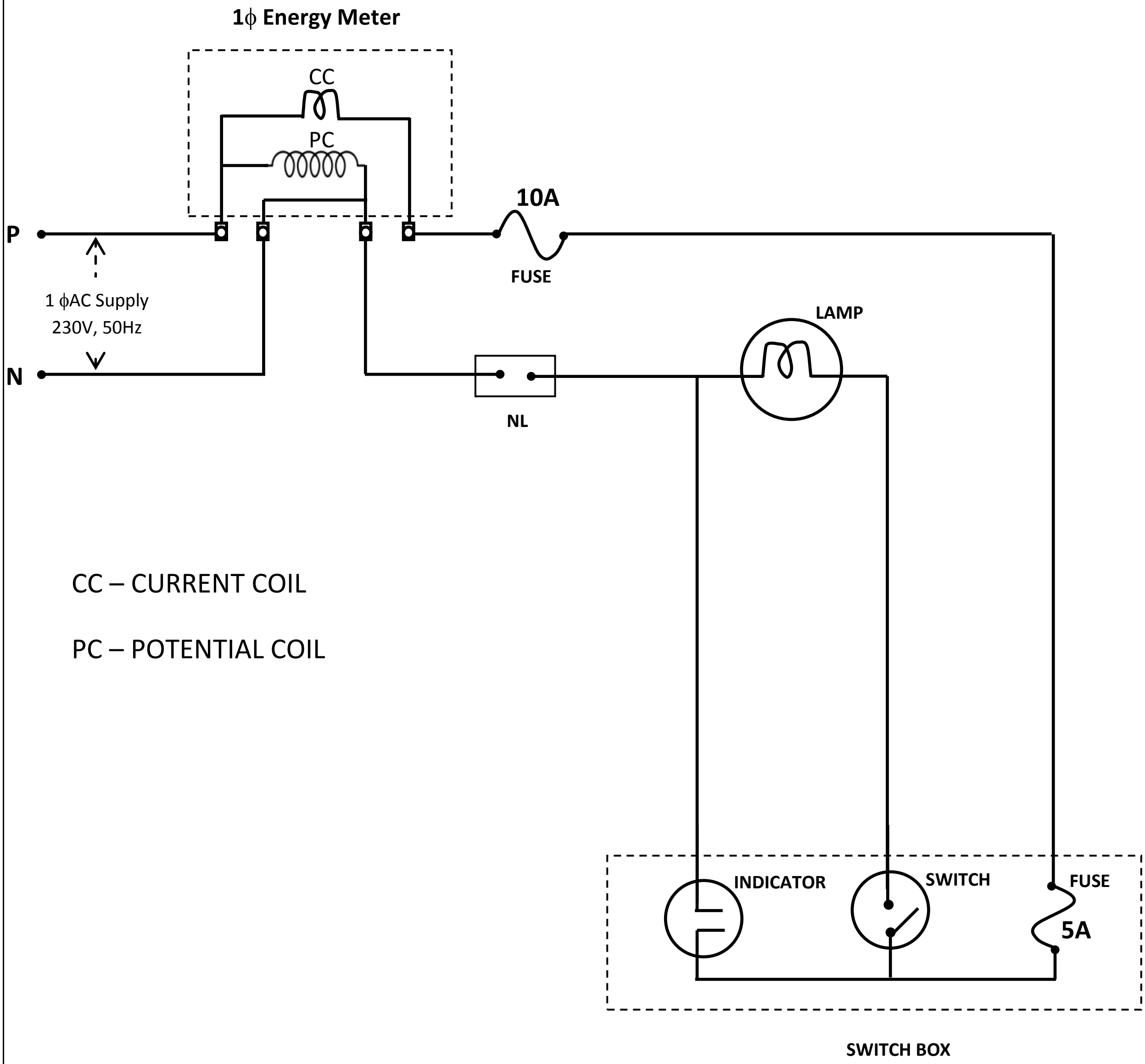
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement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

ELECTRONICS ENGINEERING PRACTICE 16

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, EX-OR 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

III ELECTRICAL ENGINEERING PRACTICE

CONNECTION DIAGRAM



CC – CURRENT COIL

PC – POTENTIAL COIL

Ex. No: 1

Date :

RESIDENTIAL HOUSE WIRING USING SWITCHES, FUSE, INDICATOR, LAMP AND ENERGY METER

AIM

To set up a model house wiring using a switch, fuse, indicator, lamp and energy meter.

APPARATUS REQUIRED

Sl. No	Description	Range / Size	Quantity
1.	One way Switch	230V / 5A	1
2.	Lamp	230V / 60W	1
3.	PVC box	6” x 4”	1
4.	PVC pipe	$3/4$"	As req.
5.	Copper wire	$1/18$	As req.
6.	Lamp Holder	230V / 5A	1
7.	PVC bends, clamps and screws	$3/4$"	As req.
8.	PVC Junction box	1 way	1
9.	Fuse Unit	230V / 5A	1
10.	1ϕ Energy meter	230V / 16A	1
11.	Indicator	230V	1

PRECAUTIONS

1. Ensure that power is switched off, before the connections are being made.
2. Live wire should always be controlled with switch.
3. Don’t use neon tester as screw driver.
4. Joints in wire are made with proper insulation.

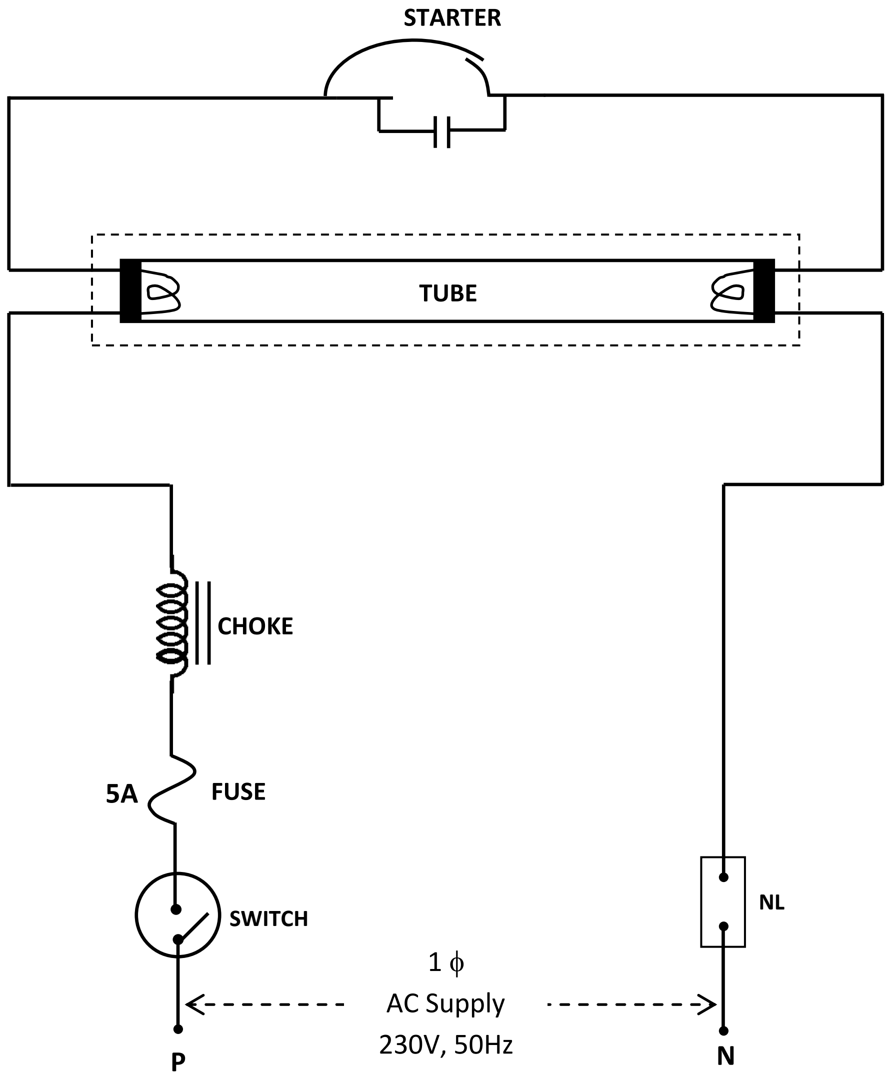
PROCEDURE

1. Layout of the given circuit diagram was drawn on the circuit board.
2. Given electrical accessories like switch, fuse, indicator and energy meter were fixed with the help of screws.
3. Given electrical accessories were connected by using copper wire.
4. Connections were checked before giving supply.
5. Performance of the given model house wiring was tested.

RESULT

Thus the set up of model house wiring using switch, fuse, and indicator and energy meter was completed successfully and was tested with a lamp.

CONNECTION DIAGRAM



Ex. No: 2

FLOURESCENT LAMP WIRING

Date :

AIM

To set up a fluorescent lamp wiring, controlled by a switch.

APPARATUS REQUIRED

Sl. No	Description	Range / Size	Quantity
1.	One way Switch	230V / 5A	1
2.	Fluorescent Lamp	230V / 60W	1
3.	Choke	-	1
4.	Tube base	4 feet	1
5.	Copper wire	$1/18$	As req.
6.	Starter	Glow type	1
7.	Screws	$1/2$"	As req.
8.	Tube side holder	-	2
9.	Starter holder	-	1

PRECAUTIONS

1. Live wire should always be controlled with switch.
2. Don't use neon tester as screw driver.
3. Joints in wire are made with proper insulation.

