

M.B.M. UNIVERSITY JODHPUR



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BASIC ELECTRONICS LAB ECE 176B LABORATORY

NAME RIDHI MULCHANDANI

M.E./B.E. (1st YEAR) SECTION D-4/EE/10 E/

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Date.....Experiment No.....P.No.....

Name Ridhi M......Faculty No.....Class.....Batch.....

S.No.	Experiment	Date	Page No.	Sign
1. (a)	Study of passive components:- Resistors, Capacitors and Inductors	6/2/24.	1-16	
2. (b)	Study of V & I characteristics of diode in forward bias.	14/2/24	17-19	
3.	Study of V & I characteristics of diode in reverse bias.	14/2/24	20-21	
4.	Study of the V & I characteristics of diode in L.E.D.	14/2/24	22-24	
5.	Study the V & I characteristics of Zener diode.	14/2/24.	25-26	



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1. The first part of the paper is devoted to a general introduction to the subject of the paper.

2. The second part of the paper is devoted to a detailed discussion of the various aspects of the problem.

3. The third part of the paper is devoted to a summary of the results obtained in the previous sections.

4. The fourth part of the paper is devoted to a discussion of the implications of the results for the theory of the subject.

5. The fifth part of the paper is devoted to a conclusion and a list of references.



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Date.....Experiment No.....P.No.....

Name Ridhi Mulchandani Faculty No.....Class.....

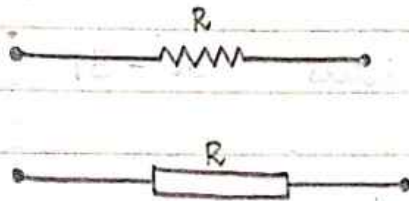
S.No.	Experiment	Page No.	Date	Sign
6.	Study the characteristics of B.J.T.	27 - 29	21/2/24	
7.	Study the characteristics of F.E.T.	30 - 31	21/2/24	
8.	Study the characteristics of S.C.R.	32 - 35	28/2/24	
9.	Study of C.R.O and its operations	36 - 41	6/3/24	
10.	Study the characteristics of half wave rectifier.	42 - 45	6/3/24	
11.	Study the characteristics at full wave rectifier using centre tap transformer.	46 - 49	6/3/24	
12.	Study the characteristics of bridge rectifier using diodes and transformer without ^{centre} tap.	50 - 53	13/3/24.	

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Date: Experiment No:
Name: Faculty No: Class: P.No:



Fixed Resistor



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Date 6/2/24 Experiment No. 1-(A) P.No. 1

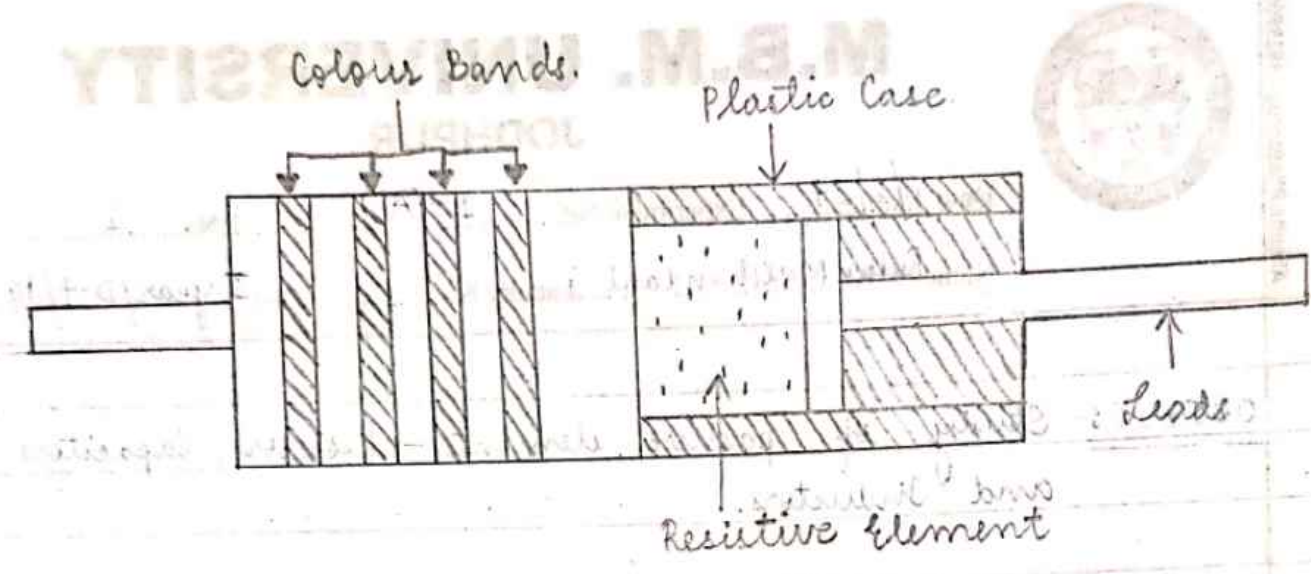
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBJECT:- Study of passive elements - Resistors, Capacitors and Inductors.

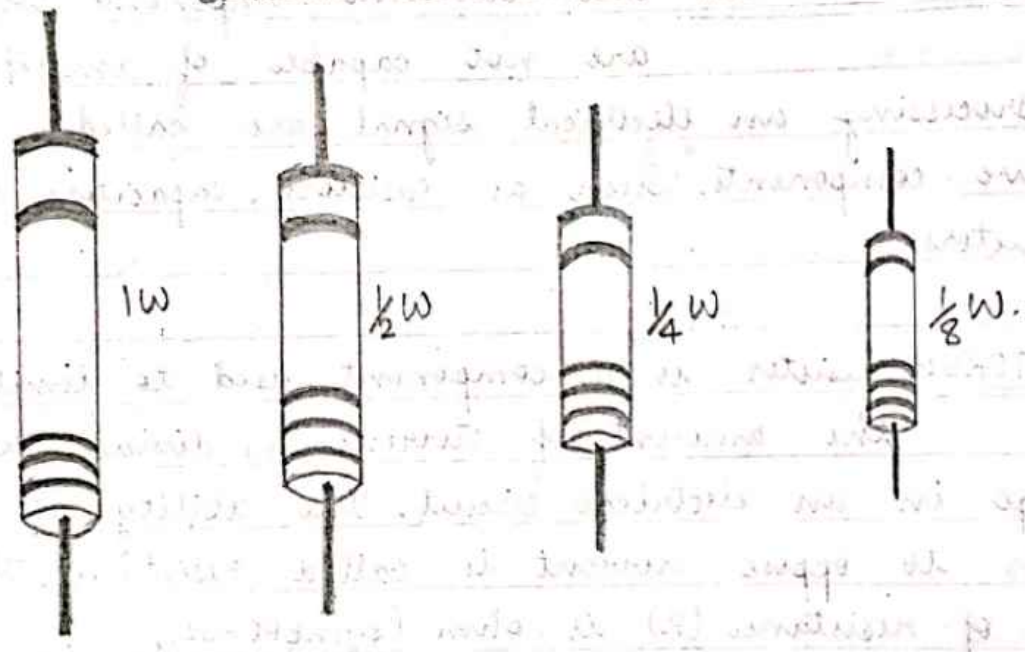
PASSIVE COMPONENTS:- The electronic components which are not capable of amplifying or processing an electrical signal are called passive components. Such as resistors, capacitors and Inductors.

RESISTORS:- Resistor is a component used to limit the amount of current or divide the voltage in an electrical circuit. The ability of a resistor to oppose current is called resistance. The unit of resistance (R) is ohm (symbol- Ω).

TYPES OF RESISTORS:- The resistors having wide range of resistance of resistance are available, the power rating may be $\frac{1}{10}$ W to as high as several hundred watts. The voltage R selected to obtain a desired current I and voltage drop IR in the circuit. At the same time wattage of the resistor



CARBON COMPOSITION RESISTOR





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Date 6/2/24 Experiment No. 1 - (A) P.No. 2

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is selected so that it can dissipate the heat losses without overheating itself. Too much heat may burn the resistor.

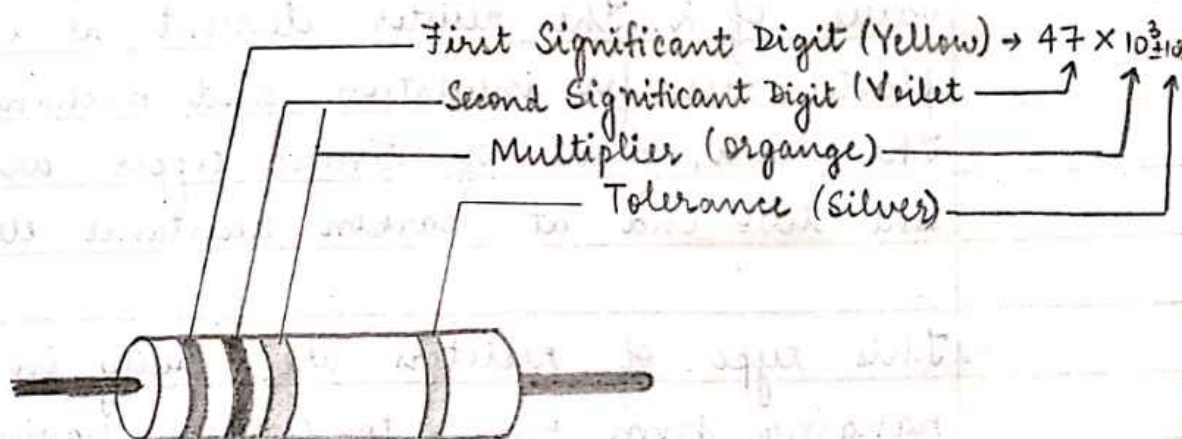
FIXED RESISTORS:- The resistors which have fixed value of resistance are called fixed resistor. These may be of two types:

1. CARBON-COMPOSITION RESISTORS:- Most common in electric circuits are carbon resistors with a low power rating (2W or less). This type of resistor is made of carbon or graphite and clay. The two materials are mixed needed for the desired value of R . The resistor element is enclosed in a plastic case for insulation and mechanical strength. The leads, made of tinned copper are joined to the two end at carbon resistance element.

This type of resistors are readily in values ranging from one Ω to 22 $M\Omega$, having a tolerance range of 5 to 20%. The power rating is generally



Colour	Significant Digits	Multiplier	Tolerance
Black	0	$10^0 = 1$	-
Brown	1	$10^1 = 10$	-
Red	2	$10^2 = 100$	-
Orange	3	$10^3 = 1000$	-
Yellow	4	$10^4 = 10000$	-
Green	5	$10^5 = 100000$	-
Blue	6	$10^6 = 1000000$	-
Violet	7	$10^7 = 10000000$	-
Gray	8	$10^8 = 100000000$	-
White	9	$10^9 = 1000000000$	-
Gold	-	$10^{-1} = 0.1$	$\pm 5\%$
Silver	-	$10^{-2} = 0.01$	$\pm 10\%$
No colour	-	-	$\pm 20\%$



Arrangement of colour coding band.



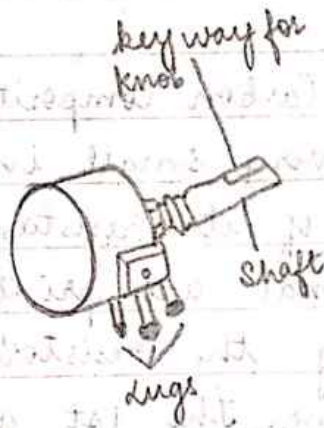
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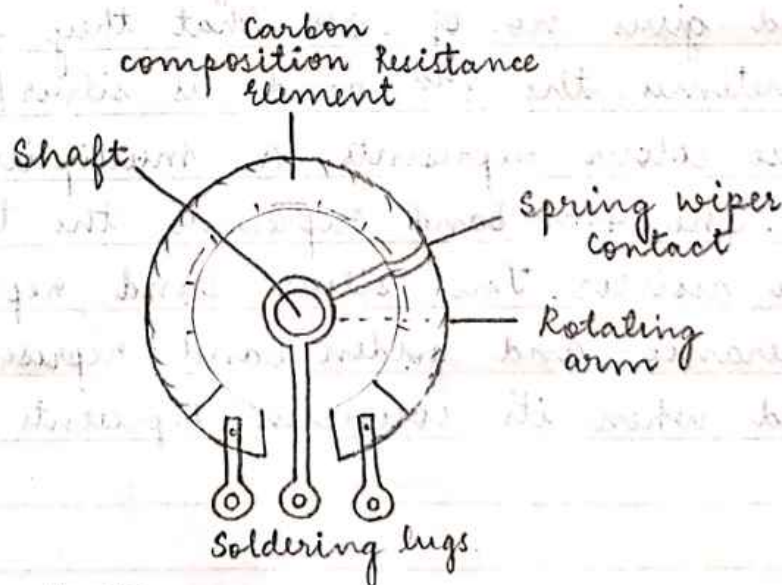
Date 6/2/24 Experiment No. 1 - (A) P.No. 3
Name Ridhi Mulchandani Faculty No. Class I-year/D-4/10

$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ or 1 W. The relative size of resistors with higher wattage increases, the other variety of carbon composition resistors is film type resistors.

RESISTOR COLOUR CODING:- Carbon Composition resistors are very small in size so print and read the value of its resistance is very difficult, so colour bands are printed on it. This system of representing the resistor's resistance is known as colour coding. The 1st and 2nd band represents the 1st and 2nd significant digits of the resistance value respectively. The 3rd band is multiplier and gives no. of zeros that they follow 2nd digits. Sometimes the 3rd band is silver/golden than these colour represents a multiplier factor of 0.01 and 0.1. The 4th band represents the tolerance and of the resistor. The silver band represents $\pm 10\%$ tolerance and golden band represents 5% tolerance and when it's colourless represents $\pm 20\%$ tolerance.



(a) External View



(b) Internal View



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Name Ridhi Mulchandani Faculty No. _____ Class I year/D-4/10

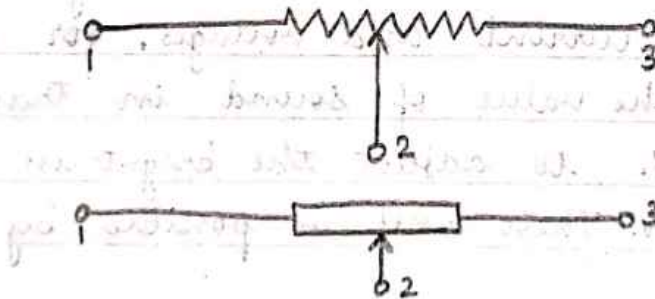
In wire wound resistors, the 1st band is of double the width as compared to the rest of the bands. For the wounded resistors with radial, the colour coding system used is called body-end-dot system.

VARIABLE RESISTORS:- Sometimes in electronic circuits it becomes necessary to adjust the value of current and voltages, for example to change the value of sound in transistor radio at T.V. to adjust the brightness and contrast of T.V. These will be possible by variable resistors.

1. CARBON COMPOSITION RESISTORS:- A thin carbon coating ~~on~~ on pressed paper or a molded carbon disc constitutes the carbon composition resistance element. The two ends of



(a) Wire-wound variable resistance



(b) Symbol of variable resistor



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Date 6/2/24 Experiment No. 1-(A) P.No. 5
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the disc are joined to the external soldering terminals 1 & 3. The middle terminal is connected to the variable arm that connects the resistor element by metal spring wiper. As the shaft of the control is turned, the variable arm moves the wiper to make contact at different points on the resistor element which changes the value of resistance ~~and~~ inserted in the circuit.

The carbon-composition variable resistors are available with 1000Ω to $5M\Omega$ approximately having power rating of usually $\frac{1}{2}$ to $2W$. A carbon control (resistor) is often combined with a power on-off switch.

