Fundamentals of Electrical and Electronics

Semester 1

Department
Of
Electrical Engineering

Neotech Faculty of Diploma Engineering
Department of Electrical Engineering

Name: - _____

Branch: - _____ **Division: -** _____

Roll No: - _____ **Year: -** _____

Subject: Fundamentals of Electrical & Electronics

Subject Code: 4300018

List of Experiments

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2.	Introduction to various Basic Electrical Instruments.			
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4.	To use Cathode Ray Oscilloscope (CRO) and measure RMS Value, peak value and frequency of alternating quantity.			
5.	To Obtain Characteristics of PN Junction Diode Under Forward & Reverse Biased Condition.			
6.	To Study the Half Wave Rectifier and Draw the Input and Output waveforms.			
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9.	To Study the Characteristics of Transistor in Common Base Configuration.			
10.	To Study the Common Emitter Configuration of BJT.			
11.	To Study the Characteristic of LDR.			

Experiment 1 Date: / /

Aim: To Understand Various Electrical Symbols.

Theory:

Graphic symbols are used to denote electrical, electronic and mechanical components and devices. They are used to portray complex schematic and wiring circuit diagrams in a simple manner for conserving space. In order to make the diagrams easier to read, the graphic symbols, in many cases, resemble the actual component or its element. Thus, the graphic symbols serve as effective & precise means of communication, particularly in situations, which involve complex diagrams and devices.

Sr. No.	Particular	Symbols
1	DC supply	
2	AC supply	
3	Battery	
4	Fuse	
5	Resistor	
6	Variable Resistor	
7	Rheostat	
8	Potentiometric Resistor	
9	Inductor (Choke Coil)	
10	Capacitor	

11	Variable Capacitor	
12	Transformer	
13	Auto Transformer	
14	DC Generator	
15	Single Phase AC Generator	
16	Three Phase AC Generator	
17	DC Motor	
18	Single Phase AC Motor	
19	Three Phase AC Motor	
20	P-N Junction Diode	
21	Zener Diode	
22	Light Emitting Diode	
23	N-P-N Transistor	
24	P-N-P Transistor	

25	FET – Field Effect Transistors	
26	Thyristor	
27	Cross Over	
28	Junction	
29	Earthing	
30	Push Button	
31	Lamp	
32	Voltmeter	
33	Ammeter	
34	Watt Meter	
35	Star Connection (With Neutral)	

36	Star Connection (Without Neutral)	
37	Delta Connection	
38	Diac	
39	Triac	
40	Thyristor (SCR)	

Conclusion:

Quiz:

1. Define: EMF, Potential Difference, Current, Power and Energy

Experiment 2 Date: / /

Aim: Introduction to various Basic Electrical Instruments.

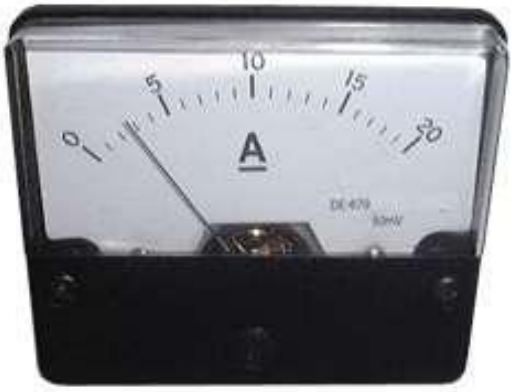
Apparatus:

Demonstration of various instruments like Ammeter, Voltmeter, Wattmeter, Energy Meter, Tachometer, Rheostat, Various Capacitors, Various Resistors, AC and DC Power Supply.

Theory:

AMMETER

Ammeter is employed for measuring of current in a circuit and connected in series in the circuit. As ammeter is connected in series, the voltage drop across ammeter terminals is very low. This requires that the resistance of the ammeter should be as low as possible. The current coil of ammeter has low current carrying capacity whereas the current to be measured may be quite high. So, for protecting the equipment a low resistance is connected in parallel to the current coil and it is known as shunt resistance.



Analog Ammeter

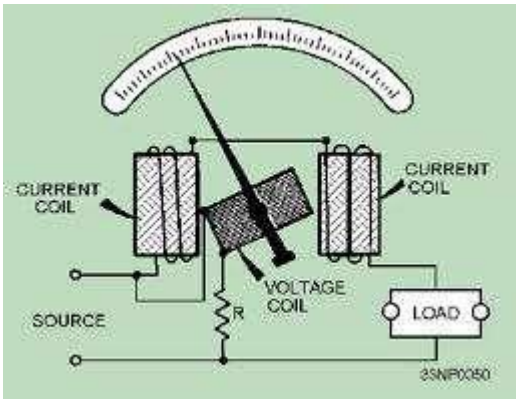
VOLTMETER

Voltmeter is employed to measure the potential difference across any two points of a circuit. It is connected in the parallel across any element in the circuit. The resistance of voltmeter is kept very high by connecting a high resistance in series of the voltmeter with the current coil of the instrument. The actual voltage drop across the current coil of the voltmeter is only a fraction of the total voltage applied across the voltmeter which is to be measured.

Analog voltmeter

WATTMETER

The measurement of real power in AC circuits is done by using an instrument using Wattmeter. The real power in AC circuits is given by expression **VI cos Ø w**here, cos Ø is power factor. A wattmeter has two coils, namely, current coil and pressure coil. The current coil (CC) is connected in series with the load and the pressure coil (PC) is connected across the load. Watt meters are available in dual range for voltages as well as for current



Internal Circuit of Wattmeter

Wattmeter

ENERGYMETER

Energy meter is an instrument which is used to measure the consumption of electric energy in a circuit (DC or AC). It measures energy in kWh. The essential difference between an energy meter and a wattmeter is that the former is fitted with some type of registration mechanism whereby all the instantaneous readings of power are summed over a definite period of time whereas the latter indicates the value at particular instant when it is read.

Energy Meter

TACHOMETER

Tachometer is an instrument to measure the speed in revolutions per minute (r.p.m.). The speed of a rotating shaft is measured by inserting the tapered projected part of the tachometer into the tapered hole in the rotating shaft speed of which is to be measured.

Tachometer

RHEOSTAT

Rheostats are made up of high resistivity material, like, nickel-chromium iron alloy closely wound over a circular tube. These are available both in single tube and double tube. Inter-turn insulation is provided to avoid short circuiting of turns. The tube of rheostat is made of insulating material, like asbestos. These are employed at places where resistance of a circuit is to be varied without breaking the circuit.

Loading Devices

The most commonly used loading devices are (1) lamp Bank (2) loading Rheostat. Lamp Bank load consists of number of lamps connected to form a load. These are suitably connected and controlled by a no. of switches. The switches are provided in a manner so that it should be possible to switch on any required no. of lamps at a time.

A loading rheostat type of load consists of no. of identical resistive elements. These elements are connected in series or parallel. The rheostat is made up of high resistivity material such as like nickel-chromium. The elements of the load can be designed to take 1A, 2A or 4 A of current.