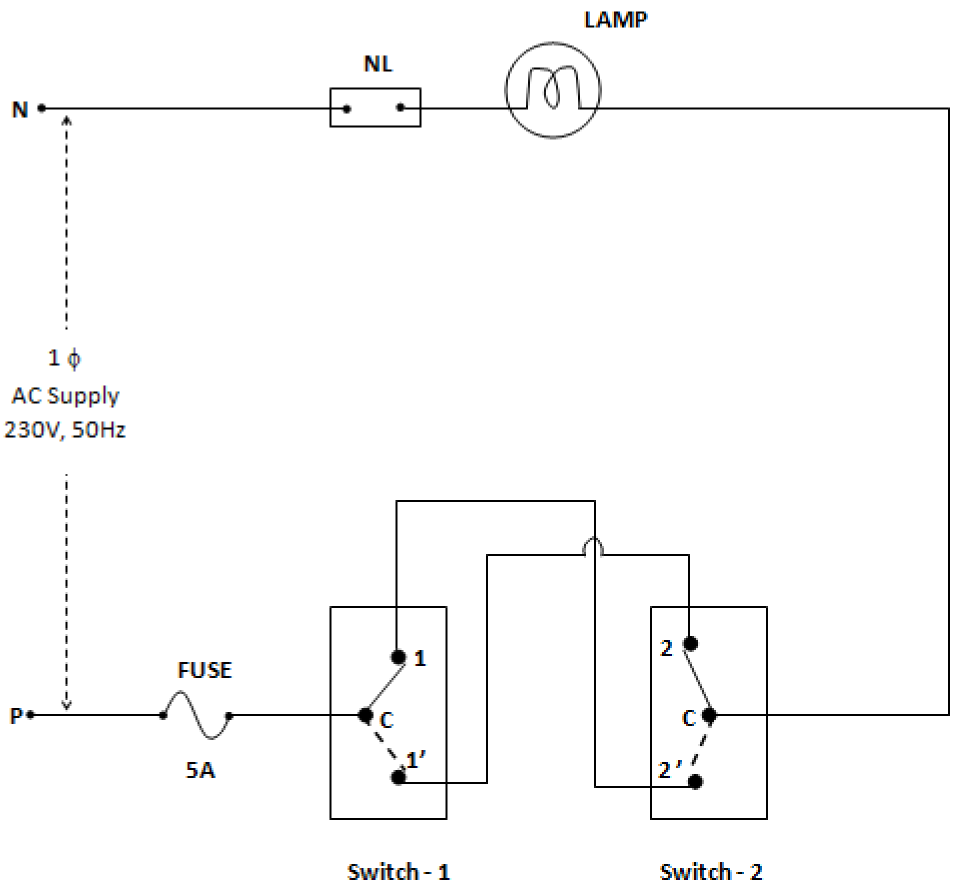
PROCEDURE

1. Layout of the given circuit diagram was drawn on the circuit board.
2. Fluorescent tube accessories like starter holder, holder for tube and choke were fitted in the tube base with the help of screws.
3. Finally the tube was fixed in the tube holder.
4. Supply was given to the circuit and the glow of lamp was identified after fine adjustment of the lamp.

RESULT

Thus the set up of fluorescent lamp wiring was completed and tested successfully.

CONNECTION DIAGRAM



TRUTH TABLE

Switch - 1	Switch - 2	Lamp Condition
ON	ON	OFF
ON	OFF	ON
OFF	ON	ON
OFF	OFF	OFF

Ex. No: 3

STAIRCASE WIRING

Date :

AIM

To set up a staircase wiring, to control a lamp.

APPARATUS REQUIRED

Sl. No	Description	Range / Size	Quantity
1.	Two way Switch	230V / 5A	2
2.	Lamp	230V / 60W	1
3.	PVC box	4” x 4”	2
4.	PVC pipe	$^{3}/_{4}$"	As req.
5.	Copper wire	$^{1}/_{18}$	As req.
6.	Lamp holder	230V / 5A	1
7.	PVC bends, clamps and screws	$^{3}/_{4}$"	As req.
8.	PVC junction box	3 way	1

PRECAUTIONS

1. Live wire should always be controlled with switch.
2. Don’t use neon tester as screw driver.
3. Joints in wire are made with proper insulation.

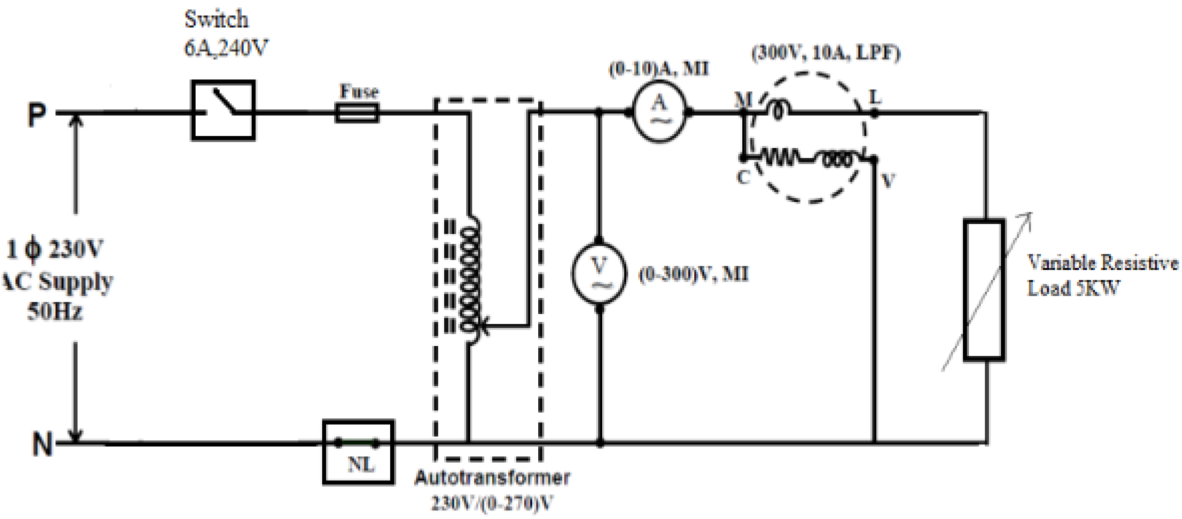
PROCEDURE

1. Layout of the given circuit diagram was drawn on the circuit board.
2. By using drilling machine, necessary materials were fixed in the layout board.
3. One end of the lamp holder was connected to neutral point and another point was connected at the centre of the two-way switch B.
4. The centre of the switch A was connected to the phase line.
5. The point 1 of switch A was connected to point 3 of A was connected to 1 of B.
6. The given lamp was fixed on the lamp holders.
7. Controlling the switches, the circuit was checked and the results were tabulated.

RESULT

Thus the set up of staircase wiring was constructed, tested and the results were tabulated.

CONNECTION DIAGRAM



Ex. No: 4

Date :

MEASUREMENT OF VOLTAGE, CURRENT, POWER, POWER FACTOR USING RLC ELEMENT

AIM

To calculate the voltage, current, power, power factor in an AC circuit containing RLC elements.

APPARATUS REQUIRED

Sl. No	Description	Range / Size	Type	Quantity
1.	Voltmeter	(0-300)V	MI	1
2.	Ammeter	(0-200)mA	MI	1
3.	Resistance Box	(0-5)kΩ	-	1
4.	Inductance Box	(0-1000)μH	-	1
5.	Capacitance Box	(0-10)μF	-	1
6.	Connecting Wire	-	-	As req.
7.	1ϕ Auto Transformer	(0-270)V	-	1

PRECAUTIONS

1. Ensure that power is switched off, before the connections are being made.
2. Live wire should always be controlled with switch.
3. When starting an auto transformer, it should be in minimum position.

FORMULA USED

1. Actual Power = observed Power * Multiplication Factor
2. Apparent power = V *I in watt
3. Power factor, Cos ϕ = Apparent power/ Actual Power

TABULATION

Multiplication Factor=

Sl.No	Voltage (V)	Current(I)	Wattmeter Reading		Apparent Power, V *I	Power factor Cosϕ = App/Act
			Observed	Actual Ob*2		
	(Volts)	(Ampere)	(Watts)	(Watts)	(Watts)	

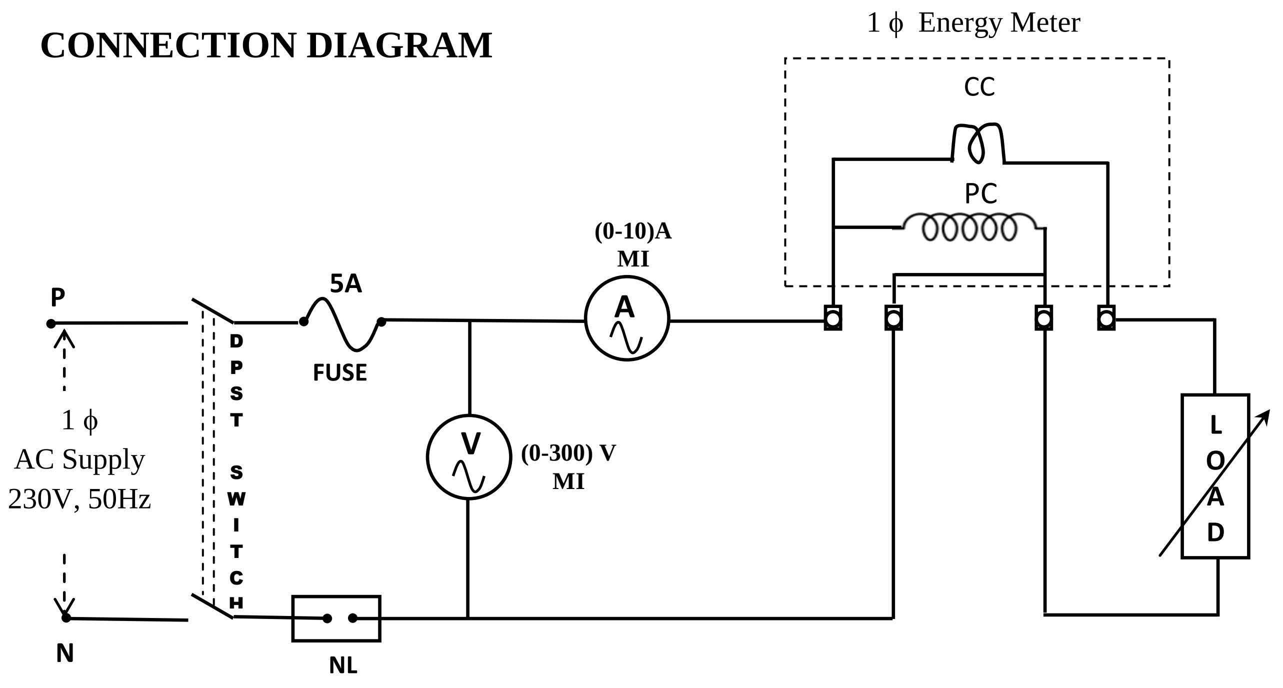
PROCEDURE

1. The connections are made as per the circuit diagram.
2. Rated Voltage is set in the voltmeter, by gradually varying the single phase variac.
3. Resistive load is switch ON.
4. Load is gradually increased and the ammeter, voltmeter & wattmeter readings are noted.