2. **WIRE-WOUND VARIABLE RESISTOR:-** In these resistors a resistance wire is wound over a dough shaped case (Bakelite or Ceramic). The connecting system in this is like that a carbon resistor. As the



Band Color	Digit A	Digit B	Multiplier D	Tolerance (T) > 10 pF	Tolerance (T) < 10 pF	Temperature Coefficient (TC)
Black	0	0	$\times 1$	$\pm 20\%$	$\pm 2.0 \text{ pF}$	
Brown	1	1	$\times 10$	$\pm 1\%$	$\pm 0.1 \text{ pF}$	-33×10^{-6}
Red	2	2	$\times 100$	$\pm 2\%$	$\pm 0.25 \text{ pF}$	-75×10^{-6}
Orange	3	3	$\times 1000$	$\pm 3\%$		-150×10^{-6}
Yellow	4	4	$\times 10000$	$\pm 4\%$		-220×10^{-6}
Green	5	5	$\times 100000$	$\pm 5\%$	$\pm 0.5 \text{ pF}$	-330×10^{-6}
Blue	6	6	$\times 1000000$			-470×10^{-6}
Violet	7	7				-750×10^{-6}
Grey	8	8	$\times 0.02$	$\pm 20\%, -20\%$		
White	9	9	$\times 0.01$	$\pm 10\%$		
Gold			$\times 0.1$	$\pm 5\%$		
Silver			$\times 0.1$	$\pm 10\%$		

Colour coding of capacitance



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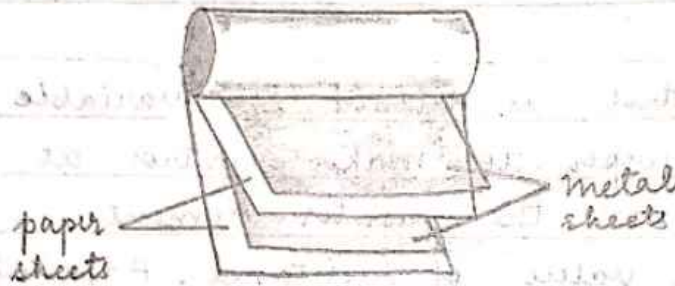
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Date 6/2/24 Experiment No. 1 - (A) P.No. 6

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shaft of the control is turned the variable arm moves the wiper to make contact at different point on the resistor element which changes the value of resistance. Adjustable wire wound resistance will be varied with them. Adjustable slides moved along an enclosed position of that winding.

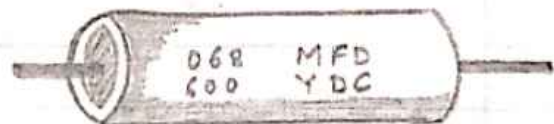
CAPACITORS:- The two conducting plates separated by an insulating material forms a capacitor. The capacity to store charge per unit potential difference is called its capacitance. The unit of a capacitor is Farad (F). A capacitor is a component which offers low impedance to AC but high to DC voltage but pass the AC voltage signal by means charging and discharging.



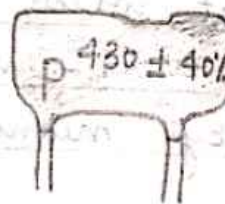
(a) Metal foils & paper sheets rolled into cylindrical shape.



(b) Internal construction of a paper capacitor.



(c) Tubular capacitor



(d) 430 PF encapsulated type capacitor

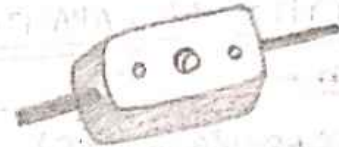
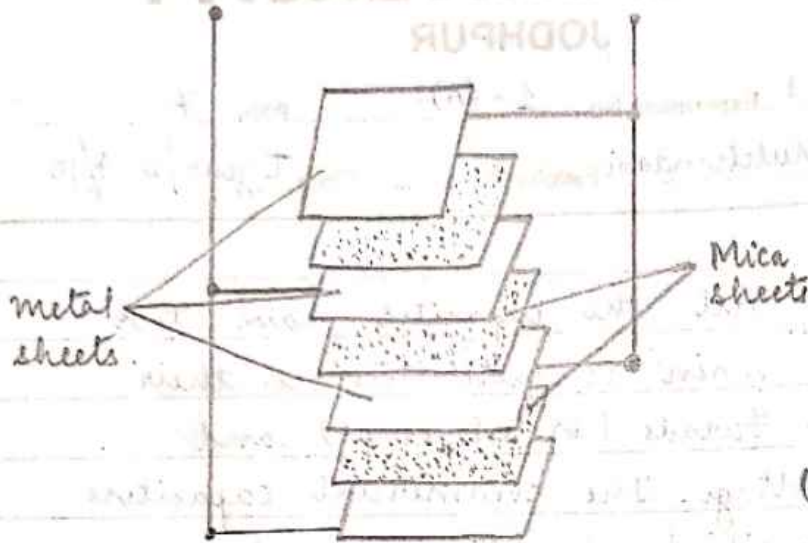


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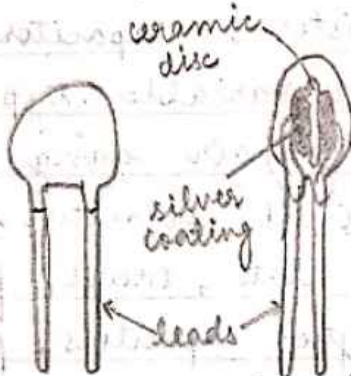
Date 6/2/24 Experiment No 1 - (A) P.No. 7
Name Ridhi Mulchandani Faculty No. Class I year / D-4/10

TYPES OF CAPACITORS:- All the capacitor have two ~~two~~ main characteristics i.e. their capacitance (C) in Farads (or μF or pF) and their operating voltage. The commercial capacitors are generally classified according to the dielectric element. Some of the most commonly used capacitors are paper, mica, ceramic electrolytic and air. Like resistors, capacitors can also either be fixed or variable type. The variable resistors are mostly air gang capacitors. There is no required polarity, since either side can be made +ve plate, except for electrolytic capacitor. In electrolytic capacitors, polarity is marked which indicates the side which must be considered as positive. It maintains the internal electrolytic action that produces the dielectric (a thin oxide film) required to form the capacitor.

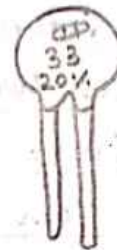


(b) Fixed Mica Capacitor

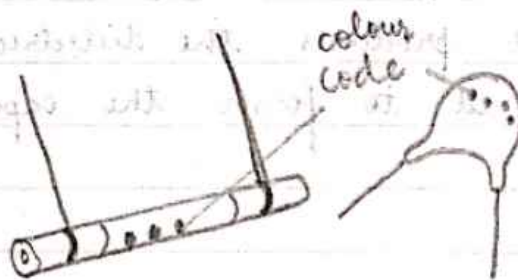
(a) Internal construction of Mica Capacitors



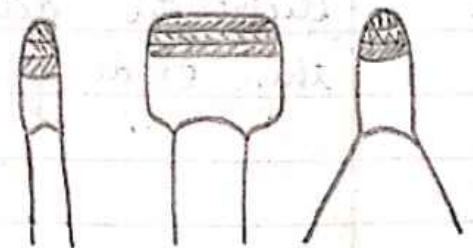
(a) Internal view



(c) Internal view



(d) Tubular Type Capacitor



(e) Disc & other shapes of capacitors



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- 1.) PAPER CAPACITOR:- It is the most common of all capacitors for all construction of those capacitors. Two metal (Al or tin) separated by paper impregnated with a dielectric material. Such as wax, plastic or oil are rolled into a complete cylinder. The entire cylinder is generally placed in a cardboard coated with wax or ~~extended~~ enclosed in plastic. The value of capacitance of these capacitors is $0.0001 \mu F$ to $0.1 \mu F$ having tolerance of $\pm 10\%$. Their leakage resistance is of the order of $100 m\Omega$.
- 2.) MICA CAPACITOR:- These capacitors consists of alternate thin sheets of metal (al or tin) foils separated by thin Mica sheets. Alternate metal sheets are connected together and brought out as one terminal for one set of plates, while opposite terminal connects to the other set of plates. The entire unit is generally encased in a plastic housing or moulded in bakelite.



Date: 6/2/24 Page No: 1-1

Name: Rishabh Mishra Roll No: 2121010101

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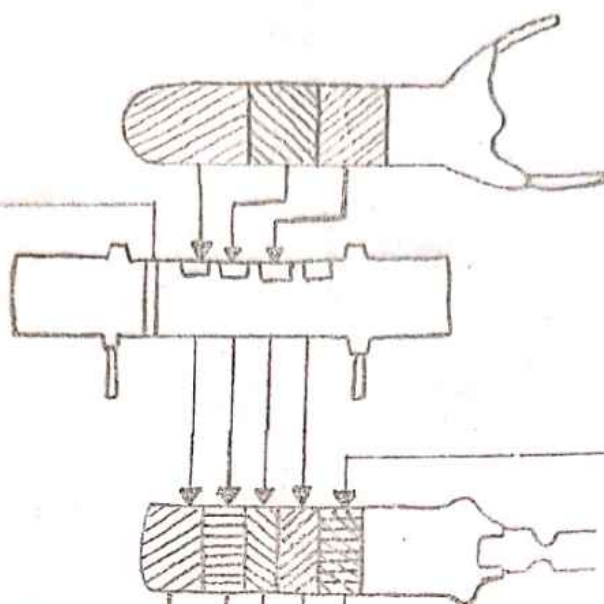
1) PAPER CAPACITOR :- It is the most common type of capacitor for all construction of these capacitors. Two metal plates separated by paper impregnated with a dielectric material. Such as wax, plastic or oil are used and are completely separated. The entire capacitor is generally placed in a cardboard container with wires or extended leads as plates. The value of capacitance of these capacitors is 0.001 to 0.1 μ F having tolerance of $\pm 10\%$. Their leakage resistance is of the order of $10^8 \Omega$.

2) MICA CAPACITOR :- These capacitors consist of alternate thin sheets of mica and metal foil separated by thin mica sheets. Alternate metal sheets are connected together and brought out as terminals for use as plates. While opposite terminal connects to the other set of plates. The entire unit is generally enclosed in a plastic case of as indicated in picture.



Temperature Coefficient

Black	10^{-6}
Orange	-250×10^{-6}
Violet	-750×10^{-6}



	YAB
Brown	100
Red	250
Yellow	400
Blue	530

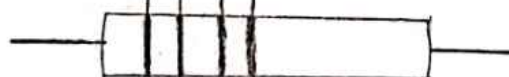
Black
Brown
Red
Orange
Yellow
Green
Blue
Violet
Grey
White
Gold
Silver

0
1
2
3
4
5
6
7
8
9

0
1
2
3
4
5
6
7
8
9

$\times 10^0 \Omega / PF$
$\times 10^1 \Omega / PF$
$\times 10^2 \Omega / PF$
$\times 10^3 \Omega / PF$
$\times 10^4 \Omega / PF$
$\times 10^5 \Omega / PF$
$\times 10^6 \Omega / PF$
$\times 10^7 \Omega / PF$
$\times 10^8 \Omega / PF$
$\times 10^9 \Omega / PF$
$\times 10^1 \Omega / -$
$\times 1.5^2 \Omega / -$

Tolerance	
Black	$\pm 20\%$
White	$\pm 10\%$
Green	$\pm 5\%$
Red	$\pm 2\%$
Brown	$\pm 1\%$
Grey	$\pm 0.5\%$
Red	$\pm 0.25\%$
Red	$\pm 2\%$
Gold	$\pm 6\%$
Silver	$\pm 10\%$
No colour	$\pm 10\%$





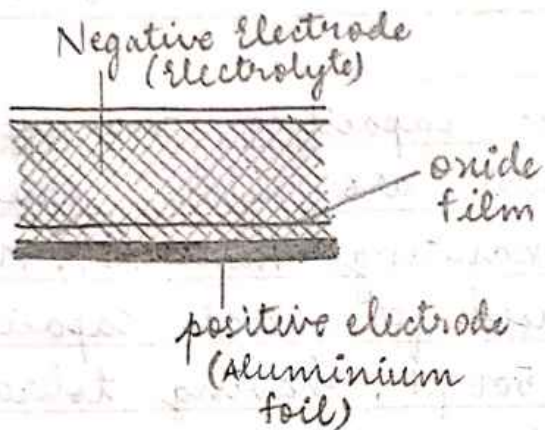
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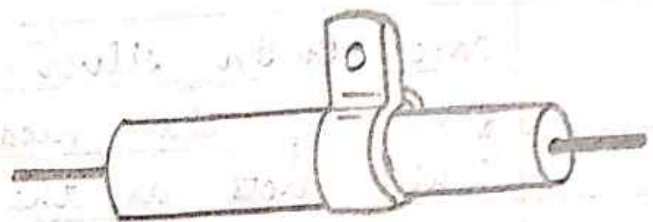
Date 6/2/24 Experiment No. 1 - (A) P.No. 9
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case. In silver-mica capacitors, the opposite faces of the mica sheets are silver coated (which acts as the conducting material). Mica capacitors are often used for small capacitance values ranging 50 to 500 pF, having tolerance of ± 2 to $\pm 20\%$ usually, with voltage rating ranging from 200 to 1000 V. The leakage resistance of mica capacitors is of the order of $1000 M\Omega$ that is why their leakage current is very small, these capacitors are very small in size (10mm-length, 3mm-thickness).

- 3.) CERAMIC CAPACITORS:- The capacitor ceramic is a dielectric material made from earth fired under extreme heat. Titanium oxide or several other types of silicates are used to obtain very high value of dielectric constant of ceramic material. The capacitors may be of disc type or tubular type. In the disc type, a ceramic disc is coated on two sides with a



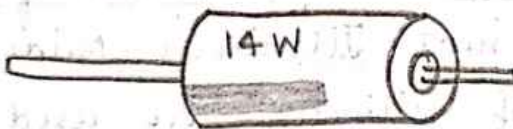
(a) Internal View



tubular capacitor



(b) Electrolytic capacitors. (c)



(a) With Axial leads.



(b) Capacitor with Radial leads.



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Date 6/2/24 Experiment No. 1-(A) P.No. 10.
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metal (silver or copper). Tinned copper wire leads are attached to each ~~ex~~ coating which act as electrodes or plates. Then the entire unit is encapsulated in a protective coating (positive) & marked with its capacitance value, either using numerals or a colour code. The colour coding is similar to that used for resistances. The capacitor colour coding is described. Disc ceramics capacitors are commonly available in capacitance values ranging from 47 pF to 0.05 μF having tolerance of ± 2 to $\pm 20\%$, with voltage ratings ranging from 200 to 1000 V. Tubular ceramic capacitors are available in capacitance values ranging from 1 to 500 μF .

- 4.) ELECTROLYTIC CAPACITORS :- It contains two aluminium electrodes, between the 2 electrodes, absorbent gauge soaks up electrolyte (borax, phosphate or carbonate) to provide the



Subject: Physics (A-1)

Q.1. A parallel plate capacitor is charged to a potential difference of 100 V. The plates are separated by a dielectric material of dielectric constant $\epsilon_r = 2$. The area of each plate is 10 cm^2 and the thickness of the dielectric is 1 mm . Calculate the capacitance of the capacitor.

Solution: The capacitance of a parallel plate capacitor is given by the formula:

$$C = \frac{\epsilon_0 \epsilon_r A}{d}$$

where ϵ_0 is the permittivity of free space, ϵ_r is the dielectric constant, A is the area of the plates, and d is the thickness of the dielectric.

Given: $V = 100 \text{ V}$, $\epsilon_r = 2$, $A = 10 \text{ cm}^2 = 10 \times 10^{-4} \text{ m}^2$, $d = 1 \text{ mm} = 1 \times 10^{-3} \text{ m}$.

Substituting the values in the formula, we get:

$$C = \frac{8.85 \times 10^{-12} \times 2 \times 10 \times 10^{-4}}{1 \times 10^{-3}}$$

$$C = 1.77 \times 10^{-11} \text{ F}$$

Therefore, the capacitance of the capacitor is $1.77 \times 10^{-11} \text{ F}$.