Loading Rheostat

Various Supply System

a. **A.C supply systems:** There are two types of supply.
   I. **Single phase-230V:** In this system we have two wires, one is known as phase/line and the other is neutral. Voltage between them is 230 V.
   ii. **Three phase - 400 V (line to line):** In his system we have three wires, one for each phase or line. In case the fourth wire is there it is neutral. While voltage between two phases/lines is 400 V, between any phase/line and neutral it is 230 V.

b. **DC Supply System:** There are two types of D.C supply system
   I. **From battery:** We use rectifiers for 6V or 12V D.C supply current.
   ii. **From generator**

DC Supply

AC Supply

MULTIMETER

Multimeter is a measuring instrument used to measure the current, voltage and resistance. These can be used to troubleshoot many electrical equipment such as domestic appliances, power supplies etc.

Transformer

A transformer is a static device which consists of two or more stationary electric circuits interlinked by a common magnetic circuit for the purpose of transferring electrical energy between them. The transfer of electric energy takes place from one circuit to another circuit without change in frequency. Transformer may be for stepping up voltage from low to high or stepping down voltage from high to low.

Single Phase Transformer

Auto Transformer

Questions:

1. What are the basic measuring instruments for measuring electrical quantities?
2. What is the working principle of wattmeter and an energy meter?
3. What are the various safety measures to be taken while performing practical work in electrical science lab?
4. Discuss various types of resistors and capacitors?
5. Define the term ideal current and ideal voltage source?

Conclusion:

Experiment 3 Date: / /

Aim: Measure Voltage & Current in a Given Linear Electrical Circuit (Verification of Ohm's Law).

Apparatus:

Power Supply; Ammeter; Voltmeter;
Rheostat; Coil; Connecting Wires & Key

Theory:

Ohm's Law deals with the relationship between voltage and current in an ideal conductor. This relationship states that:

The potential difference (voltage) across an ideal conductor is proportional to the current through it. The constant of proportionality is called the "resistance", R. Ohm's Law is given by:

$$V = I R$$

Where V is the potential difference between two points which include a resistance R. I am the current flowing through the resistance.

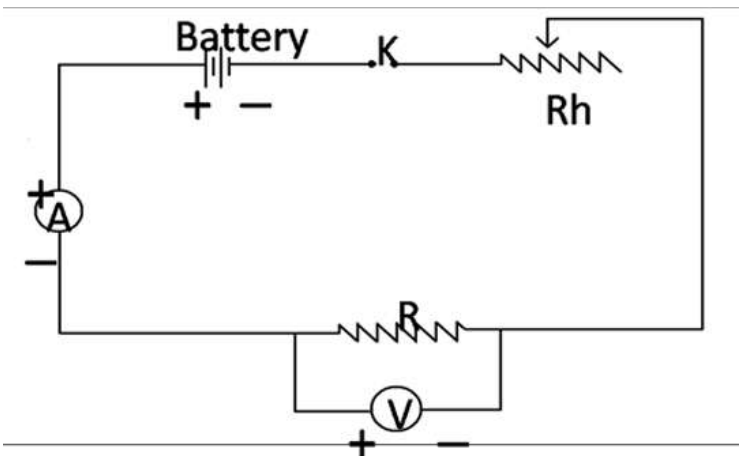
Or

Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points, and inversely proportional to the resistance between them. V, I, and R, the parameters of Ohm's law.

$$I = V / R$$

Ohm's law is among the most fundamental relationships in electrical engineering. It relates the current, voltage, and resistance for a circuit element so that if we know two of the three quantities, we can determine the third. Thus, if we measure the current flowing in a resistor of known value, we can deduce the voltage across the resistance according to V = IR. Similarly, if we measure the voltage across a resistor and the current through it, we calculate the resistance of the element to be R = V/I. Not only does this reduce the number of measurements that must be made, it also provides a way to check the results of several different measurement methods.

Circuit Diagram:



Procedure:

1. Connect the battery eliminator, ammeter, the given coil, rheostat and key (if necessary) in series.
2. The voltmeter is connected in parallel connection across the given coil. The circuit is closed.
3. Now the rheostat is adjusted so that a constant current flows through the coil. Note down the ammeter reading I and the corresponding potential difference across the coil in the voltmeter as ***V.*** Use the formula to calculate the resistance of the coil.
4. The experiment is repeated for different values of current and the corresponding potential difference is noted. Calculate the value in each trial. These values will be found to be a constant.
5. Thus verifying Ohm's law.

Observation Table:

Sr. No.	Ammeter reading I (ampere)	Voltmeter reading V(volt)	Resistance of coil R= V/ I (ohm)
1			
2			
3			
4			
5			

Calculation:

V=IR

I=V/R

R=V/I

Conclusion:

Experiment 4 Date: / /

Aim: To use Cathode Ray Oscilloscope (CRO) and measure RMS Value, peak value and frequency of alternating quantity.

Apparatus:

Power Supply; CRO; Connecting Wires & Key

Theory:

A CRO is basically a very fast X – Y plotter. It displays an input signal verses another signal or verses time. The heart of CRO is the Cathode Ray Tube (CRT). The rest of the instrument consists of circuitry necessary to operate the CRT.

1) **Cathode Ray Tube:** The schematic diagram of a CRT along with its control circuit as shown in figure-1. It consists of three basic components
2) **The Electron Gun:** It produces a sharply focused beam of electrons accelerated to a very high velocity.
3) **The Deflection system:** It deflects the electrons both in the horizontal and vertical planes, electro statically in accordance with the waveform to be displayed.
4) **The Fluorescent screen:** It is the screen upon which the beam of electrons impinges to produce the spot of visible light.