RESULT

Thus the Voltage, Current, Power and Power Factor of the AC circuit containing RLC element in series was calculated successfully.

CONNECTION DIAGRAM



CC – CURRENT COIL

PC – POTENTIAL COIL

Ex. No: 5

Date :

MEASUREMENT OF ENERGY USING SINGLE PHASE ENERGY METER

AIM

To measure the energy consumed by an electrical load using single phase energy meter.

APPARATUS REQUIRED

Sl. No	Description	Range / Size	Type	Quantity
1.	Voltmeter	(0-300)V	MI	1
2.	Ammeter	(0-200)mA	MI	1
3.	Resistance Load	5kW / 230V	-	1
4.	1ϕ Energy meter	230V, 20A	-	1
5.	Copper Wire	1/18	-	As req.

PRECAUTIONS

1. Ensure that power is switched off, before the connections are being made.
2. Live wire should always be controlled with switch.
3. Don't use neon tester as screw driver.
4. Joints in wire are made with proper insulation.
5. When starting an auto transformer, it should be in minimum position.

FORMULA USED

1. Theoretical Energy Consumption = $\frac{V \times I \times t}{1000 \times 3600}$ in kWh
2. Practical Energy Consumption = $\frac{No.\ of\ Revolutions}{Meter\ Constant}$ in kWh

Where,

V – Voltage in volt

I – Current in ampere

t – Time in seconds

TABULATION

Meter Constant = **Fixed Constant Revolution =**

Sl. No	Voltage (V)	Current (A)	Time taken for 10 revolutions (sec)	Theoretical Energy Consumption (kwh)	Actual Energy Consumption (kwh)

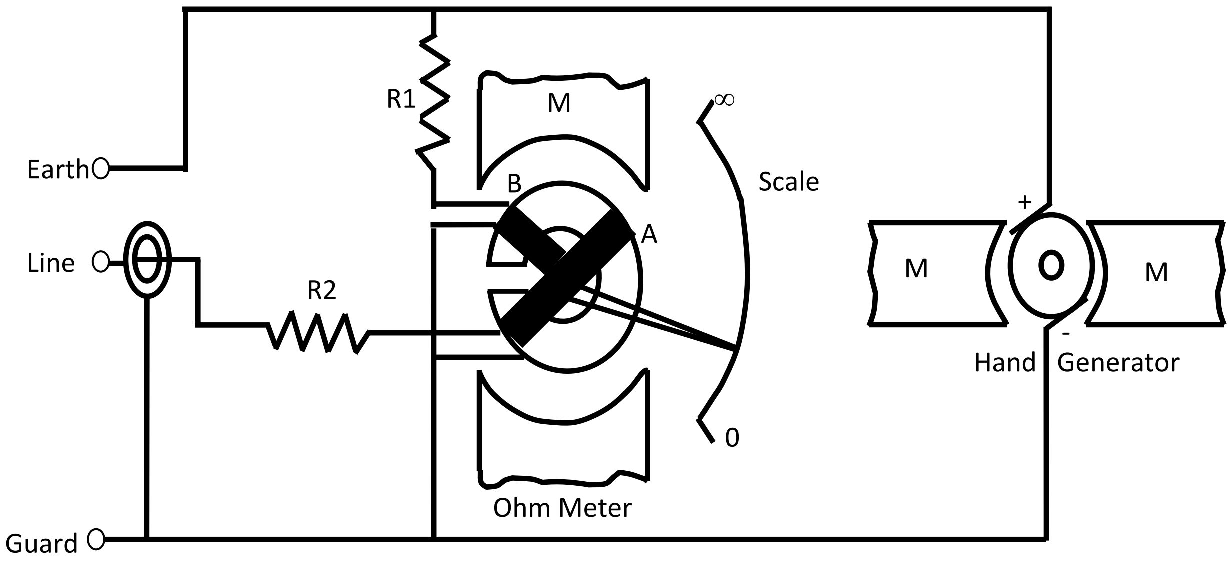
PROCEDURE

1. Connection was made as per the circuit diagram.
2. Proper connection was checked before giving the supply.
3. After that, load was gradually increased by using taping switches and corresponding voltmeter, ammeter and energy meter disc revolutions were noted.
4. After successful completion of the experiment, the applied load was gradually reduced.
5. Finally, power supply switch was switched off and the circuit was disconnected.

RESULT

Thus the measurement of energy using single phase energy meter for different load conditions was calculated successfully.

BLOCK DIAGRAM



Ex. No: 6

Date :

MEASUREMENT OF RESISTANCE TO EARTH OF AN ELECTRICAL EQUIPMENT

AIM

To measure the earth resistance of a given electrical equipment using megger.

APPARATUS REQUIRED

Sl. No	Description	Range / Size	Quantity
1.	Megger	500V, (0-200)MΩ	1
2.	Rod	-	2
3.	Connecting Wire	-	As req.
4.	Any Electrical Equipment (Transformer)	-	1

PRECAUTIONS

1. Electrical equipment to be tested must be disconnected from the supply.
2. Proper Earthing should be given for all the electrical equipments.

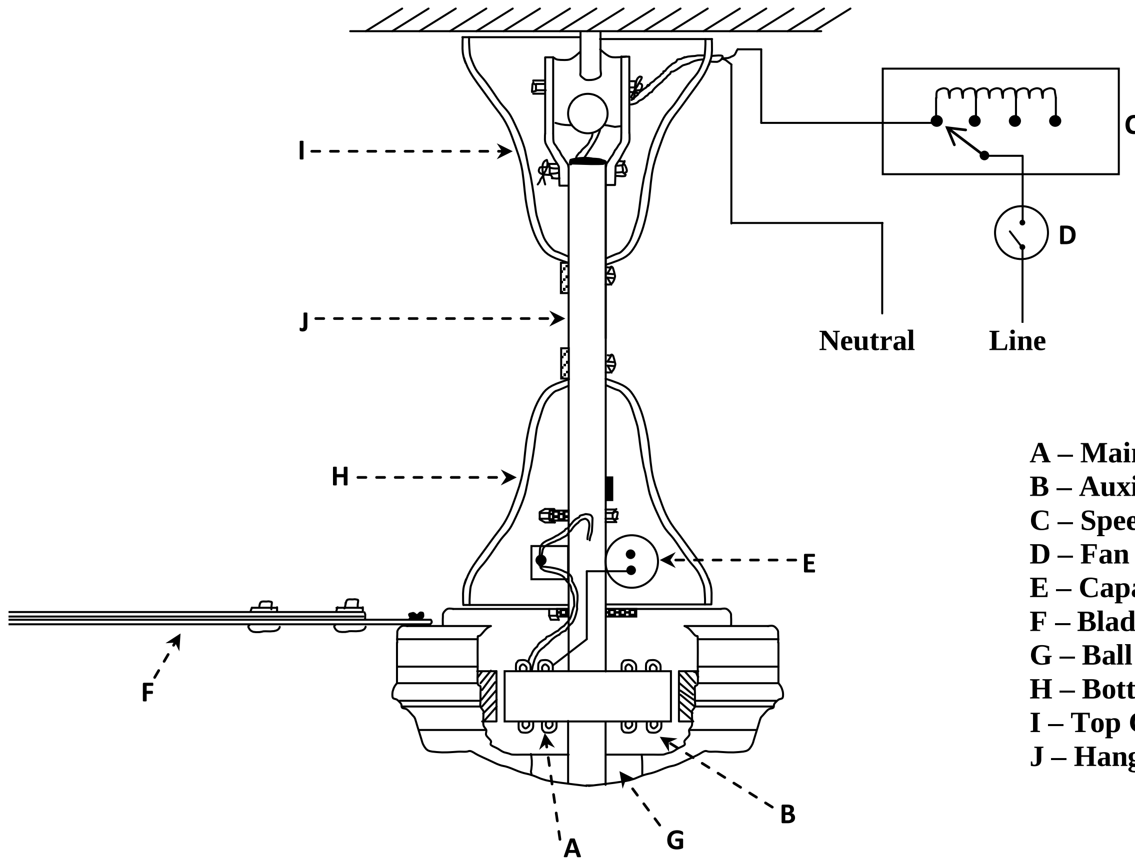
PROCEDURE

1. The materials required for this experiment was collected.
2. The terminal of ohm meter E was first connected to earth.
3. The terminal of the line L was connected to the electrical equipment.
4. Handle of the Megger was rotated and the given electrical equipment was tested.

RESULT

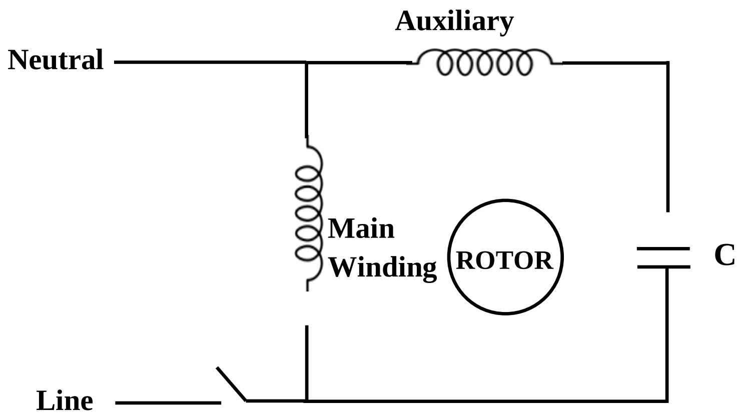
Thus the earth resistance of the given electrical equipment was measured using Megger (Insulation Tester).

CONSTRUCTION DIAGRAM



A – Main Winding
B – Auxiliary Winding
C – Speed Regulator
D – Fan Switch
E – Capacitor
F – Blade
G – Ball Bearing
H – Bottom Canopy
I – Top Canopy
J – Hanging Rod

CIRCUIT DIAGRAM



ADDITIONAL EXPERIMENT

STUDY OF CEILING FAN

Ex. No: 7

Date :

INTRODUCTION

- ✓ Ceiling fan is nothing but a single phase induction motor.
- ✓ Single phase motors are the most familiar of all electric motors because they are extensively used in home appliances, shops, office etc.
- ✓ It is true that single phase motors are less efficient substitute for three phase motors but three phase power is normally not available except in large commercial and industrial establishments.
- ✓ Since electric power was originally generated and distributed for lighting only, millions of homes were given single phase supply.
- ✓ This lead to the development of single phase motors. Even where 3 phase mains are present, the single phase supply may be obtained by using one of the three lines and the neutral.