Q.2. A series RLC circuit is connected to an AC source of voltage $V = 200 \text{ V}$ and frequency $f = 50 \text{ Hz}$. The resistance $R = 10 \Omega$, inductance $L = 0.1 \text{ H}$, and capacitance $C = 10 \mu\text{F}$. Calculate the impedance of the circuit.

Solution: The impedance of a series RLC circuit is given by the formula:

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

where R is the resistance, X_L is the inductive reactance, and X_C is the capacitive reactance.

Given: $V = 200 \text{ V}$, $f = 50 \text{ Hz}$, $R = 10 \Omega$, $L = 0.1 \text{ H}$, $C = 10 \mu\text{F} = 10 \times 10^{-6} \text{ F}$.

First, we calculate the inductive reactance X_L and capacitive reactance X_C :

$$X_L = 2\pi fL = 2\pi \times 50 \times 0.1 = 31.4 \Omega$$

$$X_C = \frac{1}{2\pi fC} = \frac{1}{2\pi \times 50 \times 10 \times 10^{-6}} = 159.2 \Omega$$

Substituting the values in the formula for impedance, we get:

$$Z = \sqrt{10^2 + (31.4 - 159.2)^2}$$

$$Z = \sqrt{100 + (-127.8)^2}$$

$$Z = \sqrt{100 + 16332.84}$$

$$Z = \sqrt{16432.84} = 128.2 \Omega$$

Therefore, the impedance of the circuit is 128.2Ω .



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Date 6/2/24 Experiment No. 1 - (A) P.No. 11

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required electrolysis that produces an oxide film (a molecular - thin layer of Aluminium oxide) at the positive electrode when d.c. voltage is applied. The oxide film acts as insulator & forms a capacitance between the +ve aluminium electrode and the electrolyte in the gauge separator. The -ve aluminium electrode simply provides a connection to the electrolyte.

These capacitors are available in capacitance values ranging from less than $1 \mu F$ to $10,000 \mu F$ or more. Common voltage range from 1 to 700 volts. The leakage current of these capacitors is as high as 0.1 to $0.5 \text{ mA}/\mu F$. These capacitors are used in the filter section of d.c. power supplies and resistor circuits, also used as audio coupling capacitors in transistor amplifier.



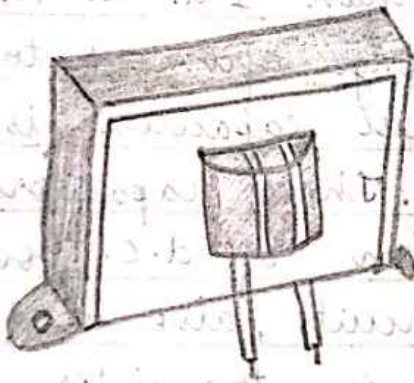
(a) Fixed inductor



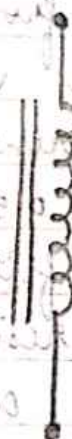
(b) Variable inductor



(c) Schematic diagram of choke



(A) Filter



(B) Schematic diagram of filter choke



(c) Variable inductor



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Date 6/2/24 Experiment No. 1 - (A) P.No. 12
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INDUCTORS:- The electric component which oppose the change at circuit is called an Inductor. The ability of coil or inductor due to which it moves oppose the change of current flowing through it is known as its inductance. The unit of inductance is Henry. An inductance is a component which offers high impedance to A.C. but very low impedance to D.C. These variable inductor are used in tuning circuit for radio frequency. (It is also called chokes).

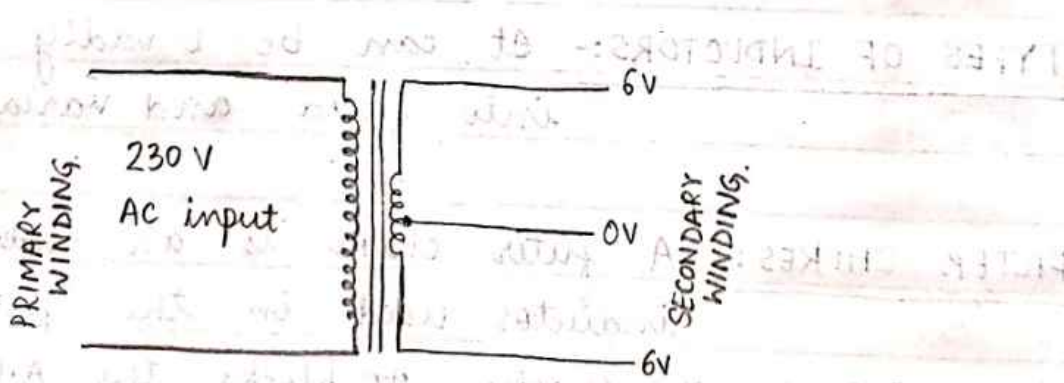
TYPES OF INDUCTORS:- It can be broadly classified into fixed and variable Inductors.

- 1) FILTER CHOKES:- A filter choke is an inductor used in the filter section of a D.C. power supply. It blocks the A.C signal and allow d.c. signal. The two major rating of a filter choke are inductance and current rating filter choke. (1 Henry-50H & current upto 1.5A).



Page No. _____
Date _____

INDUCTORS - The electric component which opposes the change of current in a circuit is called an inductor. The ability of an inductor to oppose the change of current flowing through it is known as its inductance. The unit of inductance is Henry. An inductor is a component which offers high impedance to A.C. but very low impedance to D.C. These variable inductors are used in tuning circuits for radio frequency. (It is also called choke).



STEP DOWN CENTRE TAPPED TRANSFORMER.



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Date 6/2/24 Experiment No. 1-(A) P.No. 13

Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

2) RADIO FREQUENCY CHOKE:- These are smaller in size as compared to filter chokes. Air-core coil for RF applications have very small value of inductance.

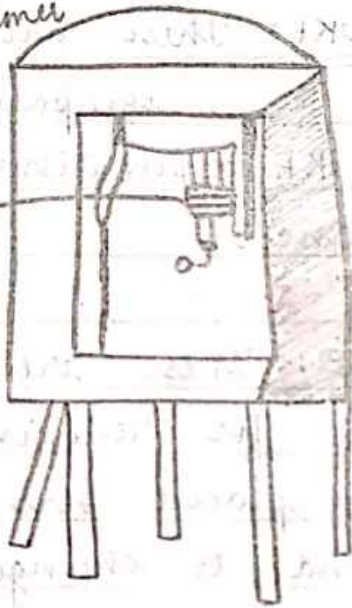
VARIABLE INDUCTANCE:- These are used in circuits for reducing frequencies. The winding is placed over a fibre or ceramic former and to change the inductance a ferrite core is employed.

TRANSFORMER:- A transformer is similar in appearance to an inductor. Basically it consists two inductors having the same core. The coil to which supply is connected is called primary winding and coil to which load is connected is called secondary winding. A transformer may be step up or step down and transformer have many parts like that which are generally known as

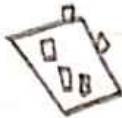


Intermediate
freq. transformer

coils



Yellow



Green



White



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JODHPUR

Date 6/2/24 Experiment No. 1-(A) P.No. 14
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

as power, output and input mediate frequency transformer.

- 1.) POWER TRANSFORMER:- Power transformer are used to step up and step down the supply voltage as per requirement in vacuum tube circuit.
- 2.) OUTPUT TRANSFORMER:- These are used in the radio receivers at the output stage for impedance matching D.C. at the output stage of power amplifier.
- 3.) INTERMEDIATE FREQUENCY TRANSFORMER:- These transformers are used in the intermediate frequency amplifier section of radio and T.V. receivers. It consists of two windings both the primary and secondary winding are tuned to the operating frequency by mica capacitor.



Page No. _____
Date _____

The power supply is provided by the main supply line which is connected to the transformer.

The transformer is a device which is used to convert the voltage from one level to another.

The transformer is used in the power supply system to step up or step down the voltage.

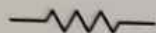
The transformer is a device which is used to convert the voltage from one level to another.

The transformer is a device which is used to convert the voltage from one level to another.

The transformer is a device which is used to convert the voltage from one level to another.

STUDY OF PASSIVE COMPONENT

Resistance (Carbon Composition)



step down center tapped transformer



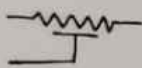
Resistance Wire Wound



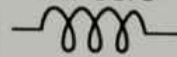
Electrolytic Capacitor



Preset (Variable Resistance)



INDUCTOR Air core



Carbon Composition (Variable Potentiometer)



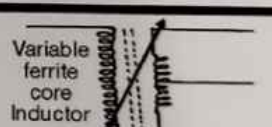
Ferrite Coil



Wire Wound POT (Potentiometer)

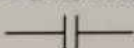


Yellow Green White



IFT 455KHz (Intermediate Frequency Transformer) (Variable Inductor)

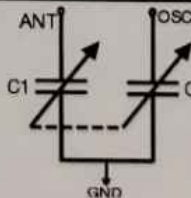
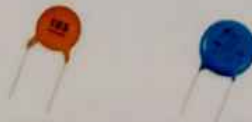
PAPER CAPACITOR



Ceramic Capacitor



DISK CAPACITOR



Variable Capacitor



Gang Capacitor (Air Core)



Trimmer (Mica)

Guided By :- C.S. Srivastava Sir
D4 BE 1st Year 2023-24



STUDY OF ACTIVE COMPONENTS

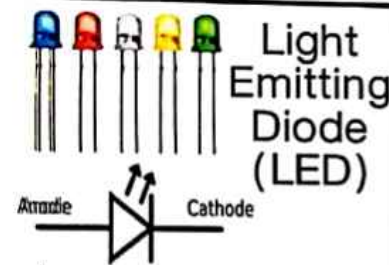


PN Junction
Silicon Diode

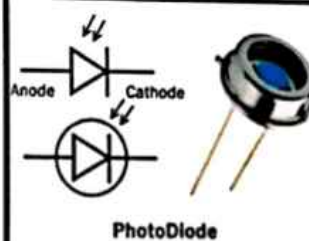


Germanium
Diode

(OA 79/80/81)
CRYSTAL DIODE
Detector Diode

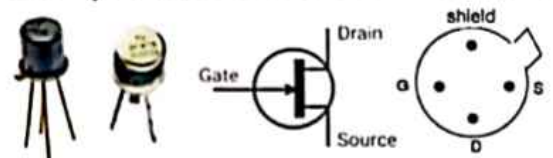


Light
Emitting
Diode
(LED)



PhotoDiode

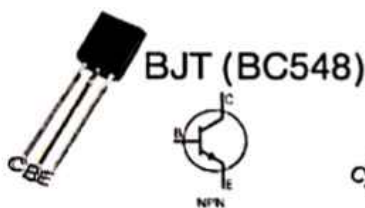
FET (Field Effect Transistor)



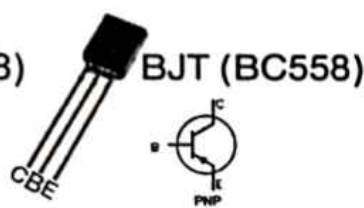
n channel (BFW10/11)



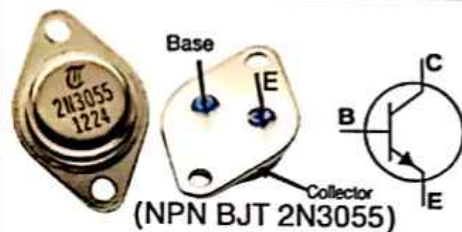
p channel (BFW60/61)



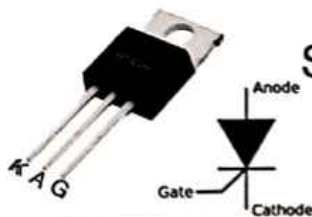
BJT (BC548)



BJT (BC558)

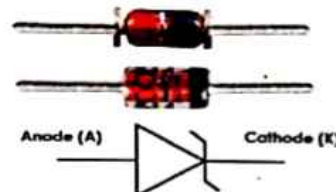


Power
Transistor



SCR (BT44H)

Zener Diode
5.2V / 400mW



Guided By :- C.S. Srivastava Sir
D4 BE 1st Year 2023-24



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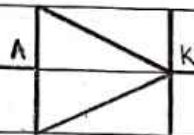
Date 6/2/24 Experiment No. 1 - (B) P.No. 15
Name Ridhi Mulchandani Faculty No. Class I year / D-4/10

OBJECT :- Study of active components.

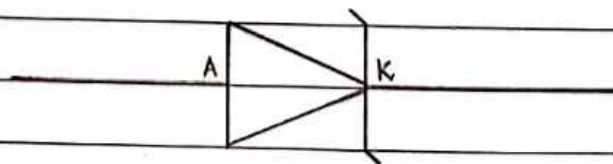
ACTIVE COMPONENTS :- The electronic components which are capable of amplifying an electrical signal are called Active components. Such as vacuum tubes, gas tubes and semiconductor (solid state devices).

SEMICONDUCTOR DEVICES :-

1) JUNCTION DIODE :- It is used as rectifier, detector and switch.



2) ZENER DIODE :- It is used as voltage regulator.





1. Active Components:- The electronic components which are capable of providing or controlling signal are called active components. Such as vacuum tubes, transistors, and semiconductor devices like diodes, etc.

2. Passive Components:- The electronic components which are incapable of providing or controlling signal are called passive components. Such as resistors, capacitors, inductors, etc.

SEMINAR TOPICS

1. Rectifier:- It is used as rectifier, detector, etc.

2. Generator:- It is used as voltage source, etc.

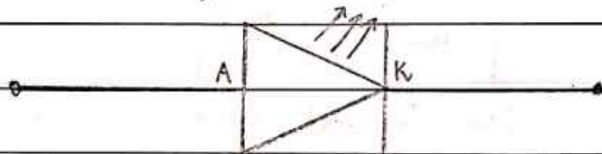


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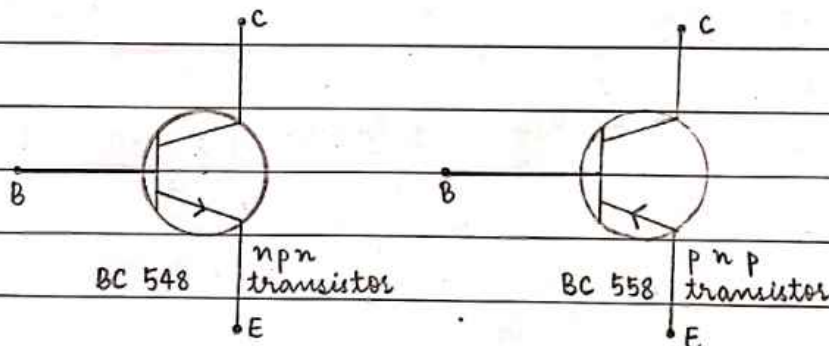
JODHPUR

Date 6/2/24 Experiment No. 1 - (B) P.No. 16
 Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

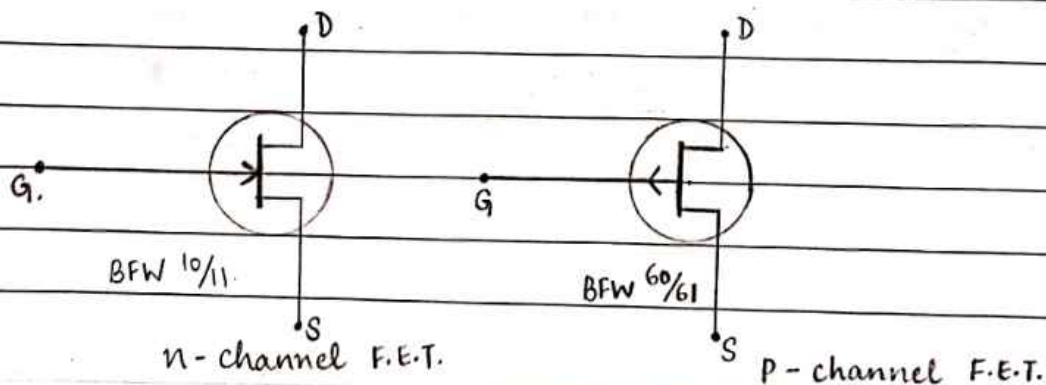
- 3.) LIGHT EMITTING DIODE :- It emits visible light and is in instrument display, calculators etc.