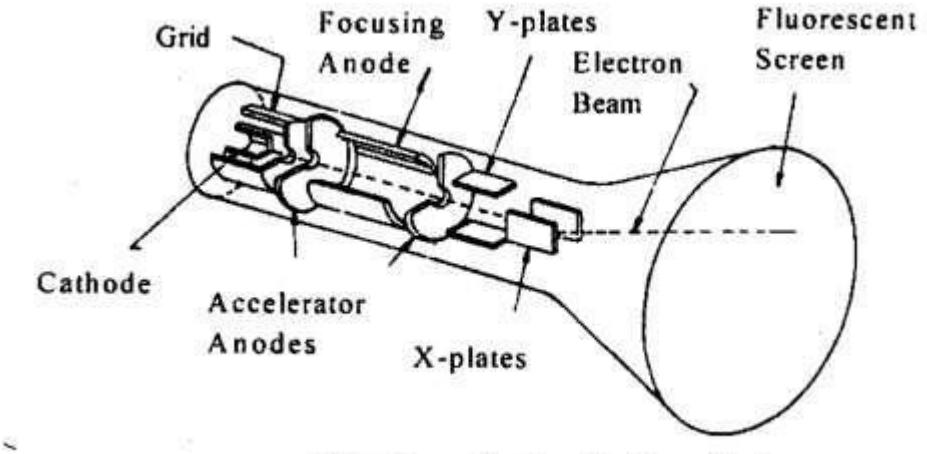
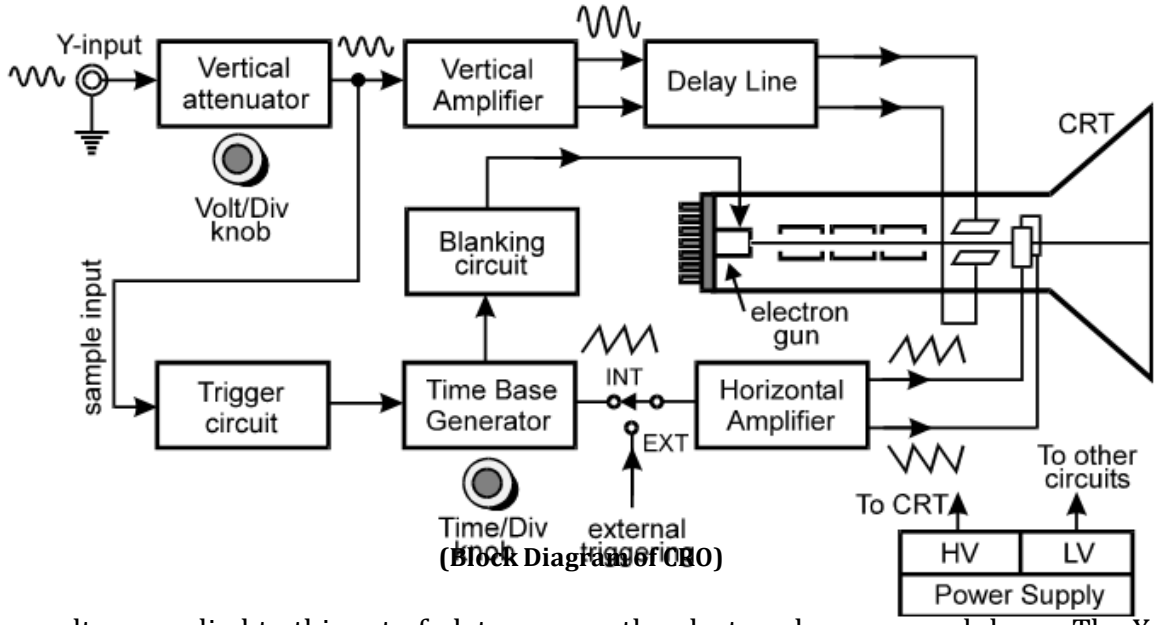


Fig. 1 Cathode Ray Tube

These three components of CRT are put inside a highly evaluated funnel shape glass envelope. The large end of this tube is coated on the inside with a phosphor material which fluoresces when high velocity electron strikes it. When the electron beam strikes the screen, it gives out visible light. Secondary emission electrons are also released. These electrons are collected by the conducive coating deposited on the inside surface of the glass bulb. The coating is an aqueous solution of graphite known as aquatic, which is electrically connected to the final anode as shown in figure 1. The electron gun fires electrons at a very high speed. These electrons are emitted from the hearted cathode. The electron grid is a nickel cylinder surrounding the cathode. It has a small hall in the far end through which the emitted electrons can get pass the grid. The control grid controls the number of electrons passing through it. Since the brightness of the spot on the face of the screen depends upon the beam intensity. It can be control by changing the negative bias on the control grid. The electrons coming out of the control grid are accelerated by the high potential applied to the accelerating anode.

This beam passes through the deflection system consisting of two pairs of parallel plates. As shown in figure -2 the Y deflection plates are placed horizontally in the tube.



(Block Diagram of CRO)

Any voltage applied to this set of plates moves the electron beam up and down. The X deflection plates are kept vertically. Any voltage applied to this set of plates moves the spot on the screen to the left or to the right. If no voltage is applied to either set of plates, the spot should locate at center of the screen. The initial centering of the spot can be done by using the X shift and Y shift controls. The block diagram of CRO shows the various subsystems as follows:

1) The vertical deflection system.
2) The horizontal deflection system including the time–base generator & Synchronization circuit.
3) The Cathode Ray Tube (CRT).
4) The high voltage and low voltage power supply.

Front Panel Control of a General Purpose CRO:

1) **Power ON:** Puts the instrument to main supply with LED indication.
2) **Focus:** This is adjusted with the conjunction with the intensity and astigmatism controls for obtaining sharpest trace on the screen.
3) **Intensity:** This is the brightness control which is adjusted for the desired brightness level of trace.
4) **Horizontal And Vertical Shift:** Horizontal and vertical position controls apply bias voltages to the horizontal and vertical deflection plates respectively and thereby bring the trace to the desired position on the screen.
5) **Vertical Gain:** This is a potentiometer which continuously variable over each range of the vertical attenuator.
6) **Horizontal Gain:** This is a potentiometer which provides continuous control of the amplitude of the signal coupled to the horizontal amplifier. In normal use the horizontal trace on a CRT is adjusted to four fifth of the CRT diameter.
7) **Vertical Range or Multiplier or Selector:** This is calibrated step attenuator which selects the multiplier of vertical deflection of the beam of a voltage divider in the vertical input circuit. In controls the extent.
8) **Level:** Variable control, selects the trigger point on the displayed waveform.
9) **Auto/Norm:** In Auto mode trace is displayed in absence of any input signal. The display is then automatically triggered for signals above 30 Hz depending upon correct setting of Trigger LEVEL.

10) Int/ Ext:
Int: Display triggers from signals derived from CH1, CH2 or line.
Ext: Triggering from any other external source fed through EXT TRIG BNC socket.
11) Line: Triggers from power line frequency.
12) Horizontal Range or Multiplier or Selector*:* This is calibrated step attenuator which selects the multiplier of a time divider in the horizontal input circuit.
13) Synchronous S e l e c t o r : This is a rotary switch selects either internal, external or line
synchronization.

Application of CRO:

1) Study of voltage and current waveform.
2) Measurement of AC and DC voltage.
3) Measurement of currents.
4) Measurement of frequency.
5) Examination of heartbeats.

Conclusion:

Questions:

1) Write down applications of CRO?
2) Give full form of CRO.
3) Explain vertical and horizontal gain of CRO?

Experiment No: - 5 Date: / /

Aim: To Obtain Characteristics Of PN Junction Diode Under Forward & Reverse Biased Condition.

Apparatus:

Power Supply	**(0-10V)**	**1**
Ammeter	**(0-10mA)**	**1**
	(0-50µA)	**1**
Voltmeter	**(0-1V)**	**1**
	(0-10V)	**1**

Theory:

Construction of P-N Junction Diode:

It is a two terminal device consisting of PN junction formed either in Ge (Germanium) or Si (Silicon) crystal. Its circuit symbol is shown in fig (I).The P and N type are referred to as anode and cathode respectively. In fig (II), arrow head indicates the conventional direction of current flow when forward biased. It is the same direction in which hole flow take place.

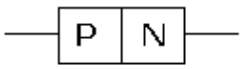


Fig.(I)

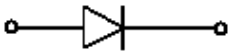


Fig.(II)

Zero External Voltage:

When the external voltage is zero, i.e. circuit is open; the potential barrier at the junction does not permit current flow. Therefore, the circuit current is zero.