MECHANISM

- ✓ Normally ceiling fans contain three blades in equidistance from each other.
- ✓ The blades of the fan should be kept away from the ceiling.
- ✓ If not, it is not possible to drive air from behind. Ceiling fan should be fitted by passing a strong bolt through a rubber bobbin placed inside a 'U' shaped clamp on the ceiling.
- ✓ Care should be taken for avoiding bending of blades from its original shape.
- ✓ The resistance type regulator, ON/OFF switch on the wall is connected in series with the phase line of the motor to control speed and ON/OFF control respectively.
- ✓ Neutral line is directly connected to the fan motor.
- ✓ Fan is factory wired for the correct rotation and the wire ends are connected to a phase and neutral lines in the Connector point.
- ✓ The parts of ceiling fan are stator, rotor and ball bearings. Stator is rotating and the rotor being stationary.
- ✓ Capacitor (2 or 2.5μF) and Connector is fitted inside the canopy at the top of the fan motor. Line (L) is connected to the common point of a main and the auxiliary winding (auxiliary winding is also called starting winding).
- ✓ These two windings are connected in parallel through a capacitor at auxiliary winding.

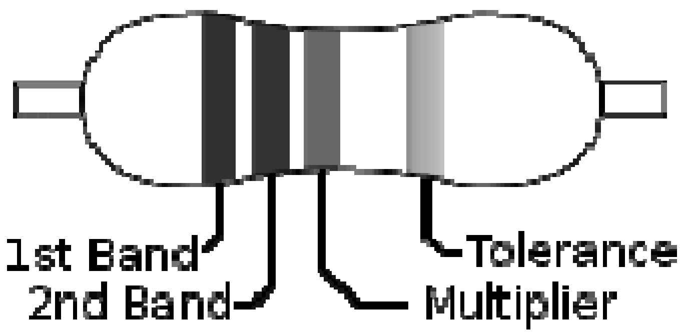
- ✓ The fan ON/OFF control is done by the switch.
- ✓ The speed of the fan is controlled by varying the regulator knob position.
- ✓ Regulator is nothing but a length of resistance with some fixed output terminals.
- ✓ So the full speed is attained by disconnecting resistance from the circuit and the fan is directly connected to the supply.
- ✓ So in ceiling fan, the electrical energy is converted into mechanical energy and that mechanical motion of the blade makes air to flow away from the fan.

RESULT

Thus the study of ceiling fan was completed.

IV ELECTRONICS ENGINEERING PRACTICE

RESISTOR COLOUR CODING



Exp No: 1(a) **STUDY OF ELECTRONIC COMPONENTS**

Date: RESISTOR, COLOUR CODING

AIM:

Tostudy about the electronic component, resistor and to find the value of given resistorusing colour coding

COMPONENT REQUIRED:

S.NO	NAME OF THE COMPONENT	RANGE	QUANTITY
1.	Resistor	1 KΩ, 2.2KΩ ,3.3Ω,	Each 1

THEORY:

- ✓ Resistors are the most common components in electronic circuits.
- ✓ Its mainfunction is to reduce the high current to the desired value.
- ✓ Italso to provide desired voltage in the circuit.
- ✓ The resistors are manufactured to have a specific value in ohm.

RESISTOR COLOUR CODING

- ✓ The use of band on strips is a common system for colour coding carbon resistors.
- ✓ Colour strips are printed at one end of the insulating body.
- ✓ It is usually band readingfrom left toright.
- ✓ The unit of resistance is ohm.
- ✓ It is denoted as Ω.
- ✓ Resister values are normally shown using colour bands.
- ✓ Most resisters have four bands.
- ✓ They are,
  1. The first band gives the first digit of the numeric value of R.
  2. The second band gives the second digit of the numeric value of R.
  3. The third band indicates the number of zeros
  4. The fourth band is used to show tolerance of the resister.

Tolerance for,

Silver ±10%

Gold ±5%

Red ±2%

Brown±1%

If no fourth band is shown the tolerance is ±20%

TABULATION:

1 st Band	2nd Band	Multiplier	Resister Value

- ✓ Each colour represents a number shown in the table.

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

- ✓ 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 3, and fourth band is red, which means that the value of the resistor is,

$R=25*10^3$

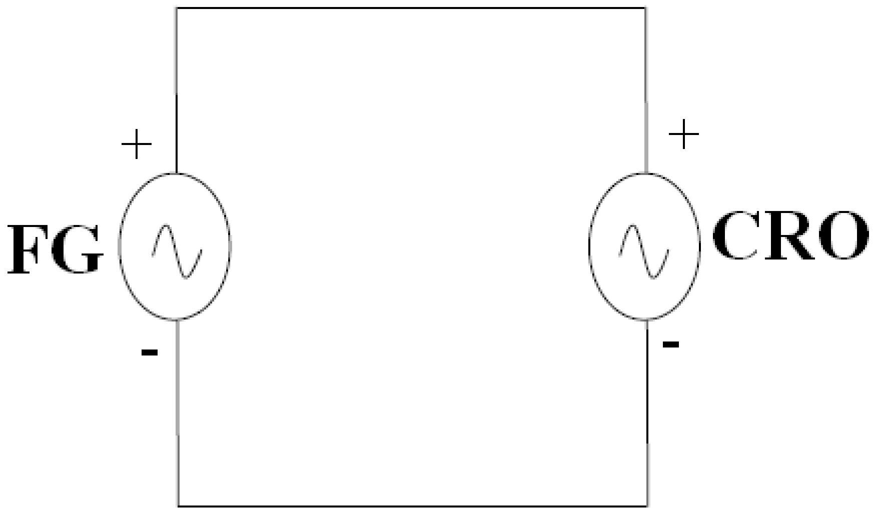
=25000Ω

=25 KΩ with 2% tolerance

RESULT:

Thus the electronic component, resistor was studied and the value of given resistor is found using colour coding.

CONNECTION DIAGRAM



Exp No: 1(b) **STUDY OF ELECTRONIC EQUIPMENTS**

Date: **MEASUREMENT OF AC SIGNAL PARAMETER USINGCRO**

AIM:

To measure AC signal parameters using CRO.

COMPONENT REQUIRED:

S.NO	NAME OF THE COMPONENT	RANGE	QUANTITY
1.	Cathode Ray Oscilloscope	30 MHz	1
2.	Function generator	-	1
3.	Connecting wires and Probe	-	As Required

FORMULA USED:

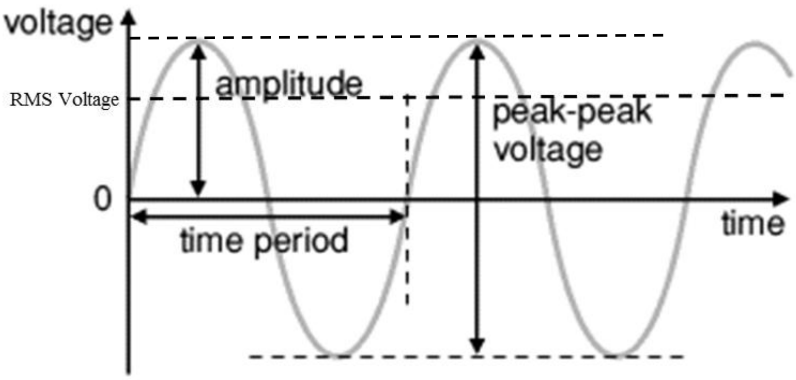
1. RMS Value, $V_{rms} = \frac{V_{pp}}{\sqrt{2}}\ in\ Volts$
2. Frequency, $f = \frac{1}{Time\ period}\ \ in\ Hz$

THEORY:

- ✓ The voltage wave form shown in the model graph is called as sine wave or sinusoidalwave or sinusoid.
- ✓ For this, the amount of voltage is proportional to the sine of theangle of the rotation in a circular motion producing the voltage.
- ✓ The sine is atrigonometric function of an angle.
- ✓ It is equal to the ratio of opposite side to thehypotenuse 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 changesthroughout the cycle
- ✓ It is convenient to define specific magnitude for comparing onewave with the other.
- ✓ **Peak**is that the highest value the sine wave canreach.

- ✓ **Peak to peak value** is the addition of both the peak values.
- ✓ 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 (RMS).**
- ✓ The number of cycles per second is called the **frequency.**

MODEL GRAPH:



TABULATION:

PEAK-PEAK VALUE,V_{pp}	**RMSVALUE,V_{rms}** $V_{rms} = \frac{V_{pp}}{\sqrt{2}}$	**TIME PERIOD,T**	**FREQUENCY, f** $f = \frac{1}{Time\ period}$
V	**V**	**mSec**	**Hz**

\

PROCEDURE:

1. Connect the signal generator output to one vertical input of the CRO.
2. Set the function generator in sinusoidal mode and adjust the amplitude of the signal so that it just about fills the screen.
3. Set the signal generator dial at any particular frequency and move the dial until you have only a few complete cycles across the CRO face in the horizontal direction.
4. Measure the period T of the signal.
5. Measure the horizontal distance between two successive peaks and multiply this distance by the reading of the “TIME/DIV” button which is the scale of the time axis.
6. This gives the period T of the AC signal, its frequency is f = 1/T.
7. In measuring the voltage, always measure the value from the centre of the trace to its peak.
8. This "peak voltage" is half the peak-to-peak voltage, which is the full height of the trace on the CRO screen.

RESULT:

Thus the AC signal parameter of the sine wave was measured using CRO.