- 4.) BIPOLAR JUNCTION TRANSISTOR (BJT) :- It is used as amplifier and oscillator.

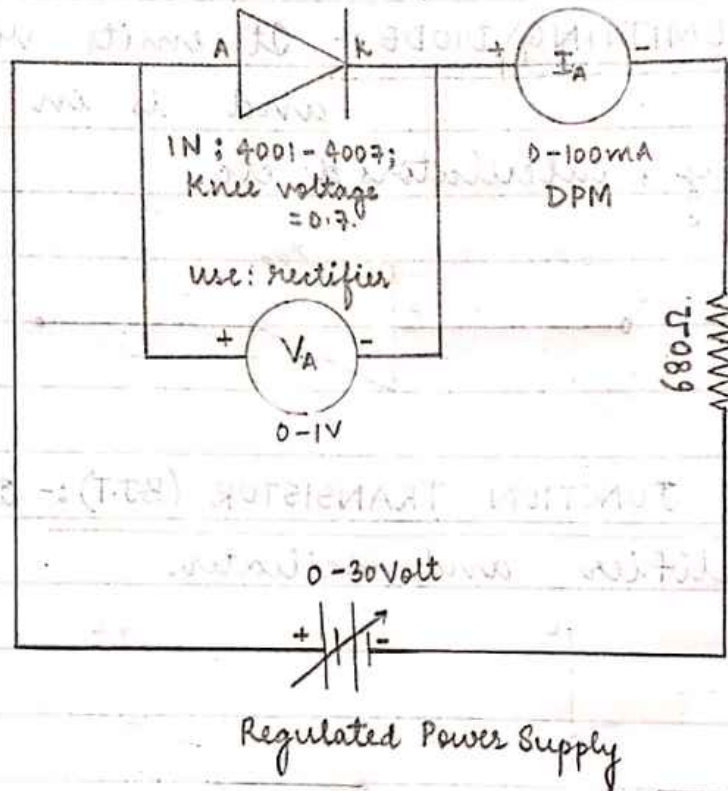


- 5.) Field effect TRANSISTOR (F.E.T.) :- It is used as amplifier and oscillator.





p-n junction semi-conductor (silicon diode)



Regulated Power Supply



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Date 14/2/24 Experiment No. 2 P.No. 17
Name Ridhi Mulchandani Faculty No. Class D-4/10/I year

OBJECT :- Study of V and I characteristics of diode in forward bias and calculate the static and dynamic resistance.

MATERIALS REQUIRED :- Silicon P-N junction diode, Voltmeter (0-1V); resistance (680 Ω)
Ammeter (0-100mA); D.p.m. (Digital Panel meter).

THEORY :- When an external voltage (V) is applied across a semiconductor diode such that P-side is connected to the positive terminal of the battery and n-side is connected to the negative terminal is said to be in forward bias.

In this case the applied forward potential acts in such a way that it establishes an $\vec{E}$ which reduces the field due to potential barrier. Thus, the barrier potential at the junction is reduced. Since, the potential



Page No. _____
Date _____

Subject: _____
Topic: _____

1. Introduction: _____

2. Definition: _____

3. Characteristics: _____

4. Importance: _____

5. Conclusion: _____

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Scale

X-axis unit = 0.1V

Y-axis unit = 1mA

Static Resistance

$$R = \frac{V}{I} = \frac{0.6}{0.6} = 1\Omega$$

Dynamic Resistance

$$= \frac{V_2 - V_1}{I_2 - I_1}$$

$$= \frac{0.58 - 0.56}{1.2 - 1.4}$$

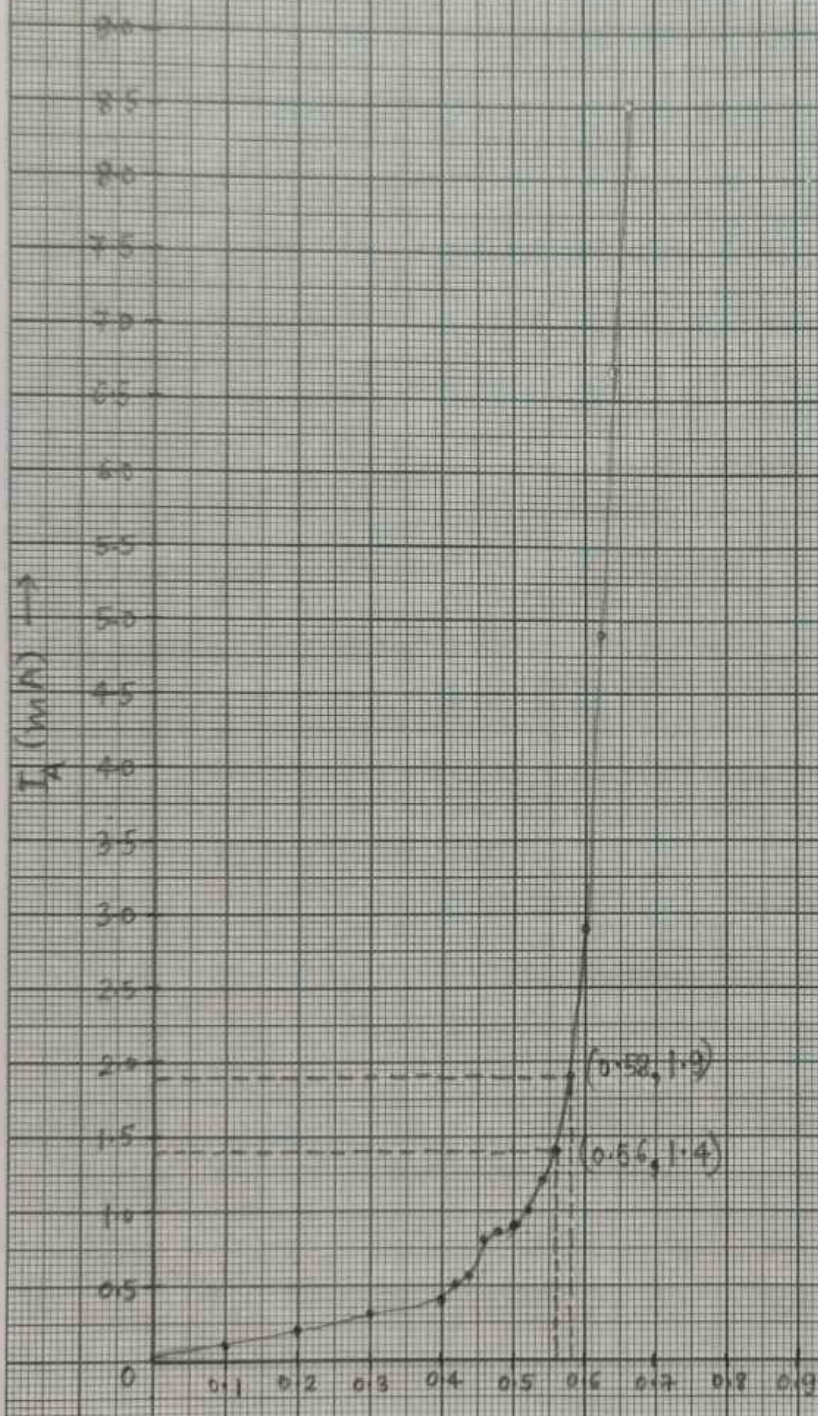
$$= \frac{0.02}{0.2} = 0.1\Omega$$

Y-axis

I_A (mA)

V_A (volts)

X-axis



Name Class Roll No. Teacher Signature



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Date 14/2/24 Experiment No. 2 P.No. 18
 Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

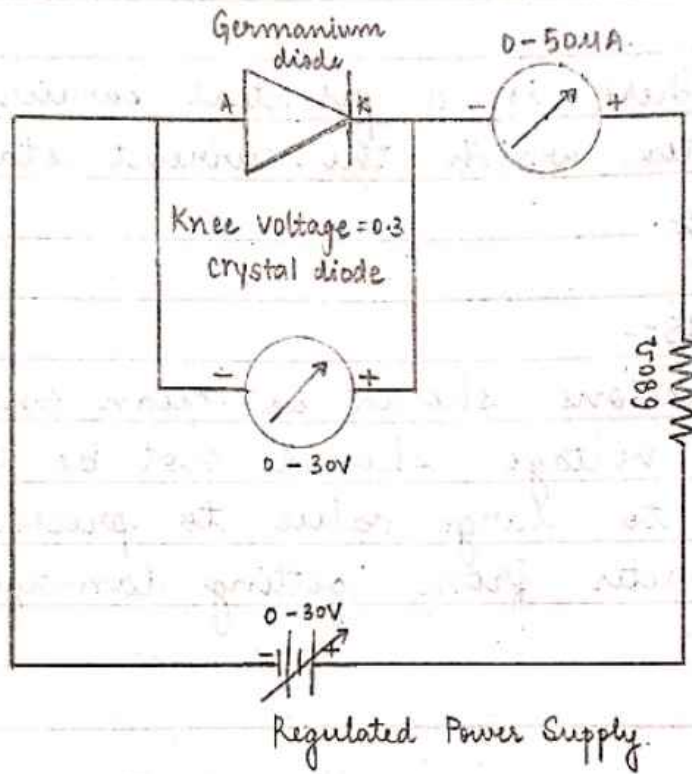
barrier voltages is very small, a small forward voltage is sufficient to completely eliminated by the forward voltage, a large current starts flowing. This current is called forward current.

OBSERVATION TABLE :-

S.No.	V (volt)	I (mA)	S.No.	V (volt)	I (mA)
1.	0	0	11.	0.52	1
2.	0.1	0.1	12.	0.54	4.2
3.	0.2	0.2	13.	0.56	1.4
4.	0.3	0.3	14.	0.58	1.9
5.	0.4	0.4	15.	0.60	0.72.9
6.	0.42	0.5	16.	0.62	4.9
7.	0.44	0.55	17.	0.64	6.7
8.	0.46	0.7	18.	0.66	8.5
9.	0.48	0.75	19.	0.68	14.3
10.	0.50	0.8	20.	0.70	31.1

(2)

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Date 14/2/24 Experiment No. 3 P.No. 20
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBJECT:- Study of V and I characteristics of diode in reverse bias.

MATERIALS REQUIRED:- A p-n junction diode maintained on a board, an ammeter (0-50 μ A); a voltmeter (0-30V) and two terminal variables, D.C. power supply, a resistor of resistance 680Ω and connecting wire.

THEORY:- When the positive terminal of D.C. source as battery is connected to n-type and negative terminal is connected to p-type semiconductor of p-n junction, the junction is said to be in reverse biasing. The external voltage applied to p-n junction that strengthened. The potential biasing and prevented the flow of the current through it is called reverse biasing.



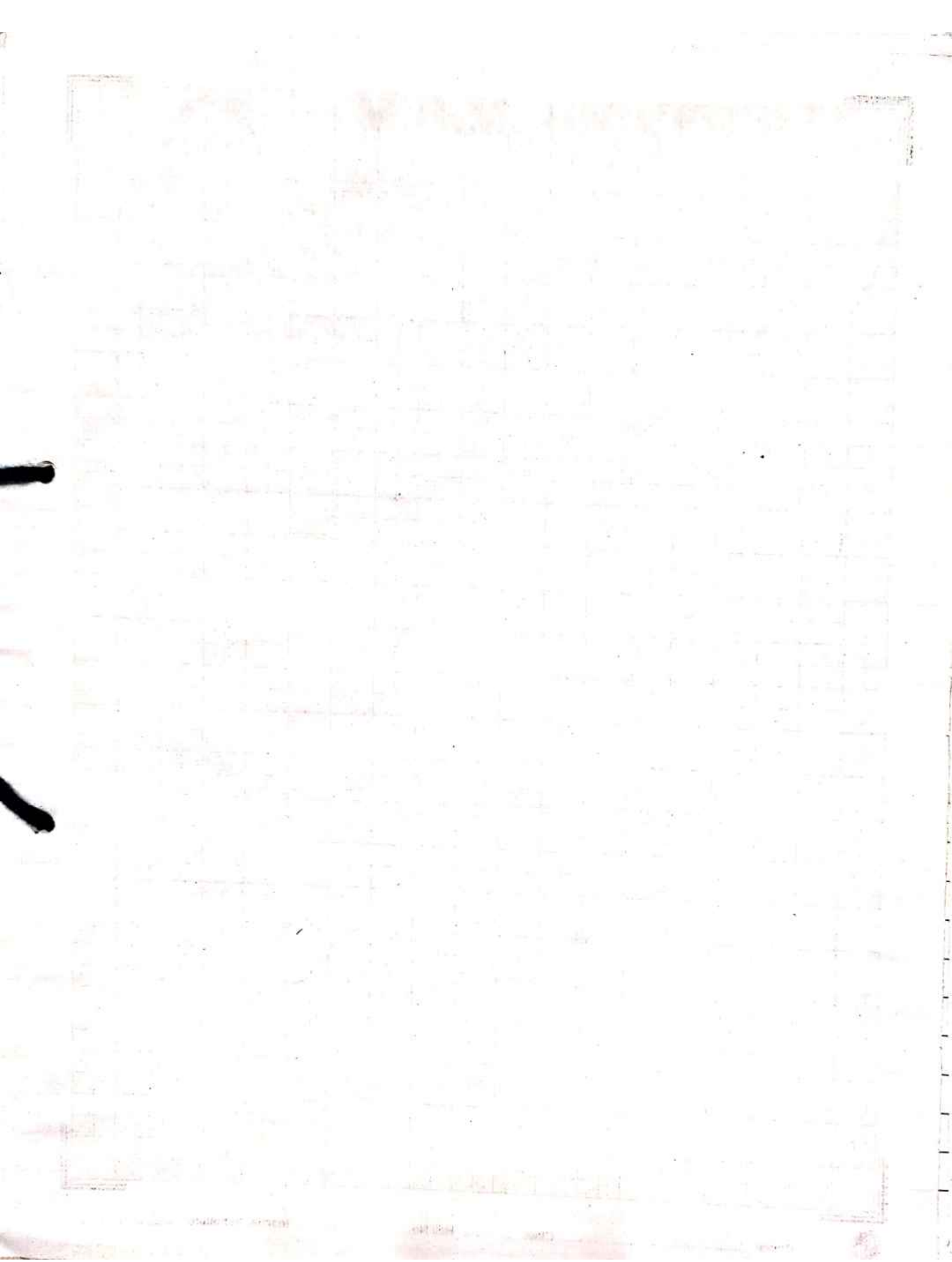
Date: 14/5/24
Page: 10

OBJECT: Study of V and I characteristics of diode. The circuit diagram is as follows.

MATERIALS REQUIRED: A p-n junction diode.

Apparatus: A variable DC voltage source (0-20V) and a milliammeter (0-10mA) connected in series with the diode. The circuit diagram is as follows.

Theor: To study the forward and reverse characteristics of a p-n junction diode. The circuit diagram is as follows. The forward bias is applied by connecting the positive terminal of the DC source to the p-region and the negative terminal to the n-region. The reverse bias is applied by connecting the positive terminal to the n-region and the negative terminal to the p-region. The forward current is measured by the milliammeter.