Forward Bias:

With forward bias to the *p-n* junction i.e. p-type connected to positive terminal and n-type connected to negative terminal, the potential barrier is reduced. At some forward voltage (0.7 V for Si & 0.3 V for Ge), the potential barrier is altogether eliminated and current starts flowing in the circuit. From now onwards, the current increases with the increase in forward voltage. In the forward characteristic, at first the current increases very slowly and the curve is non-linear. It is because the external applied voltage is used up in overcoming the potential barrier. Once the external voltage exceeds the potential barrier voltage, the PN junction behaves like an ordinary conductor. Therefore, the current rises very sharply with increase in external voltage and the curve is almost linear.

Reverse Bias:

With reverse bias to the PN junction i.e. p-type connected to negative terminal and n-type connected to positive terminal, potential barrier at junction is increased. Therefore, the junction resistance becomes very high and practically no current flows through the circuit. However, in practice, a very small current (of the order of µA) flows in the circuit with reverse bias condition. This current is

semiconductor atoms. At this breakdown of the junction occurs, characterized by a sudden rise of reverse current and a sudden fall of the resistance of barrier region. This may destroy the junction permanently.

Applications:

- As power or rectifier diodes they convert A.C. current in to D.C. current for dc Power supplies of electronic circuits.
- As signal diodes in communication circuits form Modulation & Demodulation of Small signals.
- As Zener diode in voltage stabilizing circuits.
- As Varactor diodes for use in voltage controlled tuning circuits as may be found in radio & TV receivers. For this purpose, the diode is deliberately made to have a certain range of junction capacitance.

Procedure:

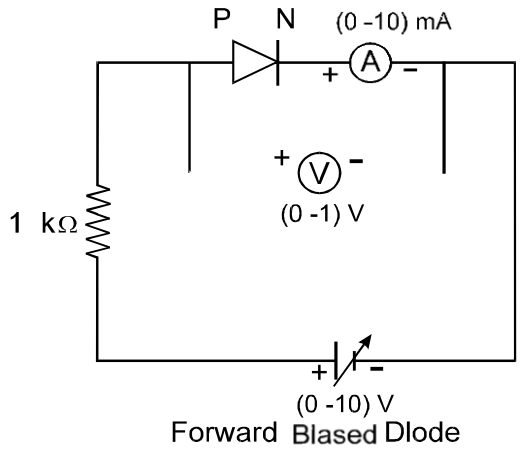
Forward Biasing

- Connect the circuit as per the circuit diagram.
- Vary the power supply voltage in such a way that the readings are taken in steps of 0.1V in the voltmeter till 1V.
- Note down the corresponding ammeter readings.
- Plot the graph Current V/S Voltage.

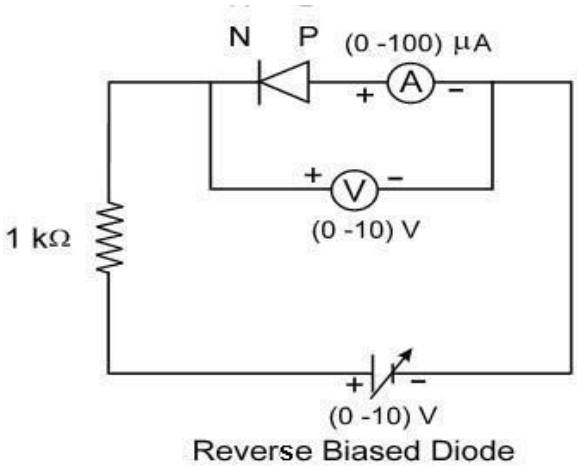
Reverse Biasing

- Connect the circuit as per circuit diagram.
- Vary the power supply voltage in such a way that there adding are taken in steps of 1.0V in the voltmeter till 10V.
- Note down the corresponding ammeter readings. O Plot the graph Current V/S Voltage.

Circuit Diagram:



Forward Blased Dlode



Reverse Biased Diode

Observation Table:

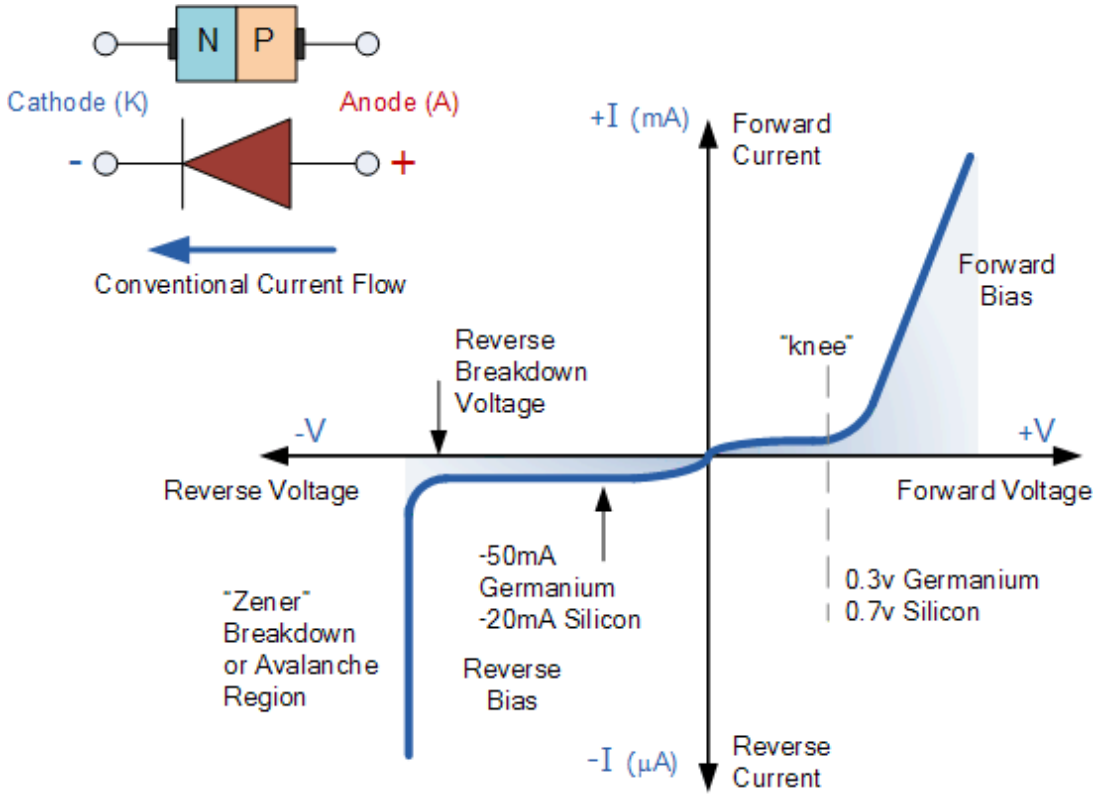
Forward biased Characteristics

Sr. No.	Voltage (V)	Anode Current (mA)
1.		
2.		
3.		