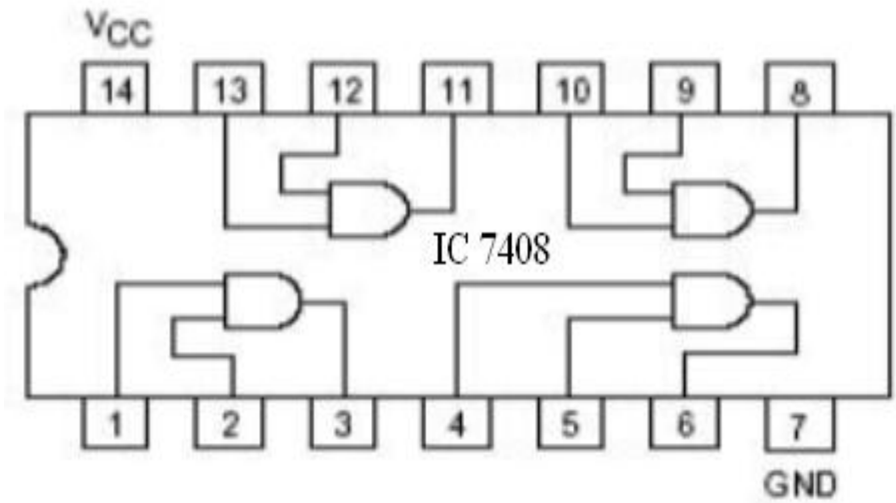
1. Peak-peak value, v_{pp} =
2. RmsValue, v_{rms} =
3. Time Period, T =

4. Frequency, f =

AND GATE

LOGIC DIAGRAM:

PIN DIAGRAM:



TRUTH TABLE:

SL.NO	INPUT		OUTPUT
	A	B	Y=A.B
1	0	0	0
2	0	1	0
3	1	0	0
4	1	1	1

ExpNo: 2 **STUDY OF LOGIC GATES AND, OR, EX-OR AND NOT**

Date :

AIM:

To verify the truth table of basic logic gates of AND, OR, NOTand EX-OR gates.

APPARATUS REQUIRED:

SL.NO	NAME OF THE APPARTUS	RANGE	QUANTITY
1	Digital IC trainer Kit	-	1
2	AND Gate	IC 7408	1
3	OR Gate	IC 7432	1
4	NOT Gate	IC 7404	1
5	EXOR Gate	IC 7486	1
6	Connecting Wires	-	As Required

THEORY:

a. AND Gate:

- ✓ An AND gate is the physical realization of logical multiplication operation.
- ✓ It is an electronic circuit which generates an output signal of '1' only if all the input signals are '1'.

b. OR Gate:

- ✓ An OR gate is the physical realization of the logical addition operation.
- ✓ It is an electronic circuit which generates an output signal of '1' if any of the input signals is '1'.

c. EX-OR Gate:

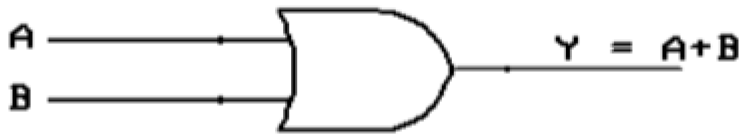
- ✓ An Ex-OR gate performs the following Boolean function, A B = (A. B') + (A'. B).
- ✓ It is similar to OR gate but excludes the combination of both A and B being equal to one.
- ✓ The exclusive OR is a function that give an output signal '0' when the two input signals are equal either '0' or '1'.

d. NOT Gate:

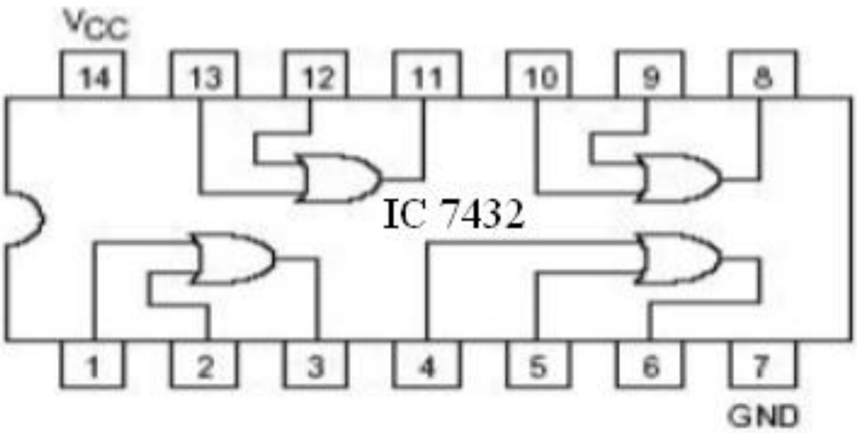
- ✓ A NOT gate is the physical realization of the complementation operation.
- ✓ It is an electronic circuit which generates an output signal which is the reverse of the input signal.
- ✓ A NOT gate is also known asan inverter because it inverts the input.

OR GATE

LOGIC DIAGRAM:



PIN DIAGRAM:

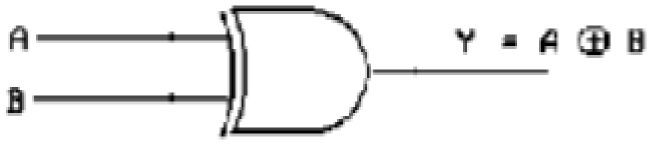


TRUTH TABLE:

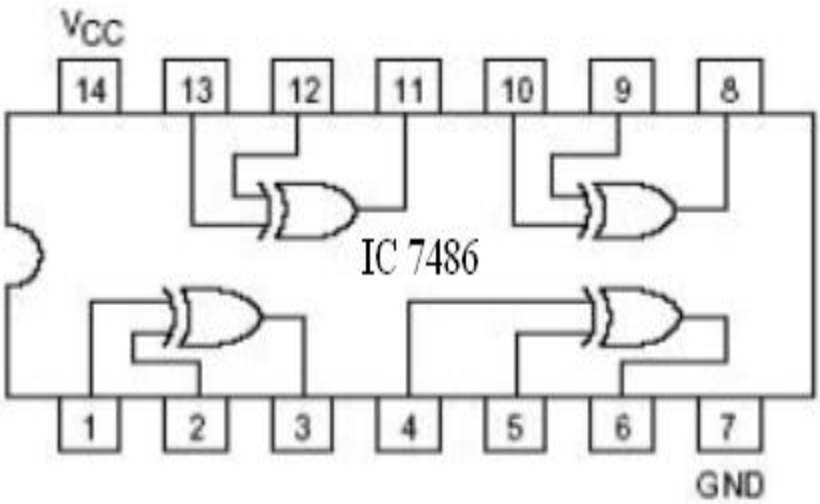
SL.NO	INPUT		OUTPUT
	A	B	Y=A+B
1	0	0	0
2	0	1	1
3	1	0	1
4	1	1	1

<u>**EX-OR GATE**</u>

LOGIC DIAGRAM:



PIN DIAGRAM:

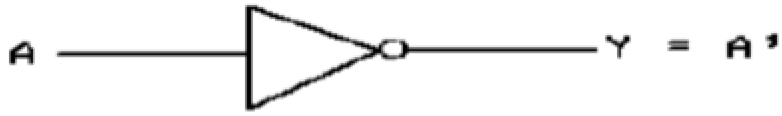


TRUTH TABLE:

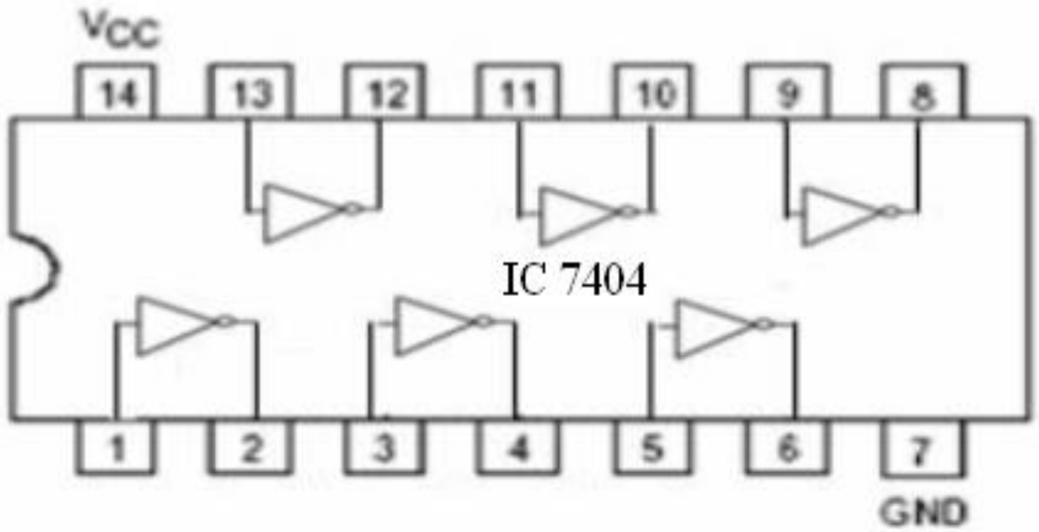
SL.NO	INPUT		OUTPUT
	A	B	Y=A.B
1	0	0	0
2	0	1	1
3	1	0	1
4	1	1	0

<u>**NOT GATE**</u>

LOGIC DIAGRAM:



PIN DIAGRAM:



TRUTH TABLE:

Sl.NO	**INPUT**	**OUTPUT**
	A	**Y=A'**
1	0	1
2	1	0

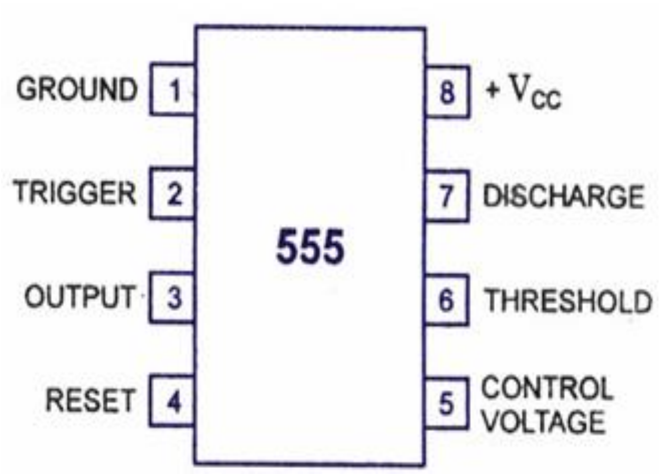
PROCEDURE:

1. Connections are given as per the circuit diagram
2. For all the ICs 7^{th} pin is grounded and 14^{th} pin is given +5 V supply.
3. Apply the inputs and verify the truth table for all gates.