Scale:

on x-axis 1cm = 5V
on y-axis 1cm = 2mA

x-axis
V (volts)

30 25 20 15 10 5 0

0

2

4

6

8

10

12

14

16

18

20

22

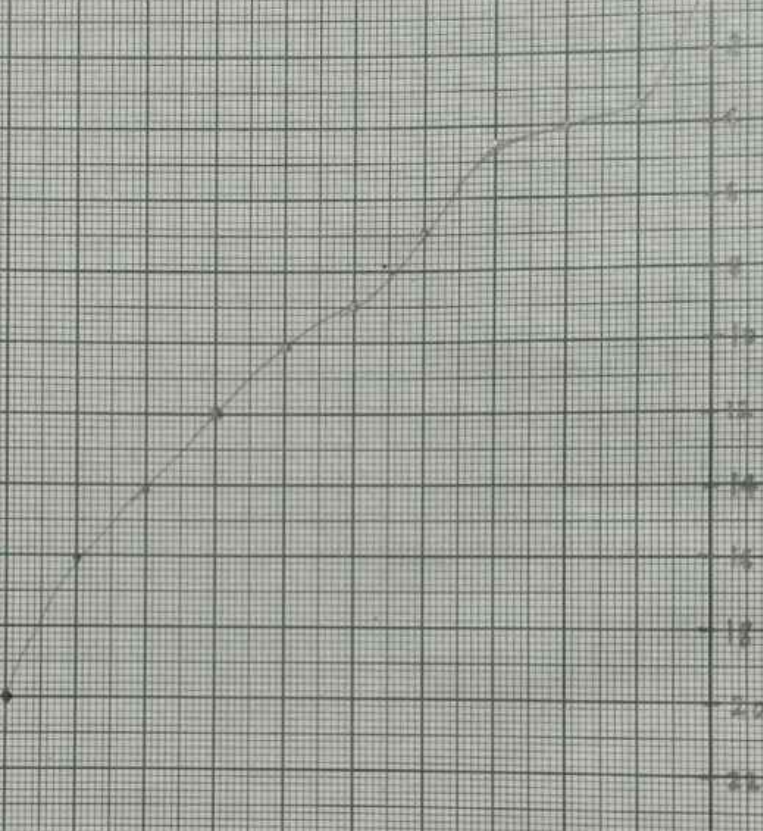
24

26

28

30

V I (mA)
y-axis



Name Class Roll No. Teacher Signature



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Date 14/2/24 Experiment No. 3 P.No. 21

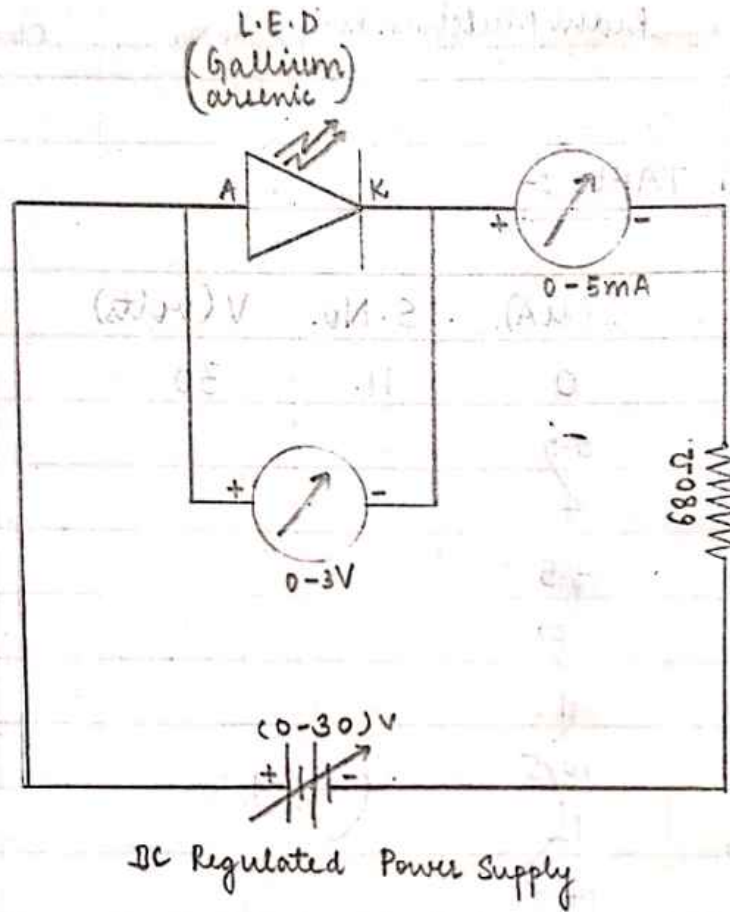
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBSERVATION TABLE :-

S.No.	V (volts)	I (μ A)	S.No.	V (volts)	I (μ A)
1.	0	0	11.	30.	20
2.	3	3.5			
3.	6	4			
4.	9	4.5			
5.	12	7			
6.	15	9			
7.	18	10.5			
8.	21	12			
9.	24	14.5			
10.	27	16.5			

RESULT: We found that current continuously with increasing voltage, it means the characteristic is $V \propto I$.

PRECAUTIONS:- 1.) Wiring connections should be tight. 2) Reading should be taken from voltmeter not from power supply and measure amount of current from ammeter.





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Date 14/2/24 Experiment No. 4 P.No. 22
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBJECT:- Study the V and I characteristics of diode in L.E.D.

MATERIALS REQUIRED:- Regulated power supply (0-30V); voltmeter (0-3V); ammeter, resistance ($1K\Omega$); connecting wires.

THEORY:- The conduction band free electrons from n-region crosses the barrier and enter the p region, the electron fall into the holes lying in the valence band hence they fall from a higher energy level to a lower energy level. In the ordinary diodes this energy radiates in the form of heat as these diodes are made of silicon or germanium which are opaque material and block the passes of light.

The L.E.D's are different. These are made from gallium arsenic (GaAs), gallium arsenide phosphide (GaAsP)



14/2/24

22

OBJECT:- Study the V and I characteristics of diode in C.D.

MATERIALS REQUIRED:- Regulated power supply (0-10V), voltmeter (0-5V), ammeter, resistance (1K Ω), connecting wires.

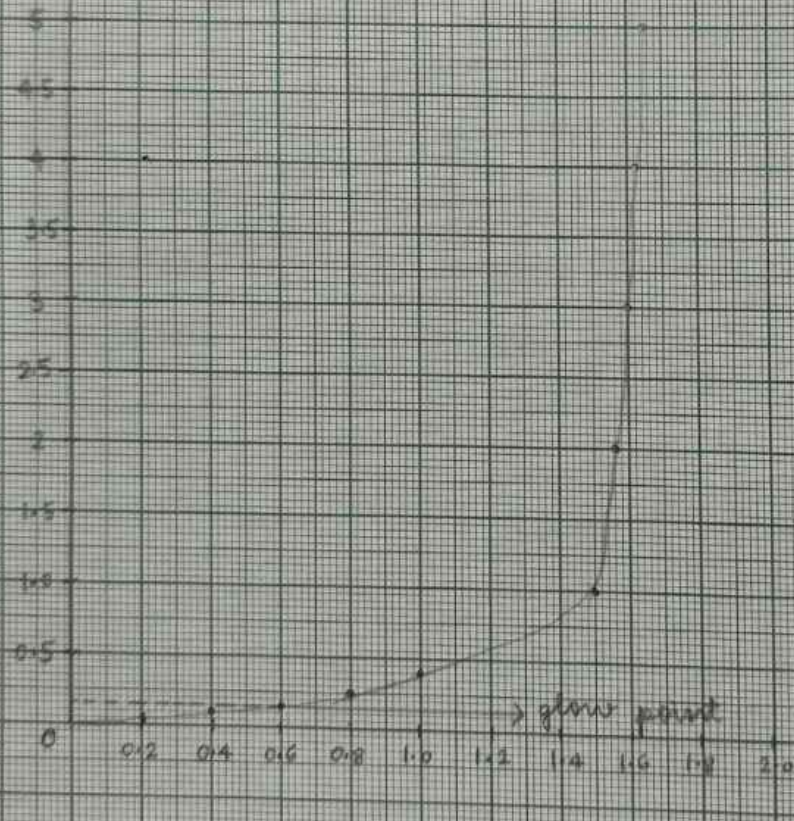
THEORY:- The conduction band free electrons from n-region cross the barrier and enter the p-region, the electron fall into the holes. In the valence band holes they fall from a higher energy level to a lower energy level. The electron holes thus energy migrate in the form of heat as these holes are made of silicon or germanium which are sparsely scattered and lack the power of light. The LEDs are efficient. They are made from gallium arsenide (GaAs), gallium arsenide phosphide (GaAsP).

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Graph of I vs V
 for a diode
 at room temperature

Glow point = 1.5V
 Current = 0.5mA

I (mA)
 y-axis





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Date 14/2/24 Experiment No. 4 P.No. 23

Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

and gallium phosphide (GaP). In L.E.D.s, the energy is radiated in the form of light and hence they glow.

OBSERVATION TABLE:-

S.No.	V (volts)	I (mA)	S.No.	V (volts)	I (mA)
1.	0	0	11.	1.65	$\frac{1}{2}$
2.	0.2	0.05			
3.	0.4	0.1			
4.	0.6	0.15			
5.	0.8	0.25			
6.	1	0.43			
7.	1.5	1			
8.	1.58	2			
9.	1.61	3			
10.	1.62	4			

→ Glow point

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Date: _____ Page: _____

Name: _____ Roll No: _____
 Date: _____ Page: _____

Write down the following in brief:
 1. _____
 2. _____
 3. _____

Observation Table

Sl. No.	Time (AM)	Time (PM)	Time (AM)
1	0.0	0.0	0.0
2	0.2	0.2	0.2
3	0.4	0.4	0.4
4	0.6	0.6	0.6
5	0.8	0.8	0.8
6	1.0	1.0	1.0
7	1.2	1.2	1.2
8	1.4	1.4	1.4
9	1.6	1.6	1.6
10	1.8	1.8	1.8



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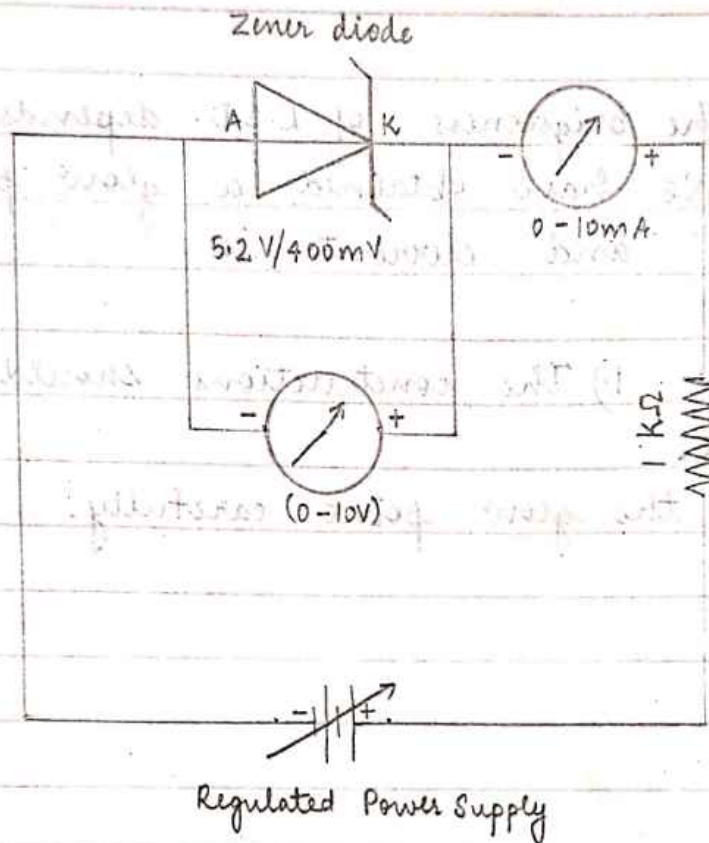
Date 14/2/24 Experiment No. 4 P.No. 24
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

RESULT:- The brightness of L.E.D. depends upon the current. We have obtained a glow point at voltage and current is

PRECAUTIONS:- 1.) The constructions should be clean and tight.
2.) Observe the glow point carefully.



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Date 14/2/24 Experiment No. 5 P.No. 25
 Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBJECT: Study the V-I characteristics of zener diode.

MATERIALS REQUIRED:- Zener diode, Voltmeter (0-10V);
 Ammeter (0-10mA); resistance (1K Ω);
 DC source; Regulated power supply (0-30V);
 connecting wires.

THEORY:- A special designed silicon diode which is optimised to operate in the breakdown region is known as Zener diode. By 2 to 200V varying the doping level of silicon diode we make Zener diode. If reverse potential on a p-n junction have a limit of is increased beyond a certain value, the current will increase rapidly. All p-n junction have a limit of allowable maximum reverse bias voltage.

The p-n junction have two types of breakdown i.e. zener breakdown and avalanche breakdown. In zener ~~break~~ breakdown it becomes possible for some $\bar{e}$ to

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Department - Year/Section - Roll No.

Date: 14/11/24
Experiment No: 5
Name: [Name] Faculty No: [Faculty No]
Class: I year/D-#10

OBJECT: Study the V-I characteristics of Zener diode.

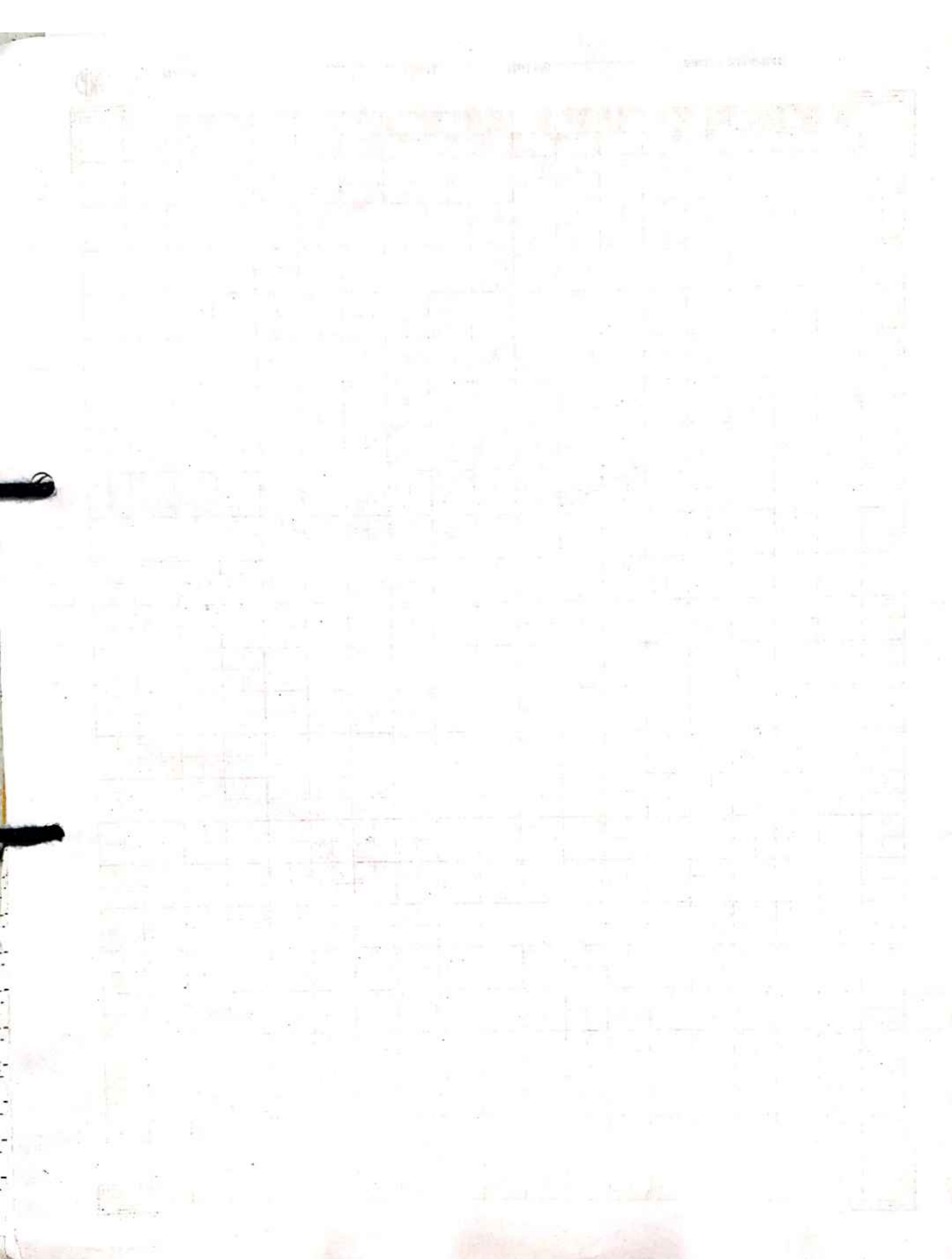
MATERIALS REQUIRED: Zener diode, Voltmeter (0-10V)

Ammeter (0-10mA), Resistor (2k Ω)

D.C. source, Regulator, Power supply (0-20V),
Connecting wires.