Reverse biased Characteristics

Sr. No.	Voltage (V)	Anode Current (µA)
1.		
2.		
3.		

Graph:



Conclusion:

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Questions:

1. Why is Silicon Preferred over Germanium in the manufacture of Semiconductor devices?
2. Why the Temperature Coefficient of Resistance of Semiconductor is negative?
3. What do you mean by Donor and Acceptor impurities?

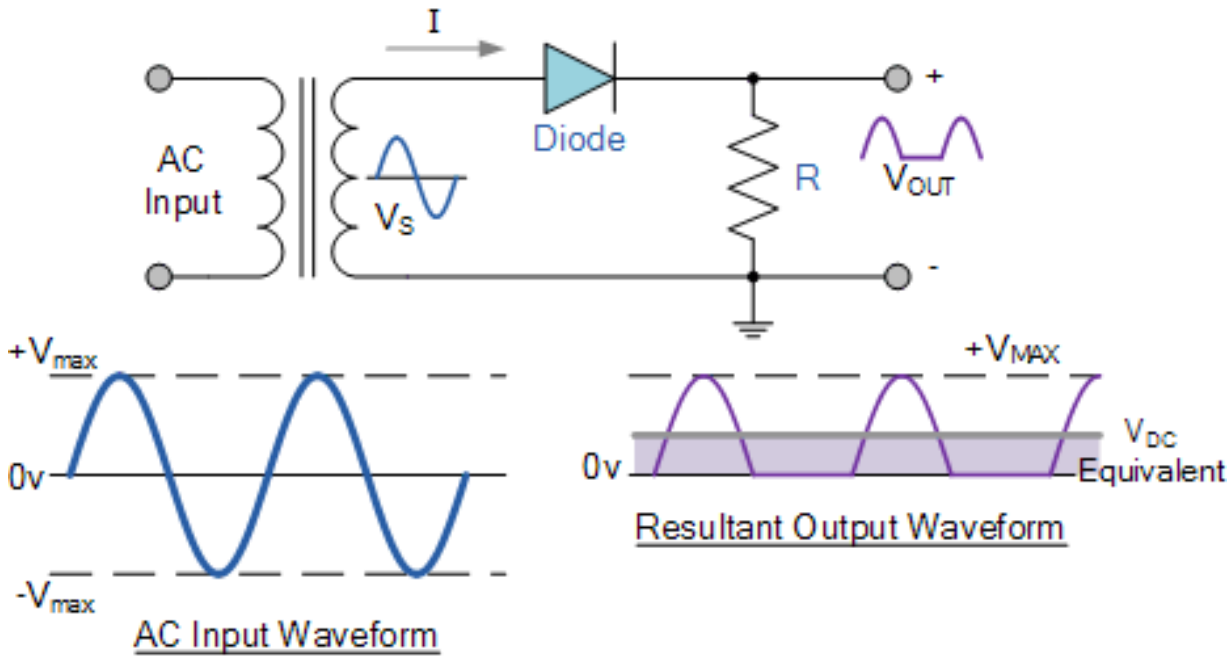
Experiment No: - 6 **Date: / /**

Aim: To Study the Half Wave Rectifier and Draw the Input and Output waveforms.

Apparatus:

- Step down transformer 230 V/ 12-0-12 V, 500mA
- Digital Multi meter
- Trainer kit
- Dual trace CRO
- Carbon resistors
- Patch cords etc.

Circuit Diagram:



Theory:

A rectifier converts alternating current in to direct current. When a PN junction diode is forward biased, it offers very low resistance and allows the current to flow through it very easily. When it is reverse biased, it offers very high resistance. So very little reverse current flows. In half wave rectifier circuit, one diode is connected in series with the load. Current flows through the load only during the positive half cycles when the anode is positive w.r.t. cathode. Current is blocked during the negative half cycles. Since current flows only during half cycle it is called a half wave rectifier. The relation between A.C. input voltage and D.C. output voltage is Edc = Em / π and the value of the ripple factor is 1.21. The ripple frequency is equal to that of the supply frequency. The maximum value of the rectification efficiency is 40.6%

Procedure:

1. Connect the circuit of half wave rectifier as shown in the block diagram.
2. Switch on the supply.
3. Observe the waveforms of A.C. input voltage across AB and D.C. output voltage across CD. Draw the waveforms.
4. Measure the A.C. input voltage across AB and D.C. output voltage across CD with the help of multi meter. Record the readings.
5. Switch off the supply.
6. Make necessary calculations.

Conclusion:

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Questions:

1. Definition: Rectifier
2. Write definition & equation for Ripple frequency.
3. Write use of transformer.

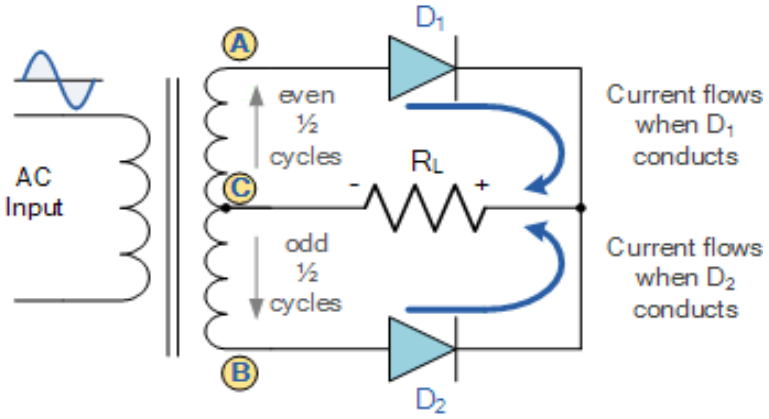
Experiment No: - 7 **Date: / /**

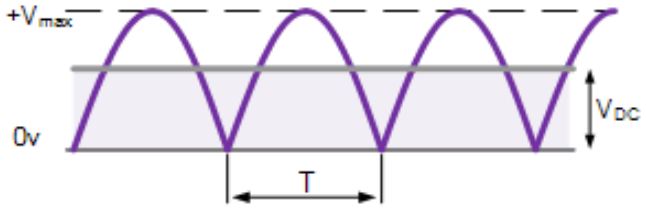
Aim: To Study The Full Wave Rectifier And Draw The Input And Output Waveforms.

Apparatus:

- Step down transformer 230 V/ 12-0-12 V, 500mA
- Digital Multi meter
- Trainer kit
- Dual trace CRO
- Carbon resistors
- Patch cords etc.