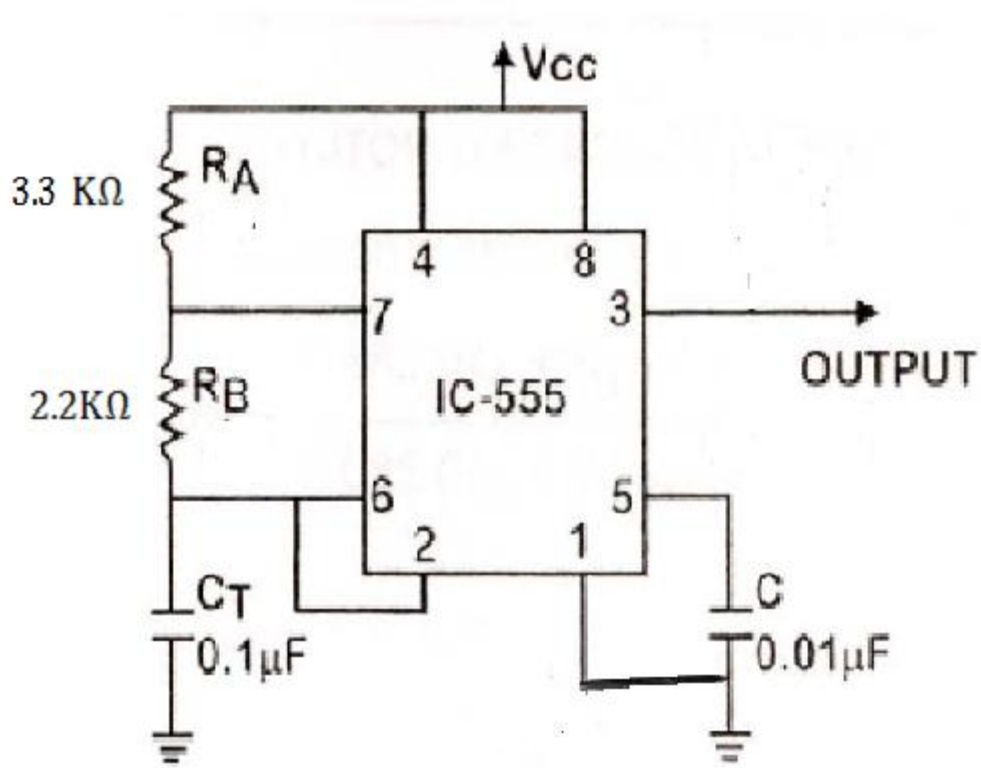
RESULT:

Thus AND, OR, NOT and EX-ORlogic gates were studied and its truth table was verified.

PIN DIAGRAM:



CIRCUIT DIAGRAM:



Exp No: 3 **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

APPARATUS REQUIRED:

S.NO	NAME OF THE APPARATUS	RANGE	QUANTITY
1.	Timer IC	IC 555	1
2.	Resistor	3.3kΩ, 2.2kΩ	1
3.	Capacitor	0.1µf, 0.01µf	1
4.	CRO	30MHz	1
5.	Bread Board	-	1
6.	Dual RPS	-	1
7.	Connecting wires and probes	-	As required

FORMULA USED:

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

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

where T = Time period

T_{ON} = ON Time

T_{OFF} = OFF Time

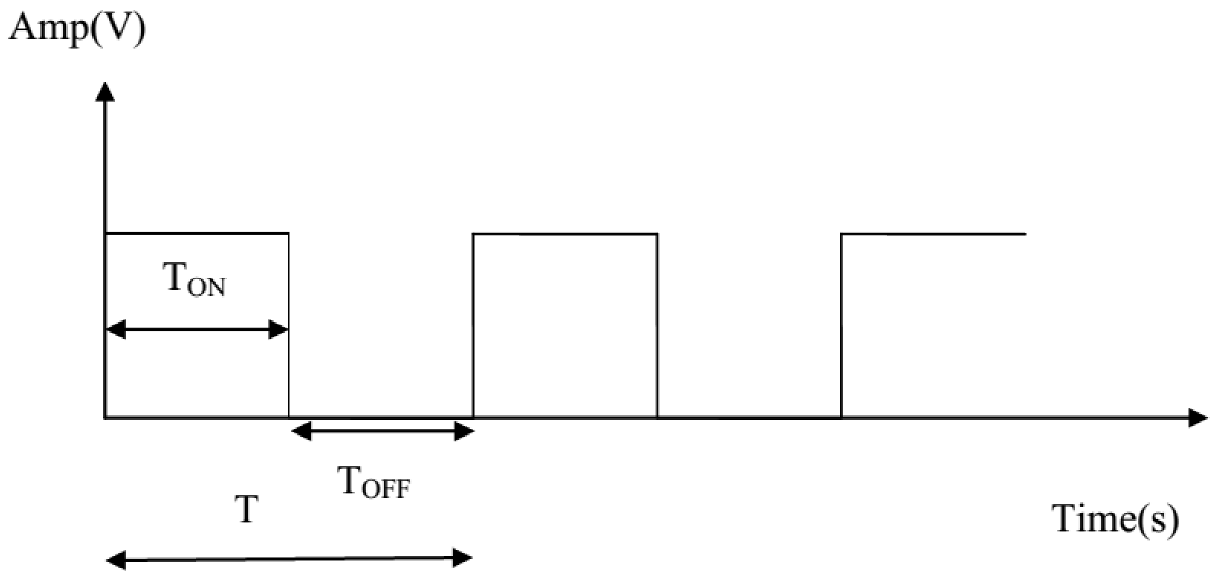
f = Frequency

THEORY:

- ✓ The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulsegeneration, and oscillator applications.
- ✓ The 555 can be used to provide time delays, asan oscillator, and as a flip-flop element.
- ✓ Derivatives provide up to four timing circuits inone package.
- ✓ The 555 Timer is a very versatile low cost timing IC.
- ✓ It can produce a very accurate timing periods with good stability of around 1%.
- ✓ It has a variable timing period from between a few micro-seconds to many hours with the timing period.

- ✓ It can be controlled by a single RC network connected to a single positive supply of between 4.5 and 16 volts.

MODEL GRAPH:



TABULATION:

AMPLITUDE (in Volts)	TIME PERIOD (in mSec)	
	T_{ON}	T_{OFF}

CALCULATION:

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

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

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 =

Ex. No: 4 **SOLDERING PRACTICE – COMPONENTS DEVICES AND**
Date: **CIRCUITS – USING GENERAL PURPOSE PCB**

AIM

To practice soldering and de-soldering for the electronic circuit by assembling and disassembling in the Printed Circuit Board (PCB) and check for its Continuity.

APPARATUS REQUIRED

S.NO	NAME OF THE APPARATUS	RANGE	QUANTITY
1.	PCB Board	-	1
2.	Soldering iron	60/40 grade	1
3.	Solder	-	As Required
4.	Soldering Flux	-	As Required
5.	Capacitor	100μf	As Required
6.	Resistor	1kΩ	As Required
7.	Multimeter	-	1

THEORY:

- ✓ Solderingis the process of joining electrical parts together to form an electric connection, using a molten mixture of lead and tin (solder), with a soldering iron.

SOLDERING IRON:

- ✓ It supplies sufficient heat to melt solder by heat transfer, when the iron tip is applied to a connection to be soldered.
- ✓ The soldering iron temperature is selected according to the work to be performed.

SOLDERING IRON STAND:

- ✓ The stand is the safe place to put the iron when we are not holding it.
- ✓ The stand includes a sponge which can be dampened for cleaning the tip of the iron.

SOLDER:

- ✓ It is alloy of low melting metals like tin, lead, cadmium, silver etc.
- ✓ The most commonly used alloy combination is 63% tin and 37% lead.

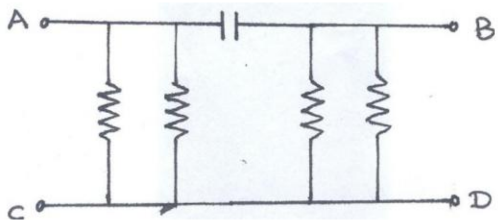
SOLDERING FLUX:

- ✓ It is a resin, applied on the work piece to be soldered, preventing contact with the atmosphere.
- ✓ It maintains a clean surface and dissolves oxides thereby enabling goodsoldering.

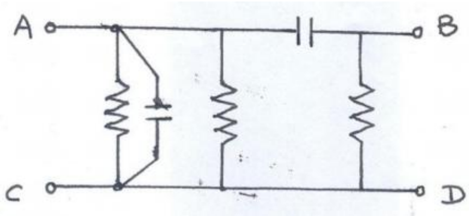
- ✓ Aluminium chloride or zinc chloride are commonly used as flux.
- ✓ The flux also assists in the transfer of heat from the soldering iron tip to the joint area.

SOLDERING:

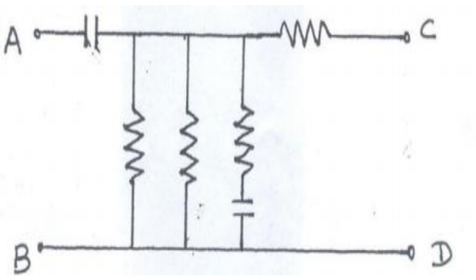
CIRCUIT DAIGRAM 1:



CIRCUIT DAIGRAM 2:

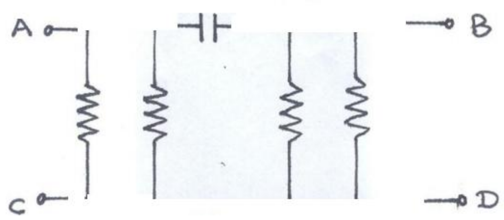


CIRCUIT DAIGRAM 3:

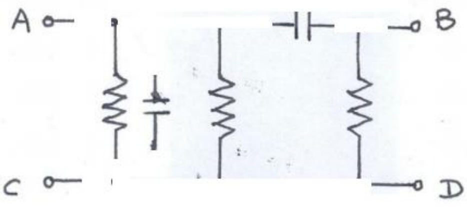


DESOLDERING:

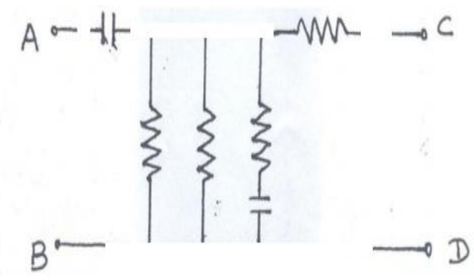
CIRCUIT DAIGRAM 1:



CIRCUIT DAIGRAM 2:



CIRCUIT DAIGRAM 3:



PROCEDURE:

SOLDERING:

1. Study the 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 leads to fit into the holes on the board.
6. Insert the resistor, as per the circuit shown in the figure and bend the leads.
7. Apply the hot tips to the joints and apply the solder.
8. Remove the soldering tip and hold the resistor tightly until the solder has cooled and set.
9. Trim excess component lead with side cutter.
10. Repeat the above steps to fix the other resistor and capacitor.