THEORY: A special designed silicon diode which is optimized to operate in the breakdown region is known as Zener diode. By 2 to 10V varying the doping level of silicon diode we make Zener diode of reverse biased for p-n junction have a limit of breakdown beyond a certain value, the current will increase rapidly. All p-n junction have a limit of allowable maximum forward bias voltage.

The p-n junction have two type of breakdown i.e. avalanche breakdown and Zener breakdown. Zener breakdown is occurs for low forward bias.



Y-axis
V (volts)

Breakdown point
(30, 12)
(50, 10)

Breakdown voltage = 30V
Current = 10mA

Y-axis
V (volts)



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Date: 14/2/24 Experiment No. 5 P.No. 26
 Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

jump across barrier from the valence band in p-material to some of the unfilled conduction band in n-material.

OBSERVATION TABLE :-

S.No.	V (volts)	I (mA)	S.No.	V (volts)	I (mA)
1.	0	0	11.	5.2	4
2.	1	0.05	12.	5.2	5
3.	2	0.1	13.	5.2	6
4.	3	0.15	14.	5.2	7
5.	4	0.2	15.	5.2	8
6.	5	0.8	16.	5.2	9
7.	BDV. 5.2	1.8 $\rightarrow I_{Z_{min}}$	17.	5.2	10
8.	5.2	2			
9.	5.2	3			

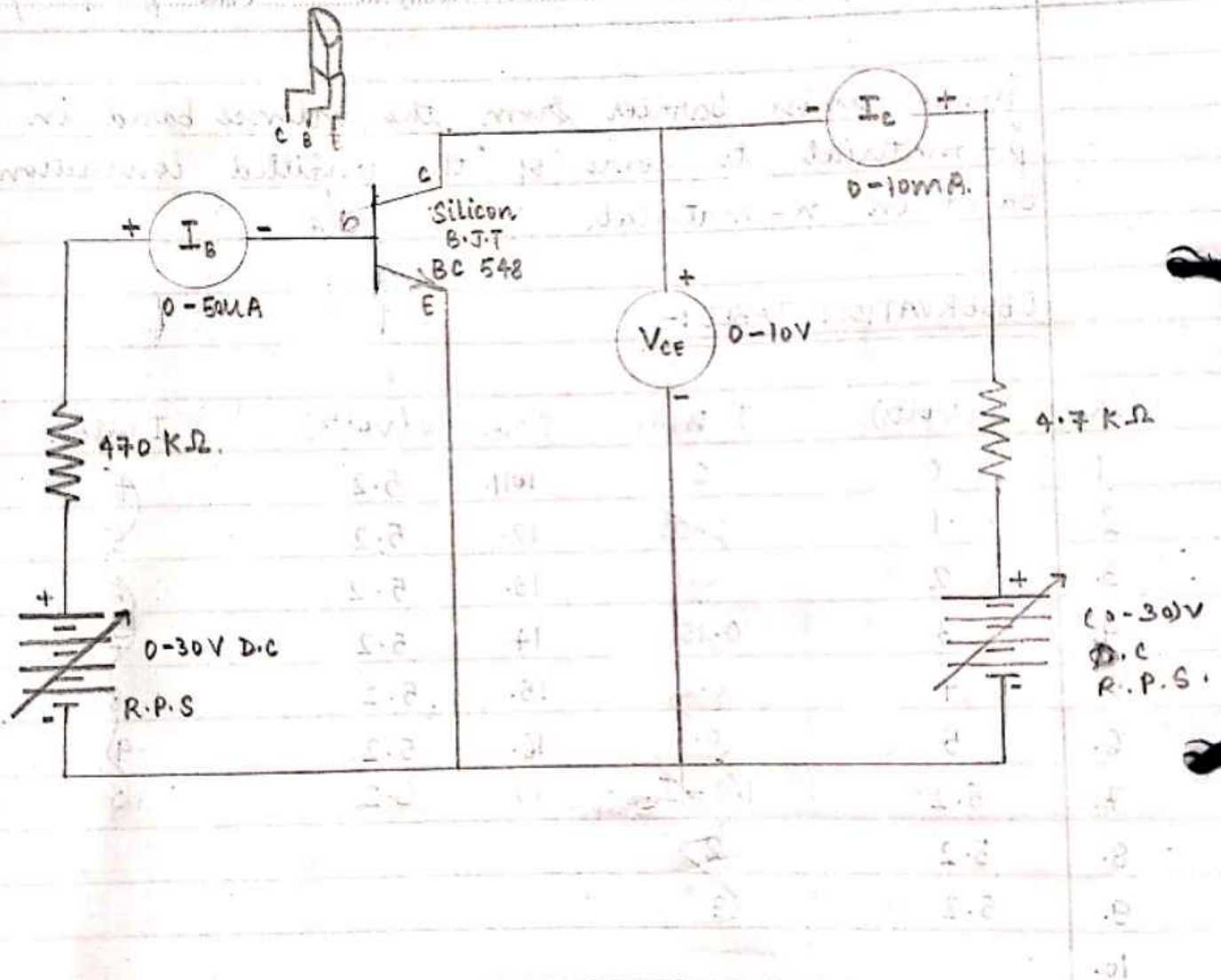
10.

RESULT:- The breakdown voltage of Zener diode is and current (I_{Zm}) is 1.8 μ A.

PRECAUTIONS :- 1) The connections should be tight.
 2) Avoid long time continuously flow of current in the circuit.



Date: 14/11/2019 Experiment No: 5
Name: [illegible] Faculty No: [illegible] Class: I Year/D-4/10





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Date 21/2/24 Experiment No. 6 P.No. 27

Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBJECT:- Study the characteristics of B.J.T. (Bipolar Junction Transistor).

APPARATUS REQUIRED:- NPN (BC(548)) transistor,
Voltmeter (0-10V); ammeter (0-10mA);
resistor (470 K Ω , 47 K Ω); DC source (0-30V);
connecting wires.

THEORY:- A semiconductor device consisting of
Z p-n junction formed by semiconducting
either p-type or n-type semiconductor between
a pair of opposite type is known as a
bipolar junction transistor (B.J.T.).

- 1) There are two junctions, one between emitter and base and other between base and collector.
- 2) The depletion layer of emitter junction is quite small as compared to depletion region at the collector region.

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00190383556 - Yashodhara Education

Date: 21/12/21 Experiment No: 6
Name: [illegible] Faculty No: [illegible] Class: [illegible]

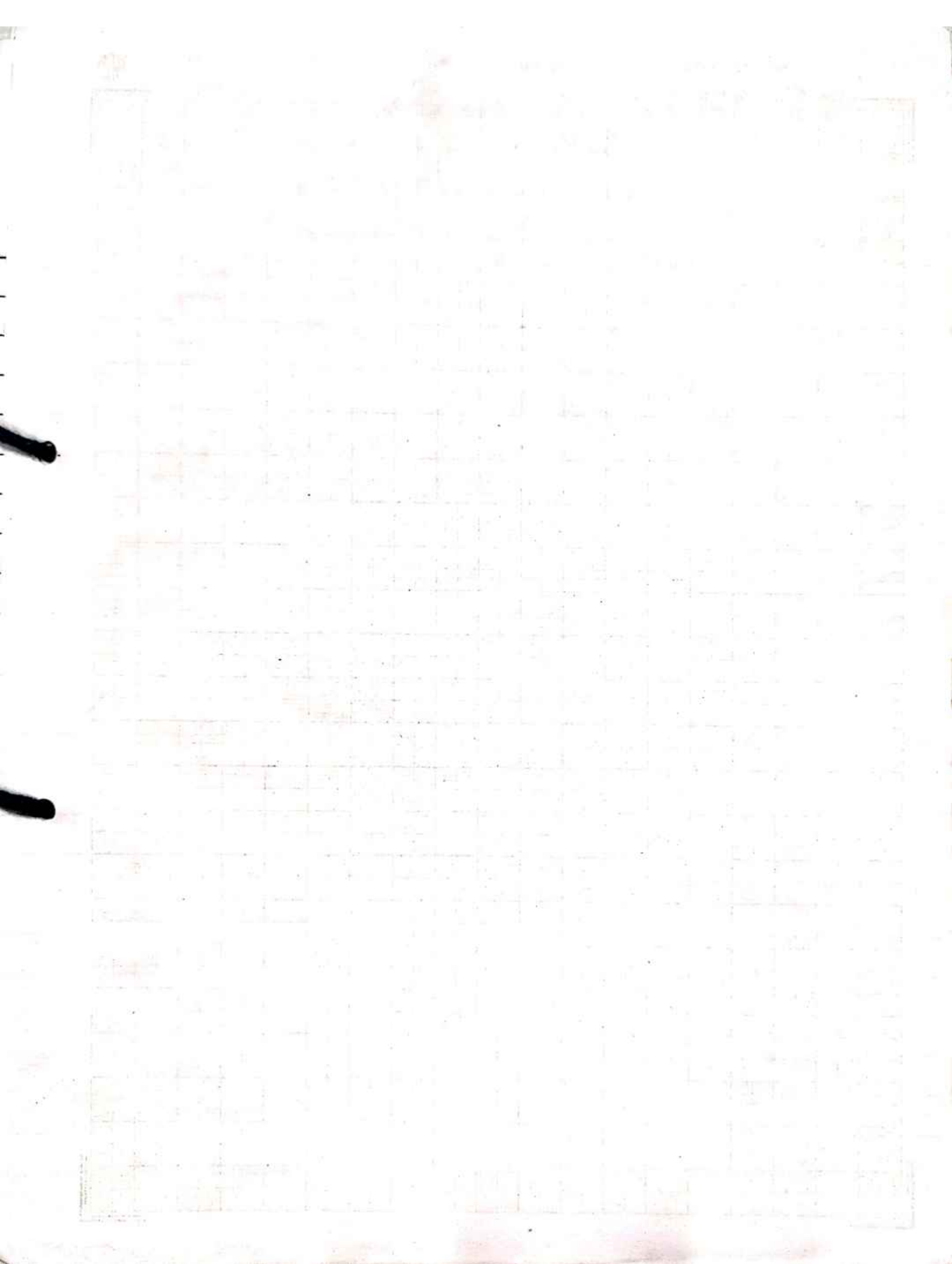
OBJECT: Study the characteristics of S.I.T. (Saturated Inductor Transistor)

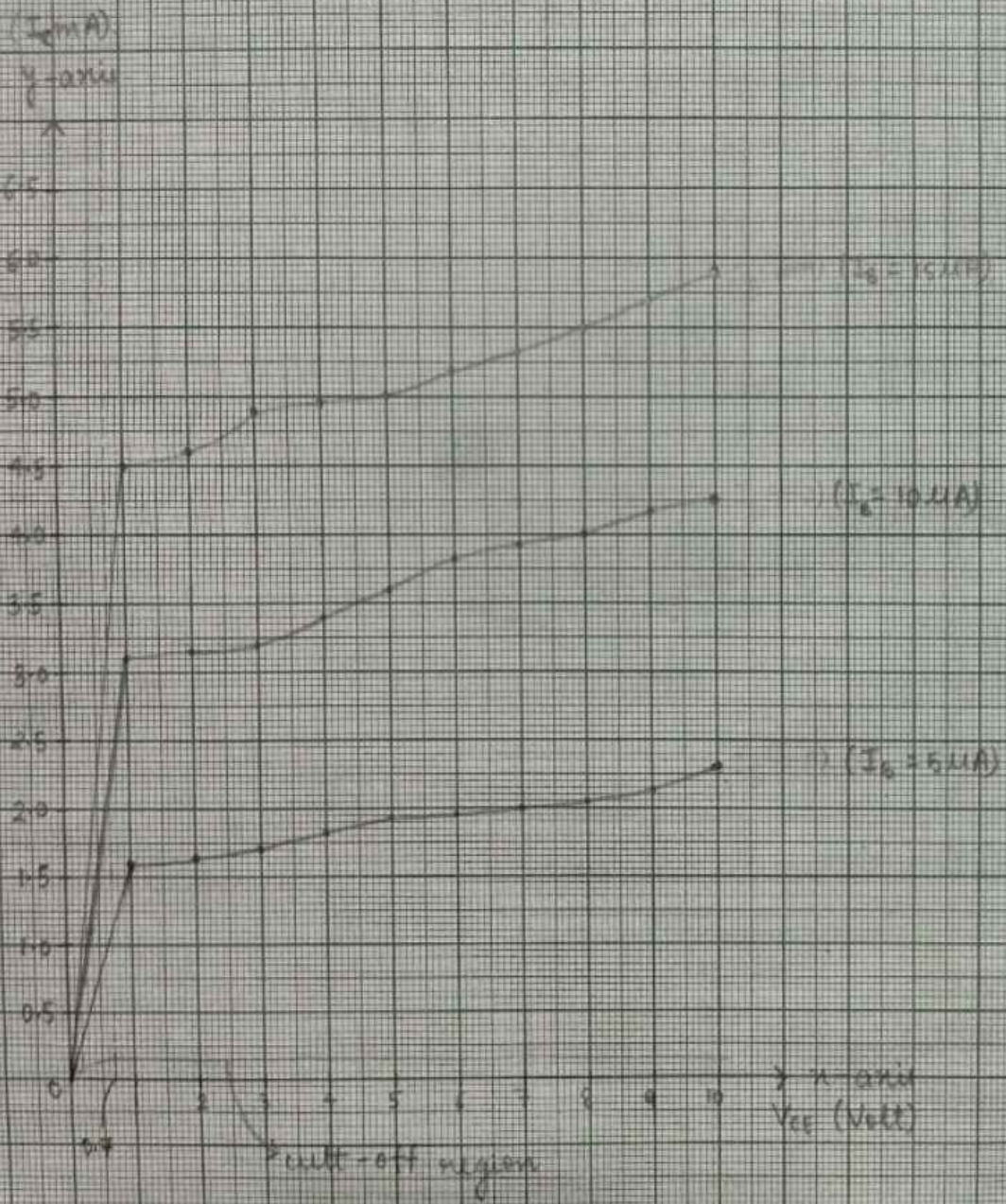
INSTRUMENTS REQUIRED: RTN (80-50V) transformer, Voltmeter (0-10V), ammeter (0-10mA), Resistor (400Ω, 470Ω, 10-50V), connecting wires.

THEORY: A saturable inductor device consisting of 3 pole laminations joined up symmetrically. It is a type of reactor which is used in a wide range of electronic circuits. It is known as a saturable inductor (S.I.T.).

(1) There are two functions: one between the collector and base and other between base and emitter.

(2) The collector layer of a saturable inductor is a thin layer of magnetic material. It is used as a collector region in a transistor.







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Date 21/2/24 Experiment No. 6 P.No. 28

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

- 3.) The resistance of emitter junction is very small (as in forward bias) whereas the resistance of collector junction is very large (as in reverse bias) output resistance $r_o = \frac{\Delta V_{CE}}{\Delta I_C}$

OBSERVATION TABLE:-

S.No.	V_{CE}	$I_C(\text{mA}) (I_B = 5\mu\text{A})$	$I_C(\text{mA}) (I_B = 10\mu\text{A})$	$I_C(\text{mA}) (I_B = 15\mu\text{A})$
1.	0	0	0	0
2.	1	1.6	3.1	4.5
3.	2	1.65	3.15	4.6
4.	3	1.7	3.2	4.9
5.	4	1.8	3.4	4.45
6.	5	1.9	3.6	5
7.	6	1.95	3.8	5.2
8.	7	2	3.9	5.3
9.	8	2.05	4	5.5
10.	9	2.15	4.2	5.7
11.	10	2.3	4.25	5.9



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Date 21/2/24 Experiment No. 6 P.No. 29
Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

RESULT:- The value of saturation current of collector (I_c) increases as the current at base (I_b) increases.