Circuit Diagram:

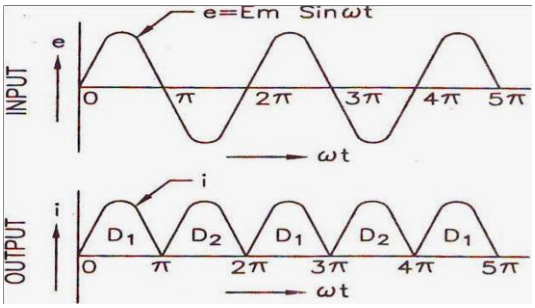




Resultant Output Waveform

Theory:

A rectifier converts alternating current in to direct current. When a PN junction diode is forward biased, it offers very low resistance and allows the current to flow through it very easily. When it is reverse biased, it offers very high resistance. So very little reverse current flows. In full wave rectifier circuit a transformer having center tapping in secondary windings and two diodes are required. Two equal voltages out of phase by 180^0 w.r.t. the center tape are available at the outer terminals. Two diodes are connected as shown in the block diagram. One diode conducts during positive half cycle and another diode conducts during the negative half cycle. So full wave rectified pulses are available at the load. Relation between A.C. input voltage and D.C. output voltage is given by $E_{dc} = 2 \times Em / \pi$. The ripple factor is 0.48. The ripple frequency is twice the supply frequency. The maximum value of the rectification efficiency is 81.2 %.



Procedure:

1. Connect the circuit of half wave rectifier as shown in the block diagram Switch on the supply.
2. Observe the waveforms of A.C. input voltage across AB and D.C. output voltage across CD. Draw the waveforms.
3. Measure the A.C. input voltage across AB and D.C. output voltage across CD with the help of multi meter. Record the readings.

Conclusion:

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Questions

1) Write definition and equation for ripple frequency & rectification efficiency.
2) Write definition for peak inverse voltage.

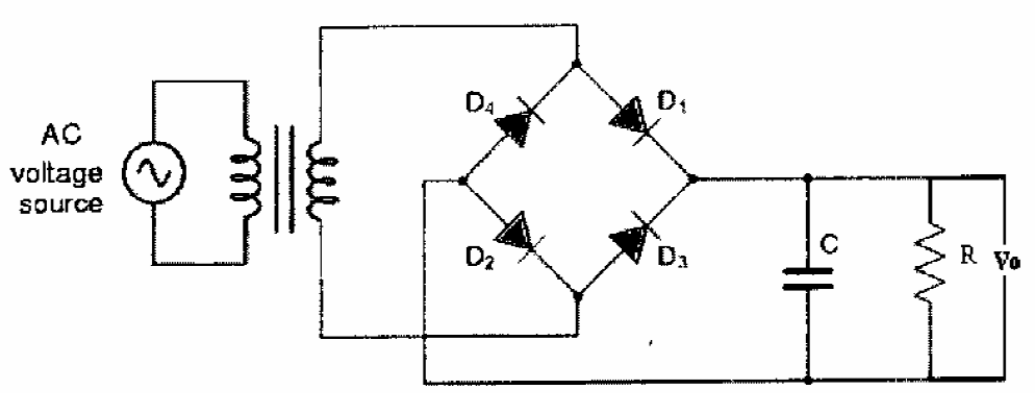
Experiment No: - 8 **Date: / /**

Aim: To Study The Full Wave Bridge Rectifier And Draw The Input And Output Waveforms.

Apparatus:

- Transformer 6-0-6 V
- Resistance 470 Ω
- Capacitor 470 µF
- Diode IN4001
- Bread board
- Connecting wires.

Circuit Diagram:



Theory:

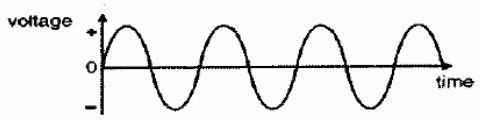
A device is capable of converting a sinusoidal input waveform into a unidirectional waveform with non-zero average component is called a rectifier. The Bridge rectifier is a circuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier has four diodes connected to form a Bridge. The load resistance is connected between the other two ends of the bridge. For the positive half cycle of the input ac voltage, diode D1 and D3 conducts whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL For the negative half cycle of the input ac voltage, diode D2 and D4 conducts whereas diodes D1 and D3 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL in the same direction as in the previous half cycle. Thus a bidirectional wave is converted into a unidirectional wave.
Ripple factor is an indication of the effectiveness of the filter and is defined as

$$R = V_{r(pp)} / V_{dc}$$

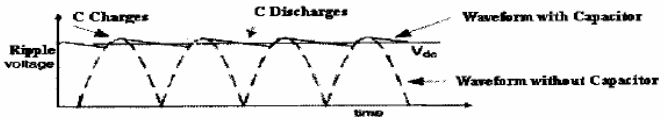
Where $V_{r(pp)}$ = Ripple voltage
V_{dc} = Peak rectified voltage.

The ripple factor can be lowered by increasing the value of the filter capacitor or increasing the load capacitance.

Waveforms:



Input Waveform



Resultant Output Waveform

Procedure:

1. Connections are given as per the circuit diagram without capacitor.
2. Apply AC main voltage to the primary of the transformer. Feed the rectified output voltage to the CRO and measure the time period and amplitude of the waveform.
3. Now connect the capacitor in parallel with load resistor and note down the amplitude and time period of the waveform.
4. Measure the amplitude and time period of the transformer secondary (input waveform) by connecting CRO.
5. Plot the input, output without filter and with filter waveform on a graph sheet.
6. Calculate the ripple factor.

Conclusion:

Experiment No: - 9 **Date: / /**

Aim: To Study The Characteristics Of Transistor In Common Base Configuration.

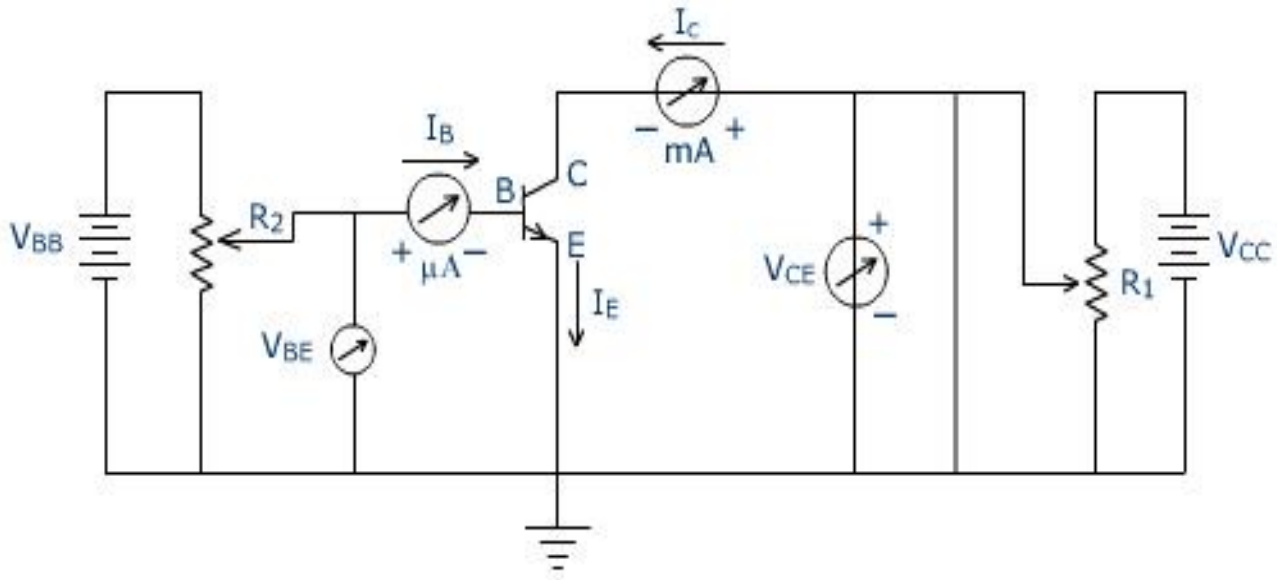
Apparatus:

- Transistor
- Resistance
- Regulated power supply
- Ammeter
- Voltmeter
- Bread board and connecting wires

Introduction:

Bipolar junction transistor (BJT) is a 3 terminal (emitter, base, and collector) semiconductor device. There are two types of transistors namely NPN and PNP. It consists of two P-N junctions namely emitter junction and collector junction. In Common Emitter configuration the input is applied between base and emitter and the output is taken from collector and emitter. Here emitter is common to both input and output and hence the name common emitter configuration. Input characteristics are obtained between the input current and input voltage taking output voltage as parameter. It is plotted between V_{BE} and I_B at constant V_{CE} in CE configuration. Output characteristics are obtained between the output voltage and output current taking input current as parameter. It is plotted between V_{CE} and I_C at constant I_B in CE configuration. Base is made common. I/P is connected between base & emitter and O/P is taken between base & collector.

Circuit Diagram:



Procedure:

Input Characteristics:

a) Make the connection as per circuit diagram.
b) Switch 'ON' the supply & set V = 0V
c) Vary V in step & note down the emitter current I at each step.
d) Set V = 1V & again repeat the same procedure.
e) Draw the graph.

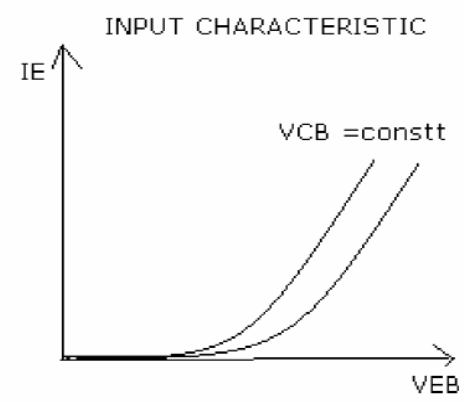
Output Characteristics:

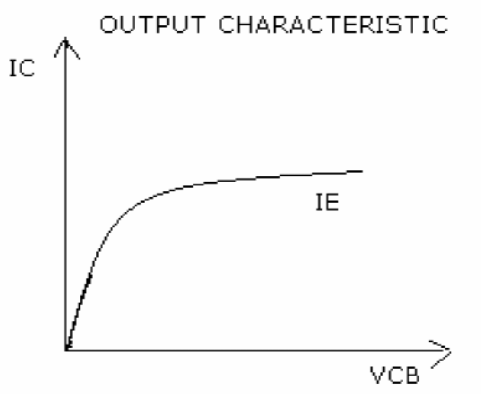
a) Make the connection as per circuit diagram.
b) Set the value of I = 1mA
c) Vary V in step & note down the collector current I at each step.
d) Set I = 2mA & repeat the same procedure.
e) Draw the graph.

Observation Table:-

Sr. No.	Input Characteristics (V_{cb}=Cons.)		Output Characteristics (I_e = Const.)	
	I_e (mA)	V_{eb} (Volts)	I_c (mA)	V_{cb} (Volts)
1				
2				
3				

Graph:





Conclusion:

_____
_____
_____
_____

Experiment No: - 10 **Date: / /**

Aim: To Study The Common Emitter Configuration of BJT.

Apparatus:

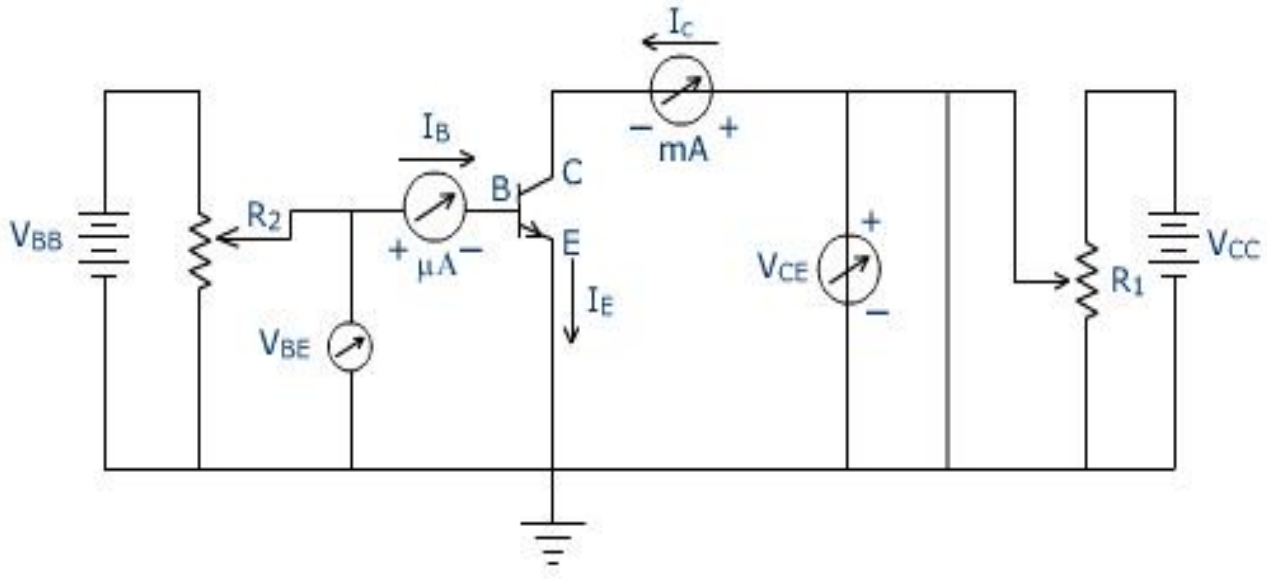
- Transistor
- Resistance
- Regulated power supply
- Ammeter
- Voltmeter
- Bread board and connecting wires

Theory:

The CE amplifier is a small signal amplifier. This small signal amplifier accepts low voltage ac inputs and produces amplified outputs. A single stage BJT circuit may be employed as a small signal amplifier; has two cascaded stages give much more amplification.

Designing for a particular voltage gain requires the use of an AC negative feedback to stabilize the gain. For good bias stability, the emitter resistor voltage drop should be much larger than the base -emitter voltage. And Re resistor will provide the required negative feedback to the circuit. CE is provided to provide necessary gain to the circuit. All bypass capacitors should be selected to have the smallest possible capacitance value, both to minimize the physical size of the circuit for economy. The coupling capacitors should have a negligible effect on the frequency response of the circuit.