DE-SOLDERING:

1. Place the tip of the soldering iron on the joints until the solder is melt.
2. Using de-soldering wick remove the molten state.
3. On the component side using tweezers remove the de-soldered components.

CONTINUITY CHECK:

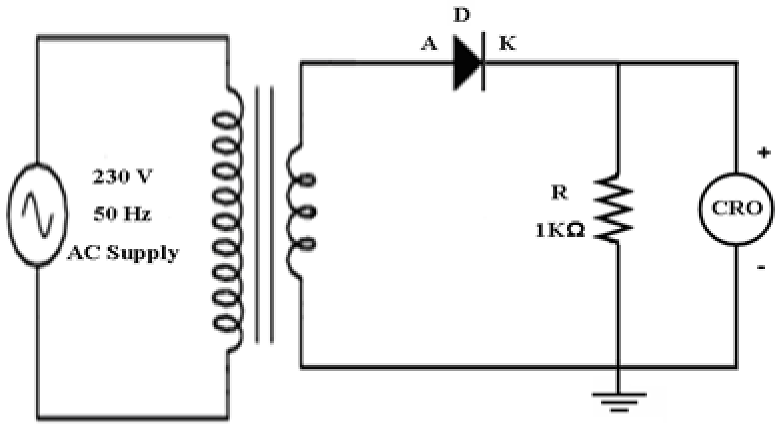
1. Set the Multimeter in continuity check mode or resistor mode.
2. Place the two leads (common, +ve lead) in the two points to be checked.
3. If the resistance value is displayed as zero, there exists continuity.
4. Otherwise two points are not internally connected. (When set in continuity check mode, a beep sound is heard, if continuity exists between the two points)

RESULT:

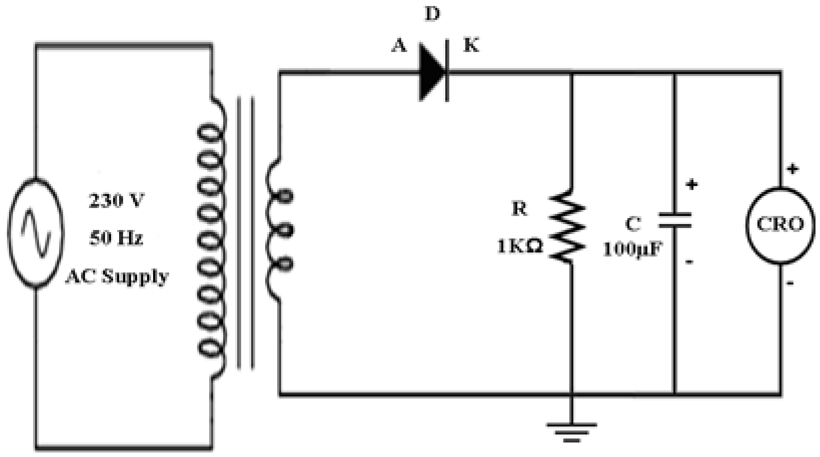
Thus the soldering and de-soldering for the electronic circuit by assembling and disassembling in the Printed Circuit Board (PCB) is practised and continuity check was also done.

CIRCUIT DIAGRAM:

HALF WAVE RECTIFIER (WITHOUT FILTER):



HALF WAVE RECTIFIER (WITH FILTER):



Exp No:5(a) **MEASUREMENT OF RIPPLE FACTOR OF HWR**

Date:

AIM:

To study the characteristics of a half wave rectifier and to obtain it's the ripple factor.

APPARATUS REQUIRED:

S.NO	NAME OF THE APPARATUS	RANGE	QUANTITY
1.	Bread board	-	1
2.	Step down transformer	6-230 V/6-0-(-6)	1
3.	Diode	IN4007	1
4.	Cathode Ray Oscilloscope	30 MHz	1
5.	Resistor	1KΩ	1
6.	Capacitor	100µF	1
7.	Connecting wires and Probe	-	As Required

FORMULA USED:

Ripple factor $\gamma = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$ (no unit)

Where $V_{rms} = \frac{V_m}{2}$ $in\ volts$

$$V_{dc} = \frac{V_m}{\pi}\ in\ volts$$

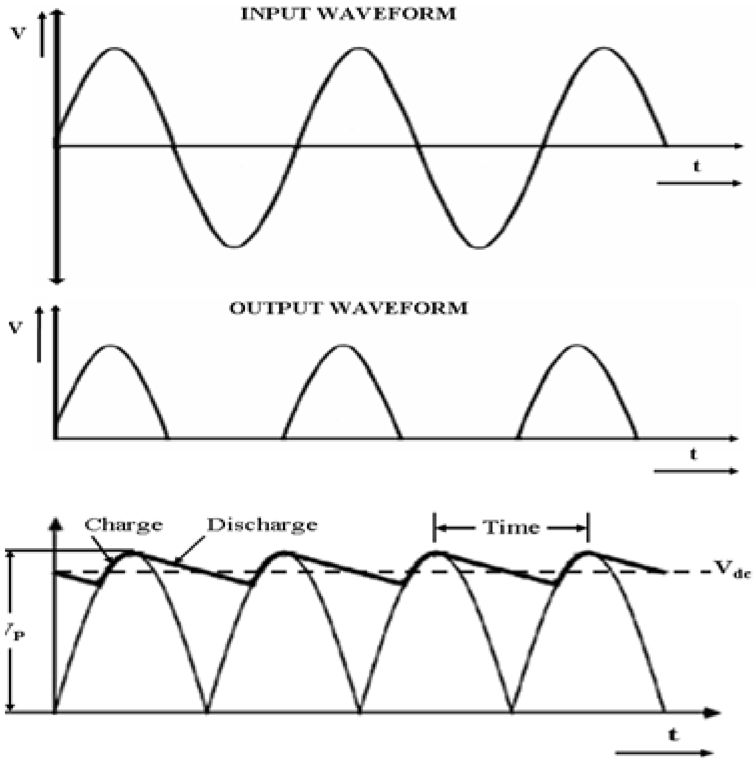
V_m is the peak Voltage.

THEORY:

- ✓ A rectifier is an electrical device.
- ✓ It converts alternating current (AC) to direct current (DC).
- ✓ This conversion process is known as rectification
- ✓ AC is periodically reverses direction and DC is in only one direction
- ✓ Rectifiers have many uses including as components of power supplies and as detectors of radio signals.
- ✓ Rectifiers may be made of solid state diodes, silicon-controlled rectifiers, vacuum tube diodes, mercury arc valves, and other components.
- ✓ In a half wave rectifier circuit, the diode conducts only during one half cycle of the input Ac supply. While the other half cycle diode gets reverse biased. It will not conduct.

- ✓ The unidirectional flow of current through the diode is obtained.

MODEL WAVEFORM:



TABULATION:

	AMPLITUDE (V)	TIME PERIOD (mSec)
SINE WAVE		
WITHOUT FILTER		
WITH FILTER		

CALCULATION:

	$V_{rms} = \frac{V_m}{2}$	$V_{dc} = \frac{V_m}{\pi}$	$\frac{V_{rms}}{V_{dc}}$	$\left(\frac{V_{rms}}{V_{dc}}\right)^2$	$\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1$	$\gamma = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$
WITHOUT FILTER						
WITH FILTER						

PROCEDURE:

1. Connections are made as per the circuit diagram.
2. Apply AC input to rectifier.
3. The rectifier inputs are absorbed with and without filter.
4. Ripple factor are calculated and tabulated.

RESULT:

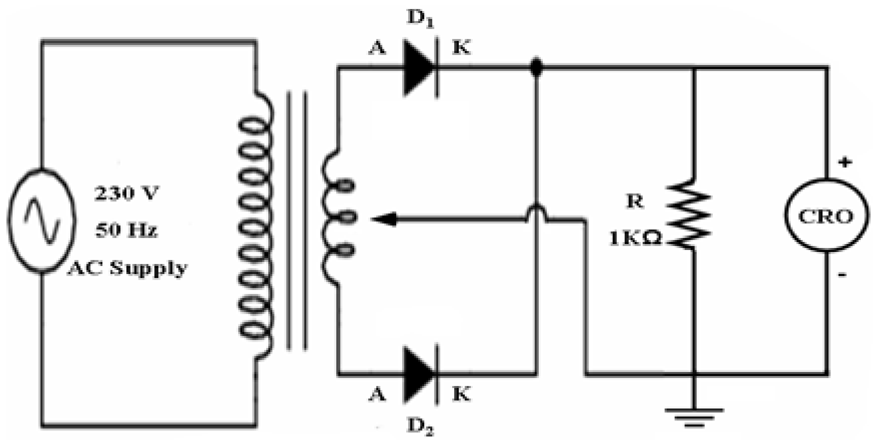
Thus the characteristics of a half wave rectifier was studied and the ripple factor was calculated

Ripple factor without filter :

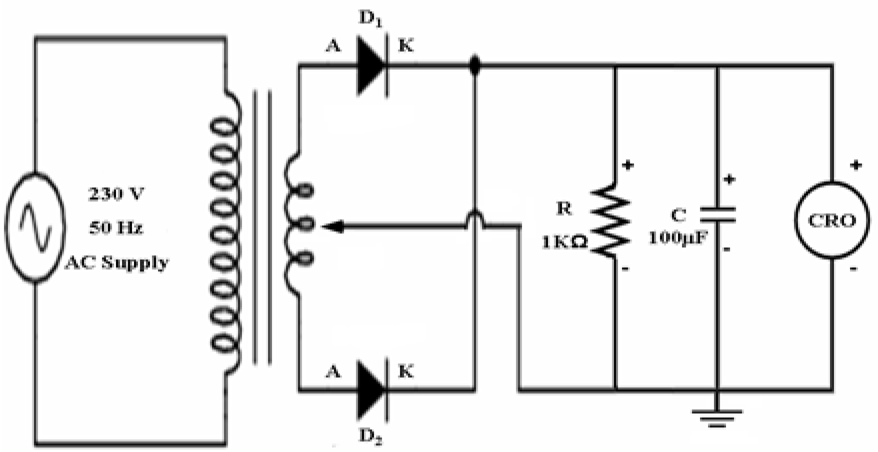
Ripple factor with filter :

CIRCUIT DIAGRAM:

FULL WAVE RECTIFIER (WITHOUT FILTER):



FULL WAVE RECTIFIER (WITH FILTER):



Exp No:5(b) **MEASUREMENT OF RIPPLE FACTOR OF FWR**

Date:

AIM:

To study the characteristics of a full wave rectifier and to obtain it's the ripple factor.