PRECAUTIONS:- 1) The connections made should be tight.

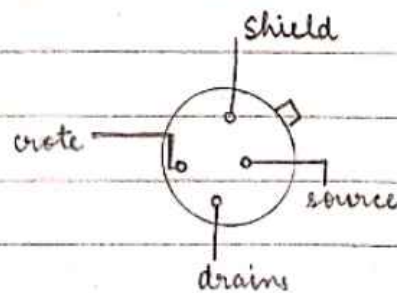
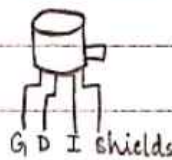
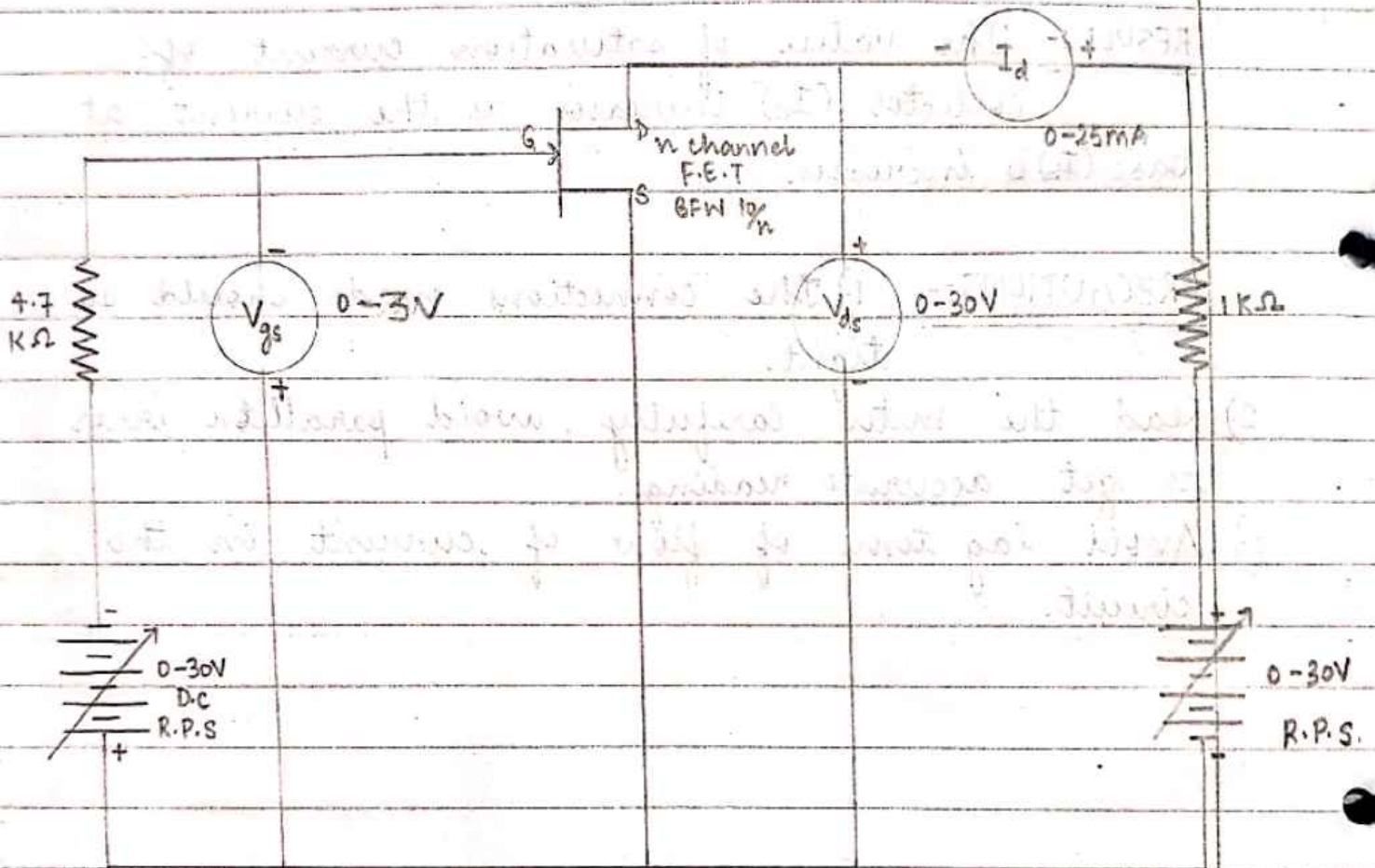
- 2) Read the meter carefully, avoid parallax error to get accurate readings.
- 3) Avoid lag time of flow of current in the circuit.

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Date: 21/12/21 Experiment No: 6
Name: Pooja Wadhwa Faculty No: Class: I





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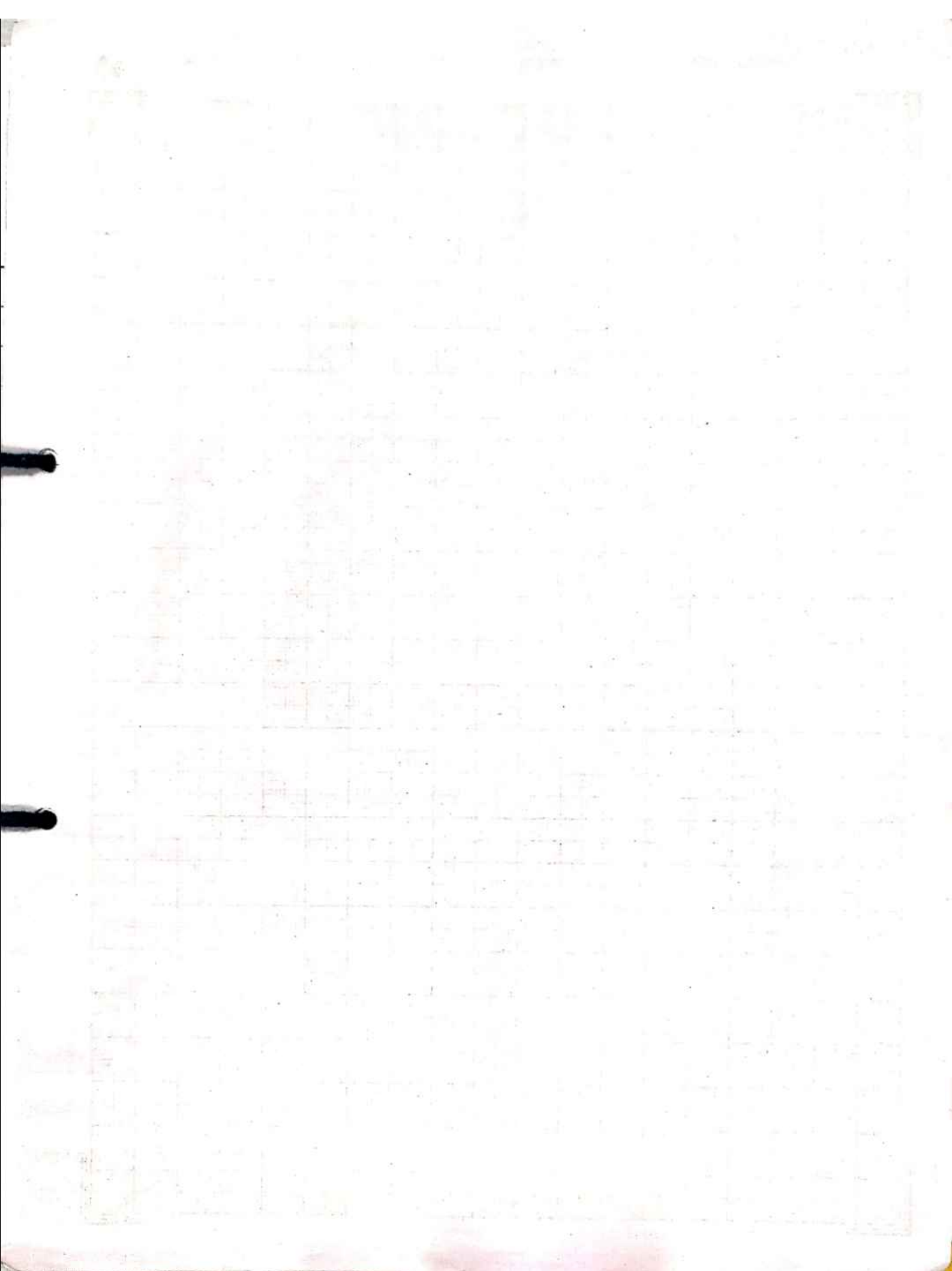
Date 21/2/24 Experiment No. 7 P.No. 30

Name Ridhi Mulchandani Faculty No. Class I year/D-4/10

OBJECT:- Study the characteristics of F.E.T. (Field effective transistor).

APPARATUS REQUIRED:- Two D.C. power source (0-30V);
D.C. power supply (10V); voltmeter (3V);
n channel FET (field effective transistor);
Ammeter (0-25mA); resistance ($1K\Omega$, $4K\Omega$, $7K\Omega$).

THEORY:- A curve between drain current (I) drain source voltage (V_{ds}) of FET of voltage carried constant gate source voltage (V_{gs}) is known as output characteristics of FET. At this initial stage the drain source voltage (V_{ds}) but then become almost constant the drain source voltage above which drain current becomes almost constant is known as pinch off voltage. The reason of the above behaviour of the device is because at the initial stage the n-type or acts as a simple SC,





7

Name

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I_d (mA)

y-axis

↑

10

8

6

4

3

2

1

0

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

$V_{gs} = 4V$

$V_{gs} = 1V$

$V_{gs} = 2V$

x-axis
 V_{ds}
(in Volts)



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Date... 21/2/22 ... Experiment No. 7 ... P.No. 31

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

resistance and the current. It increases initially with V_{as} , however with increasing current smaller values of V_{ds} . Thus the maximum values of drain current will be smaller.

PINCH OFF VOLTAGE:- Pinch off voltage is the value of V_{ds} when current reaches constant saturation value.

OBSERVATION TABLE:-

S.No.	V_{dc}	$V_{gs}(0V)/I_d$	$V_{gs}(-1V)/I_d$	$V_{gs}(-2V)/I_d$
1.	0	0	0	0
2.	1	5.05	3	1.25
3.	2	9.85	5	2
4.	3	10.05	6	2.5
5.	4	11.5	6	2.5
6.	5	11.5	6	2.5
7.	6	11.5	6	2.5
8.	7	11.5	6	2.5
9.	8	11.5	6	2.5
10.	9	11.5	6	2.5
11.	10	11.5	6	2.5

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21/4/22

Subject: English

The student is required to write an essay on the following topic: "The importance of education in the development of a nation". The student is to write in his own words and to use the following points as a guide: (i) Education is the key to progress. (ii) Education creates a sense of unity and patriotism. (iii) Education is the best way to improve the living standards of a nation. (iv) Education is the only way to create a better future for the next generation.

EXERCISES

Q. No.	Ans.	Q. No.	Ans.
1.	Education is the key to progress.	11.	Education is the only way to create a better future for the next generation.
2.	Education creates a sense of unity and patriotism.	12.	Education is the best way to improve the living standards of a nation.
3.	Education is the best way to improve the living standards of a nation.	13.	Education is the only way to create a better future for the next generation.
4.	Education is the only way to create a better future for the next generation.	14.	Education is the best way to improve the living standards of a nation.
5.	Education is the key to progress.	15.	Education creates a sense of unity and patriotism.
6.	Education creates a sense of unity and patriotism.	16.	Education is the best way to improve the living standards of a nation.
7.	Education is the best way to improve the living standards of a nation.	17.	Education is the only way to create a better future for the next generation.
8.	Education is the only way to create a better future for the next generation.	18.	Education is the key to progress.
9.	Education is the key to progress.	19.	Education creates a sense of unity and patriotism.
10.	Education creates a sense of unity and patriotism.	20.	Education is the best way to improve the living standards of a nation.



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Date 21/2/24 Experiment No. 7 P.No. 31

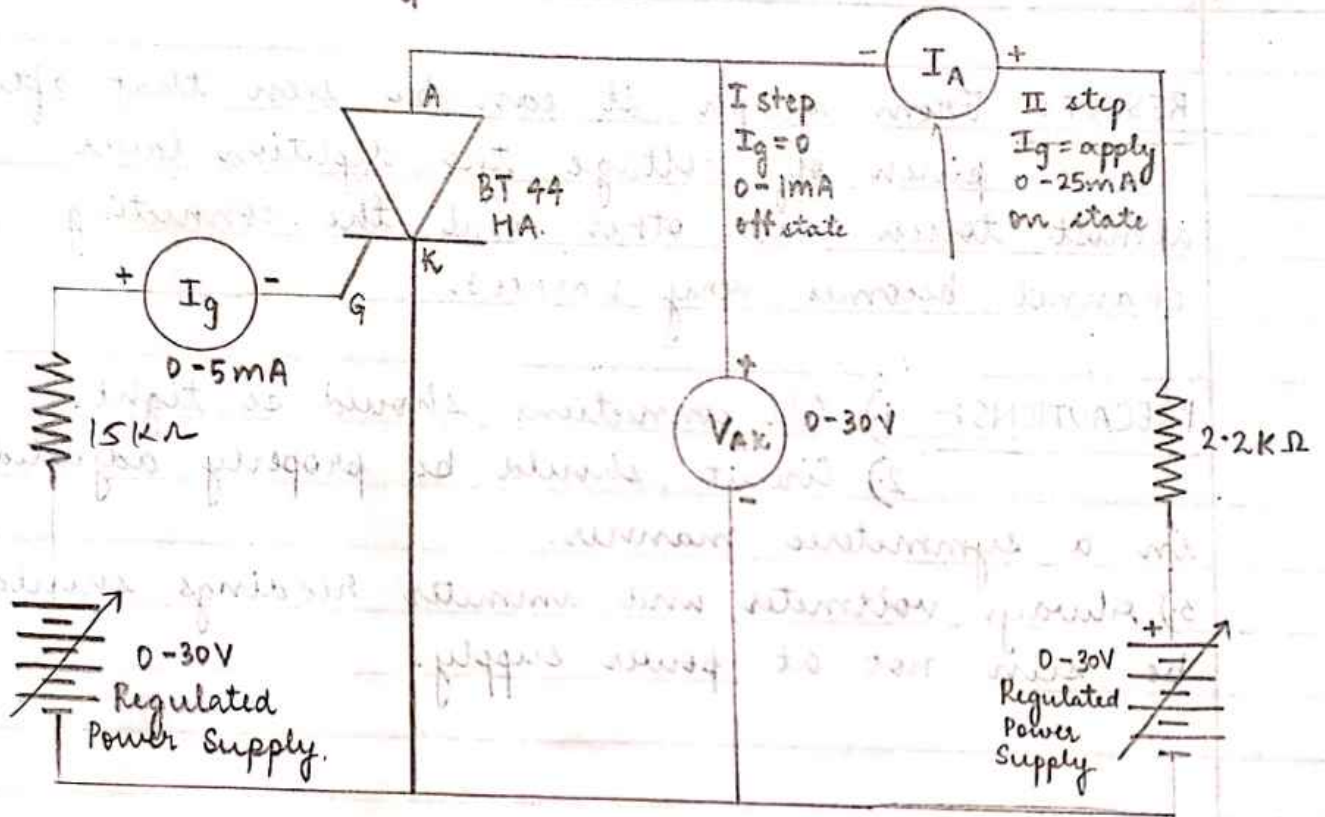
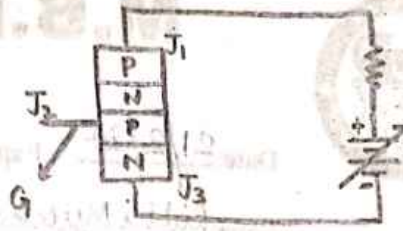
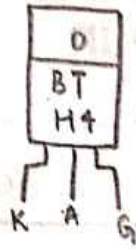
Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

RESULT:- From graph it can be seen that after pinch off voltage the depletion layer almost touch each other and the connecting channel becomes very narrow.