Circuit Diagram:



Procedure:

Input Characteristics:

a) Keep emitter - collector voltage constant.
b) Vary collector-base voltage in steps and note down base reading.
c) Readings are tabulated and graph is drawn

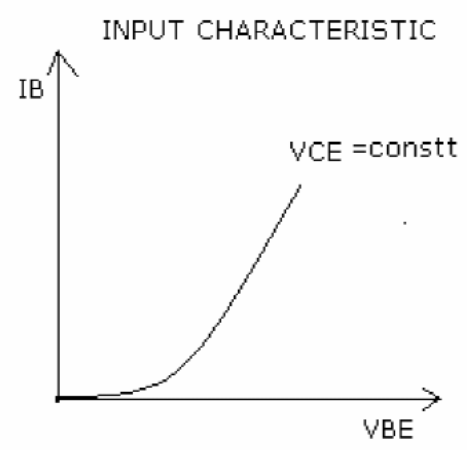
Output Characteristics:

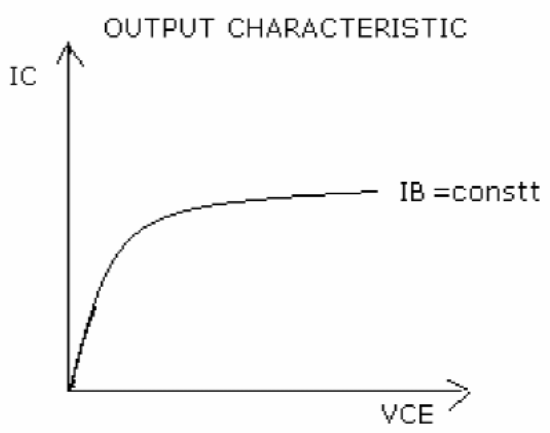
a) Keep base current constant
b) Vary collector-emitter voltage in steps and note down emitter current
c) Readings are tabulated and graph is drawn

Observation Table:-

Sr. No.	Input Characteristics (V_{cb}=Cons.)		Output Characteristics (I_e = Const.)	
	I_e (mA)	V_{eb} (Volts)	I_c (mA)	V_{cb} (Volts)
1				
2				
3				

Graph:





Conclusion:

Experiment No: - 11 **Date: / /**

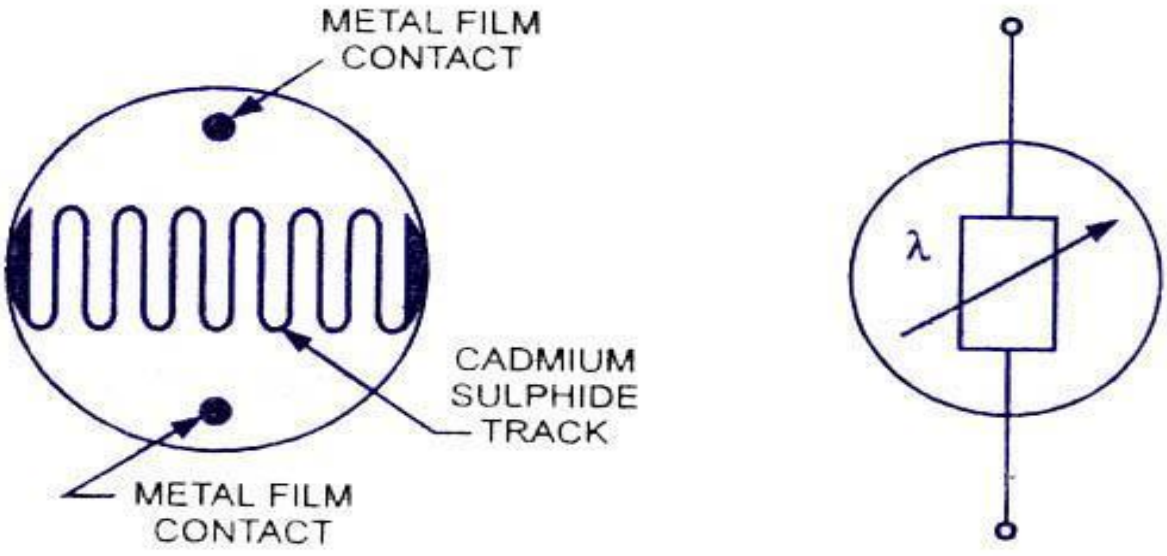
Aim: To Study The Characteristic of LDR.

Apparatus:

- Lamp post with 60W, 250 V lamp.
- Ammeter (0-5 mA).
- Voltmeter (0-10 V)
- 100 cm wooden scale
- Patch cords etc.

Theory:

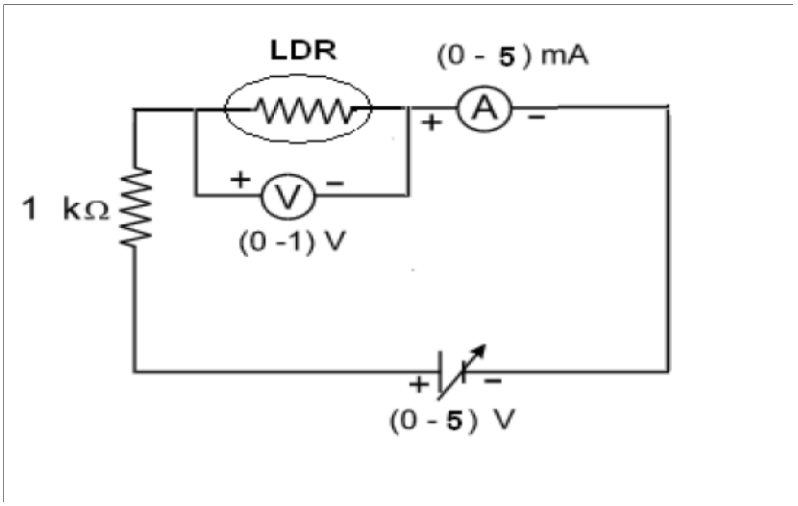
LDR is light dependent resistor. It is also known as the photo conductive cell. Its conductivity increases (i.e. resistance decreases) with the increase in intensity of light falling on its surface. When photon having sufficient energy collides with the photoconductive material and if this energy is more than the forbidden gap, covalent bonds are broken in the valance band. Electron hole pairs are generated. Electrons go to the conduction band from the valance band. So there is increase in the conductivity due to the number of charge carriers. The conductivity increases (resistivity decreases) with the increase in the intensity of light. Cadmium sulphide, lead sulphide, Cadmium selenide are used as the material of LDR.



(a) Basic Structure *(b) Symbol*

LDR

Circuit Diagram:



Procedure:

1. Arrange LDR and scale as shown in the diagram.
2. Connect the DMM (Digital multi meter) across the LDR leads. Keep function switch of DMM
   to measure resistance.
3. First to measure the dark resistance of LDR, prevent ambient light falling on the LDR by covering its surface by handkerchief
4. Now switch on the lamp and take the readings of the resistance and the distance between
   the lamp and LDR in steps of 2cms and note down the readings.
5. Plot the graph of resistance(in ohms)v/s distance between LDR and LAMP

Conclusion:

_____
_____
_____
_____

Questions:

1. Working principle of photo conductive cell.
2. What is Dark Resistance?
3. Write types & application of LDR.
4. Write Advantages & Disadvantages of LDR.