APPARATUS REQUIRED:

S.NO	NAME OF THE APPARATUS	RANGE	QUANTITY
1.	Bread board	-	1
2.	Step down transformer	6-230 V/6-0-(-6)	1
3.	Diode	IN4007	2
4.	Cathode Ray Oscilloscope	30 MHz	1
5.	Resistor	1KΩ	1
6.	Capacitor	100µF	1
7.	Connecting wires and Probe	-	As Required

FORMULA USED:

Ripple factor $\gamma = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$ (no unit)

Where $V_{rms} = \frac{V_m}{\sqrt{2}}$ *in volts*

$$V_{dc} = \frac{2V_m}{\pi} \text{ in volts}$$

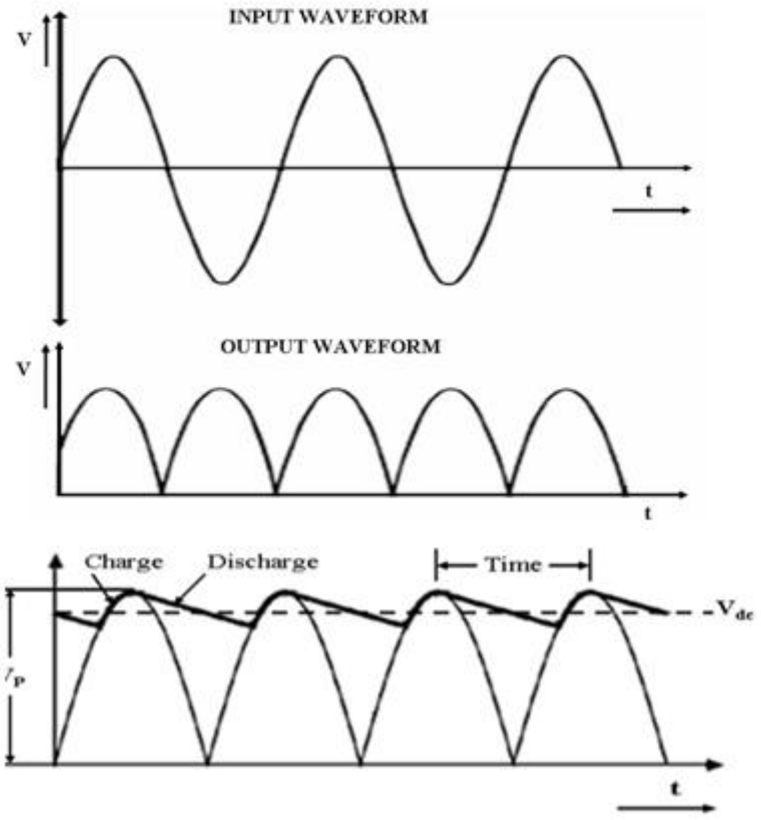
V_m is the peak voltage..

THEORY:

- ✓ A rectifier is an electrical device.
- ✓ It converts alternating current (AC) to direct current (DC).
- ✓ This processis known as rectification.
- ✓ Rectifiers have many uses including as components of power supplies and as detectors of radio signals.
- ✓ Rectifiers may be made of solid state diodes, silicon-controlled rectifiers, vacuum tube diodes, mercury arc valves, and other components.
- ✓ 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 ofthe 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.

MODEL WAVEFORM:



TABULATION:

	AMPLITUDE (V)	TIME PERIOD (mSec)
SINE WAVE		
WITHOUT FILTER		
WITH FILTER		

CALCULATION:

	$V_{rms} = \frac{V_m}{\sqrt{2}}$	$V_{dc} = \frac{2V_m}{\pi}$	$\frac{V_{rms}}{V_{dc}}$	$\left(\frac{V_{rms}}{V_{dc}}\right)^2$	$\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1$	$\gamma = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$
WITHOUT FILTER						
WITH FILTER						

PROCEDURE:

1. Connections are made as per the circuit diagram.
2. Apply AC input to rectifier.
3. The rectifier inputs are absorbed with and without filter.
4. Ripple factor are calculated and tabulated.

RESULT:

Thus the characteristics of a full wave rectifier was studied and the ripple factor was calculated

Ripple factor without filter :

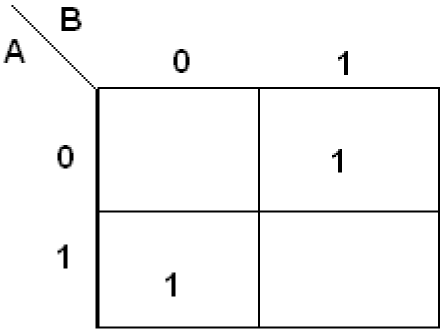
Ripple factor with filter :

HALF ADDER

TRUTH TABLE:

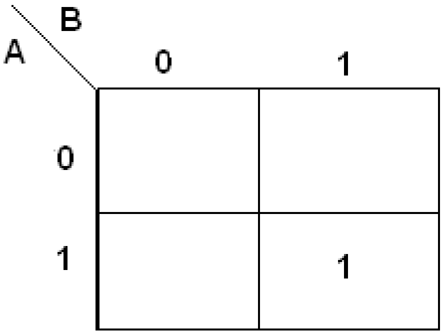
Addend (A)	Augend (B)	Sum (S)	Carry (C)
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

K-Map for SUM:



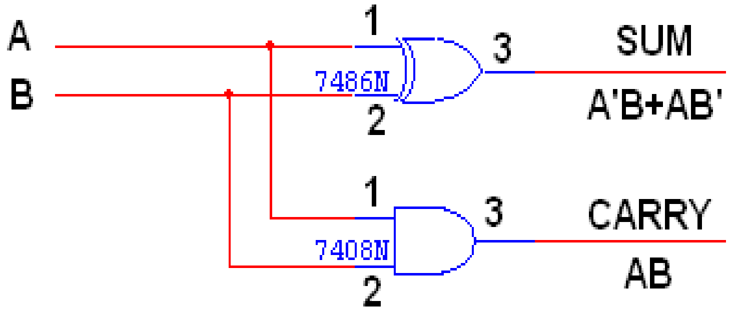
SUM = A'B + AB'

K-Map for CARRY:



CARRY = AB

LOGIC DIAGRAM:



<u>**ADDITIONAL EXPERIMENT**</u>

EXPT NO : 06 **DESIGN AND IMPLEMENTATION OF HALF ADDER**

DATE : **AND HALF SUBTRACTOR USING LOGIC GATES**

AIM:

To design and construct half adder and half subtractor circuits and to verify the truth table using logic gates.

APPARATUS REQUIRED:

SL.NO.	COMPONENT	SPECIFICATION	QUANTITY
1.	AND GATE	IC 7408	1
2.	EX-OR GATE	IC 7486	1
3.	NOT GATE	IC 7404	1
4.	OR GATE	IC 7432	1
3.	IC TRAINER KIT	-	1
4.	PATCH CORDS	-	23

THEORY:

HALF ADDER:

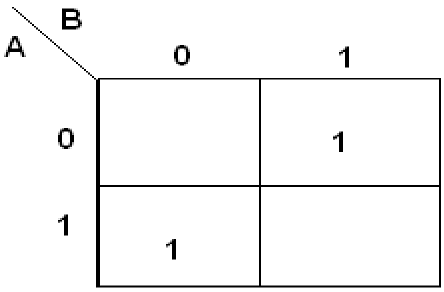
- ✓ A half adder has two inputs for the two bits to be added.
- ✓ It has two outputs one from the sum ‘S’ and other from the carry ‘C’ into the higher adder position.
- ✓ The circuit shown in diagram is called as a carry signal from the addition of the less significant bits sum from the X-OR Gate the carry out from the AND gate.

HALF SUBTRACTOR

TRUTH TABLE:

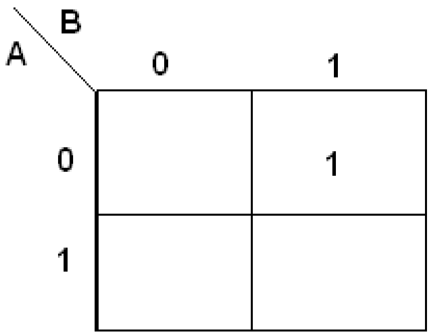
A	B	Borrow	Difference
0	0	0	0
0	1	1	1
1	0	0	1
1	1	0	0

K-Map for DIFFERENCE:



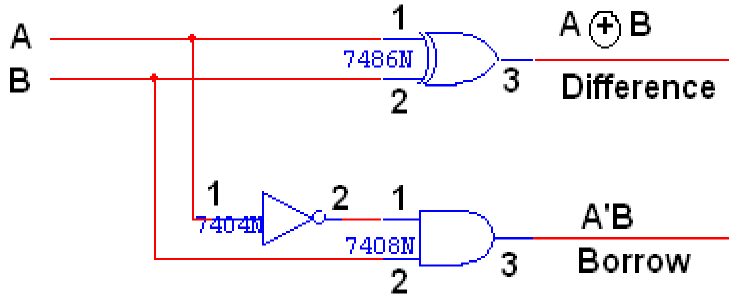
DIFFERENCE = A'B + AB'

K-Map for BORROW:



BORROW = A'B

LOGIC DIAGRAM:



HALF SUBTRACTOR:

- ✓ The half subtractor is constructed using X-OR and AND Gate.
- ✓ The half subtractor has two input and two outputs.
- ✓ The outputs are difference and borrow.
- ✓ The difference can be applied using X-OR Gate, borrow output can be implemented using an AND Gate and an inverter.

PROCEEDURE:

1. Connections are given as per circuit diagram.
2. Logical inputs are given as per circuit diagram.
3. Observe the output and verify the truth table.

RESULT:

Thus the half adder and half subtractor circuits were designed and implemented using logic gates.