PRECAUTIONS:-

- 1.) All connections should be tight.
- 2.) Circuit should be properly adjusted in a symmetric manner.
- 3.) Always voltmeter and ammeter readings should be seen not at power supply.

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Date 28/2/24 Experiment No. 8 P.No. 32

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

OBJECT:- Study V and I characteristics in S.C.R.
(Silicon control rectifier).

APPARATUS REQUIRED:- Ammeter (0-5mA); voltmeter (0-30V);
silicon control rectifier (S.C.R.); 0-30V
D.C power supply, resistor ($45K\Omega$, $2.2K\Omega$); connecting
wires.

THEORY:- A S.C.R. is a three terminal semiconductor
device which can be used as controlled
switch to perform various functions, such as
rectification inversions and regulations of power
flow. A graph is between anode and cathode
voltage (V_{AK}) and anode current (I_A) at constant.
The current is known as V and I characteristics
of S.C.R.

CHARACTERISTICS:- 1.) gate current $I_g = 0$; As
power voltage is increased from
there. Its a leakage current which flows through

30 di V $\rightarrow$ 1 $\rightarrow$ 20 div.



SUBJECT: Study V and I characteristics in S.C.R.
(Instructor: Dr. J. K. Sharma)

APPARATUS REQUIRED: Ammeter (0-50mA), Voltmeter (0-50V),
Variable control resistor (0-50k Ω), 100k Ω , 2.2k Ω , connecting
wires.

THEORY: A S.C.R. is a three terminal semiconductor device which can be used as controlled switch to perform various functions such as rectification, voltage and regulation of power, etc. A graph is between anode and cathode voltage (V_a) and anode current (I_a) is constant. The current is known as I and I characteristics of S.C.R.

CHARACTERISTICS: The graph shows the variation of anode current (I_a) with anode-cathode voltage (V_a) for a constant gate current (I_g). The graph shows that the device remains in the off state until the anode-cathode voltage reaches a certain value (breakover voltage) after which the device turns on and the anode current increases rapidly.



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Date 28/2/24 Experiment No. 8 P.No. 33

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

anode. This is due to leakage of minority carrier. However, its value is extremely small (μA) and remains constant as the voltage is increased in other side. The S.C.R. is said to be applied. Now when the power supply voltage reaches the forward break over voltage, S.C.R. at once begins to conductor and the voltage V across the resistor suddenly drops whole induction is reached rapidly under such condition most of power supply voltage appears across the load, as drop across the resistor is hardly $1V$ as compared to several hundred volts across load.

- 2.) When gate current flows : the above considered apply for zero gate current i.e. when gate current is open. However when a small gate voltage is applied, the gate current starts flowing.

The flow of gate current helps in making current helps flow across junction i.e., an breaking

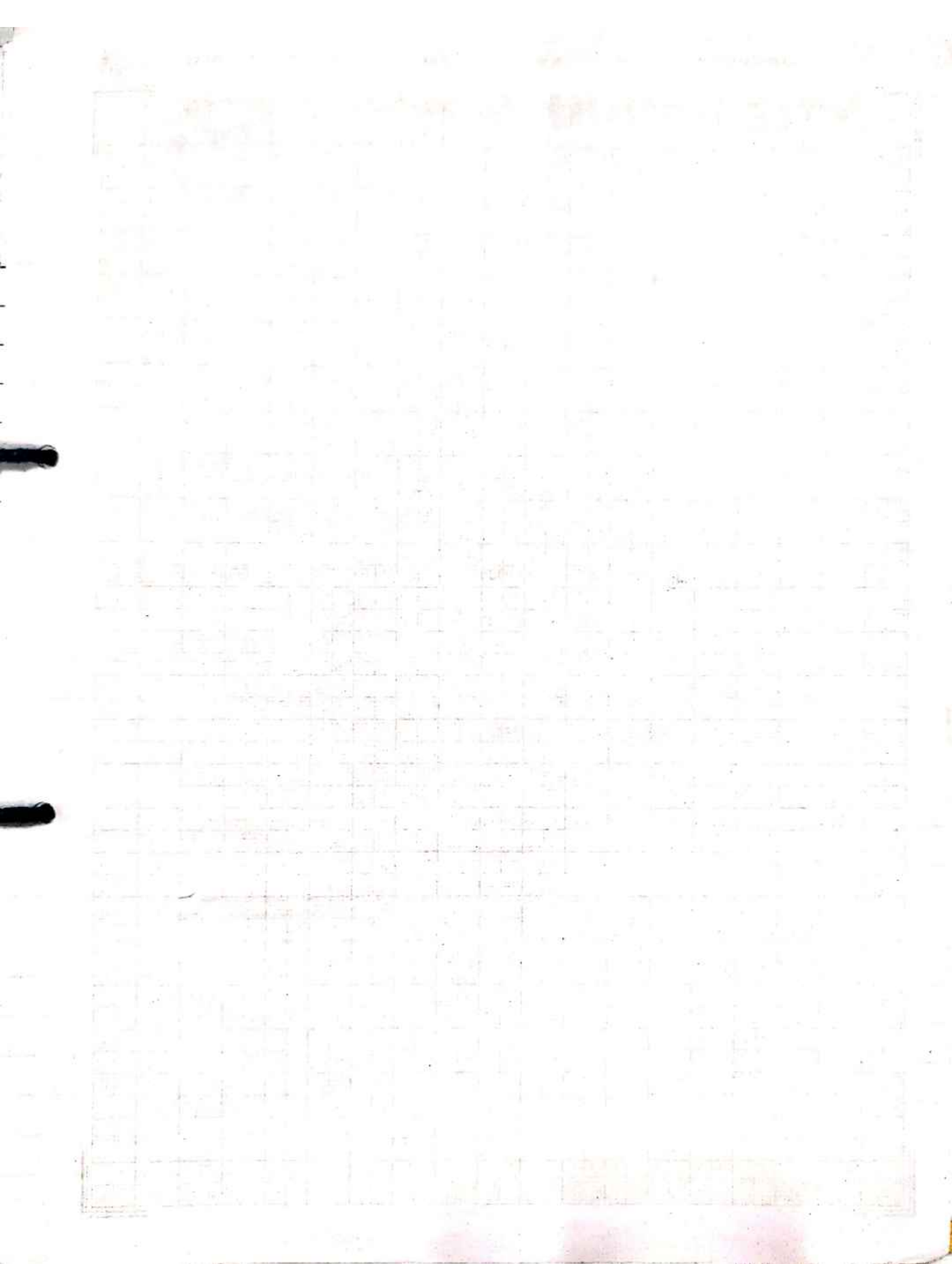


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When a load is connected to the output of a MOSFET, the voltage across the load is initially zero. As the gate voltage is increased, the MOSFET starts to conduct and the voltage across the load begins to rise. The MOSFET acts as a switch and the voltage across the load is equal to the supply voltage when the MOSFET is fully on. The MOSFET is said to be in saturation when the voltage across the load is equal to the supply voltage. The MOSFET is said to be in the linear region when the voltage across the load is less than the supply voltage. The MOSFET is said to be in the sub-threshold region when the voltage across the load is less than the threshold voltage. The MOSFET is said to be in the cut-off region when the voltage across the load is zero.

2) When the gate voltage is increased, the MOSFET starts to conduct and the voltage across the load begins to rise. The MOSFET acts as a switch and the voltage across the load is equal to the supply voltage when the MOSFET is fully on. The MOSFET is said to be in saturation when the voltage across the load is equal to the supply voltage. The MOSFET is said to be in the linear region when the voltage across the load is less than the supply voltage. The MOSFET is said to be in the sub-threshold region when the voltage across the load is less than the threshold voltage. The MOSFET is said to be in the cut-off region when the voltage across the load is zero.

The MOSFET is said to be in saturation when the voltage across the load is equal to the supply voltage. The MOSFET is said to be in the linear region when the voltage across the load is less than the supply voltage. The MOSFET is said to be in the sub-threshold region when the voltage across the load is less than the threshold voltage. The MOSFET is said to be in the cut-off region when the voltage across the load is zero.



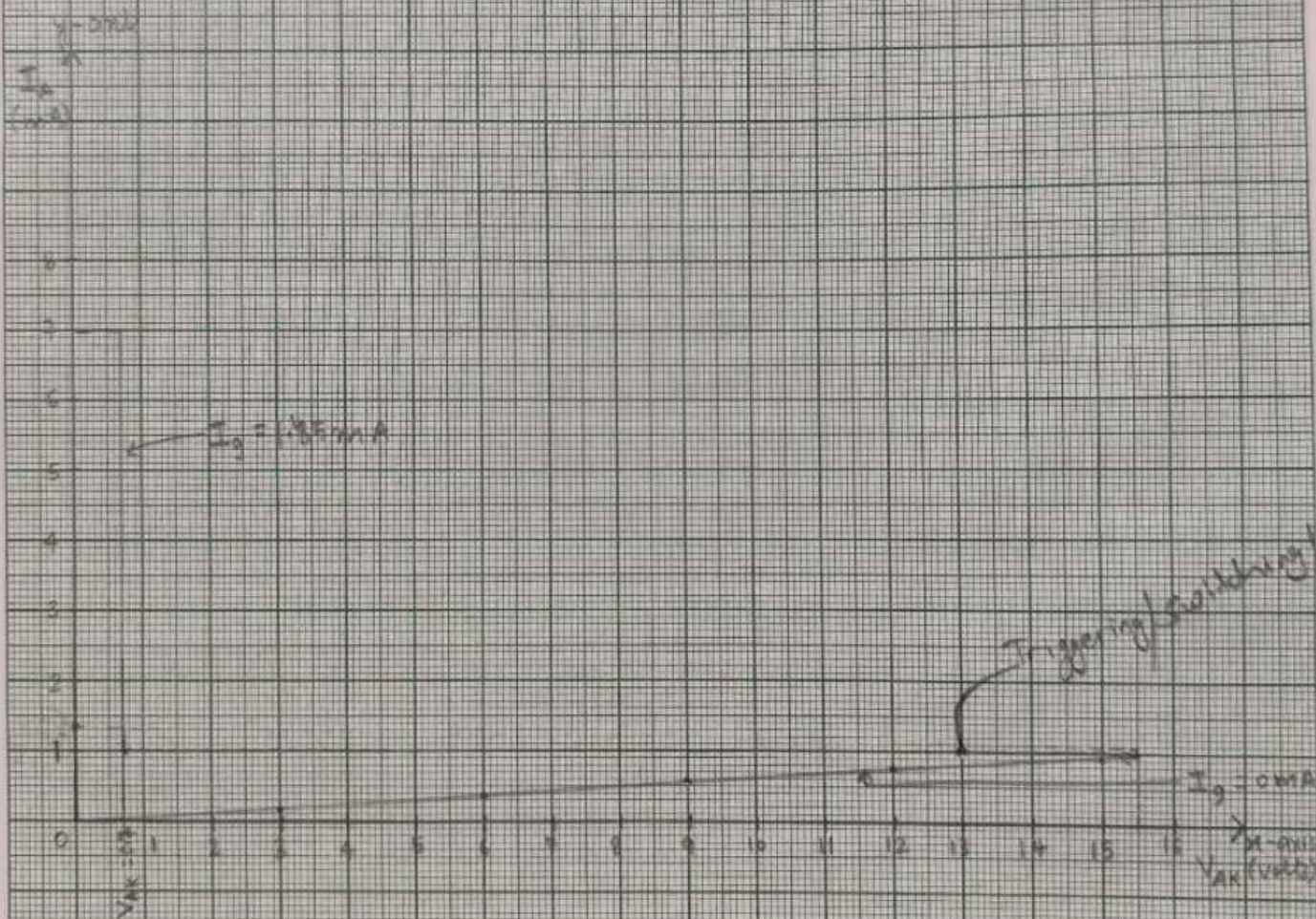


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Date 28/2/24 Experiment No. 8 P.No. 34

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

it down, due to high +ve potential on anode side of the junction electrons in n-type materials are vertically pulled into p-type.

$I_L \rightarrow$ Latching current :- The least amount of anode current which is necessary to supply from the anode terminal to the cathode terminal to achieve the S.C.R. of after detaching the gate terminal.

$I_H \rightarrow$ Holding current :- The smallest amount of current under which anode current has to drop to enter status.

OBSERVATION TABLE :-

S.No.	V_{AK}	I_A (mA) [$I_g = 0$]	1) I step (1 mA meter) 2) II step (0-25 mA, II meter)
1.	0	0	
2.	3	0.18	$V_{AK} = 0.7V$
3.	6	0.36	$I_g = 15mA$
4.	9	0.56	$I_A = 7mA$
5.	12	0.69	
6.	15	0.94	
7.	15.5	1	



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Date _____

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Date 28/2/24 Experiment No. 8 P.No. 35

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

After I step power supply must neither decrease nor off replace the 1mA meter to the 25mA meter.

RESULT:- When gate current is 0, the value of leakage current (I_A) is extremely small (μA) and remain fairly constant at the voltage is applied. increased. So the curve will be horizontal approx a straight line curve.

PRECAUTIONS:-

- 1) All connections should be tight.
- 2) Excessive flow of current may damage the S.C.R. device.
- 3) Current for very long may change the reading.



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After I stop the supply of water to the tank, I replace the tank with the same water.

Result:- When gate current is 0, the value of leakage current (I_L) is extremely small and remains fairly constant as the voltage is applied. As the gate voltage is increased, the leakage current approaches a straight line curve.

PRECAUTIONS:-

- 1) All connections should be tight.
- 2) Excessive flow of current may damage the S.C.R. device.
- 3) Current for long time may change the reading.



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Date 28/2/24 Experiment No. 8 P.No. 36
 Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

OPERATING STEPS:-

- 1.) Connect main chord of C.R.O to the electric board pannel.
 - 2.) Power on the front pannel switch and ensure that all pressing switches are upward and ground switch should be press condition.
 - 3.) Check the intensity control for 50% intensity of beam/trace.
 - 4.) Check the Y-switch for vertical centering of the beam meanwhile the focus of the beam is required.
 - 5.) Check the X-switch for horizontal centering of the beam.
- | | | | |
|-----------------|-----------------|-----|---------------------------------------|
| CH ₁ | CH ₂ | TB | Setting is for H.W and F.W Rectifier. |
| 5V | 5V | 5ms | |
- 6.) Chord: BNC (By Nut Connector) code to crocodile clips, co-crid cable having impedence $Z = 75\Omega$



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Page: 8
Sem: D-4-I-Geo/10

OPERATING STEPS:-

- 1) Connect power chord of C.R.O. to the electric board power.
- 2) Turn on the front panel switch and ensure that all fusing switches are opened and ground switch should be press condition.
- 3) Check the intensity control for CRT intensity of beam/trace.
- 4) Check the Y-axis for vertical centring of the beam observable the focus of the beam is adjusted.
- 5) Check the X-axis for horizontal centring of the beam.

CH1	CH2	TP	Attenuation is for 10 and
5V	5V	5V	For Rectifier

- 6) Connect BNC (or Nist) probe to oscilloscope. Co-ax cable having impedance 50Ω or 75Ω .



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Date 28/2/24 Experiment No. 8 P.No. 37
Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

Measurement of colliteration output signal

CH ₁	CH ₂	T _B
0.2 V	5V	0.5ms

$$T_B = 2 \times 0.5 \text{ ms} = 0.001 \text{ sec.}$$

frequency = 1 kHz.

$$CH_1 = 0.2 \text{ V}$$

$$\text{Amp} = 1 \text{ div.} \times 0.2 \text{ V/div.} = 0.2 \text{ V}$$

$$T_B = 0.5 \text{ ms}$$

(Amplitude).



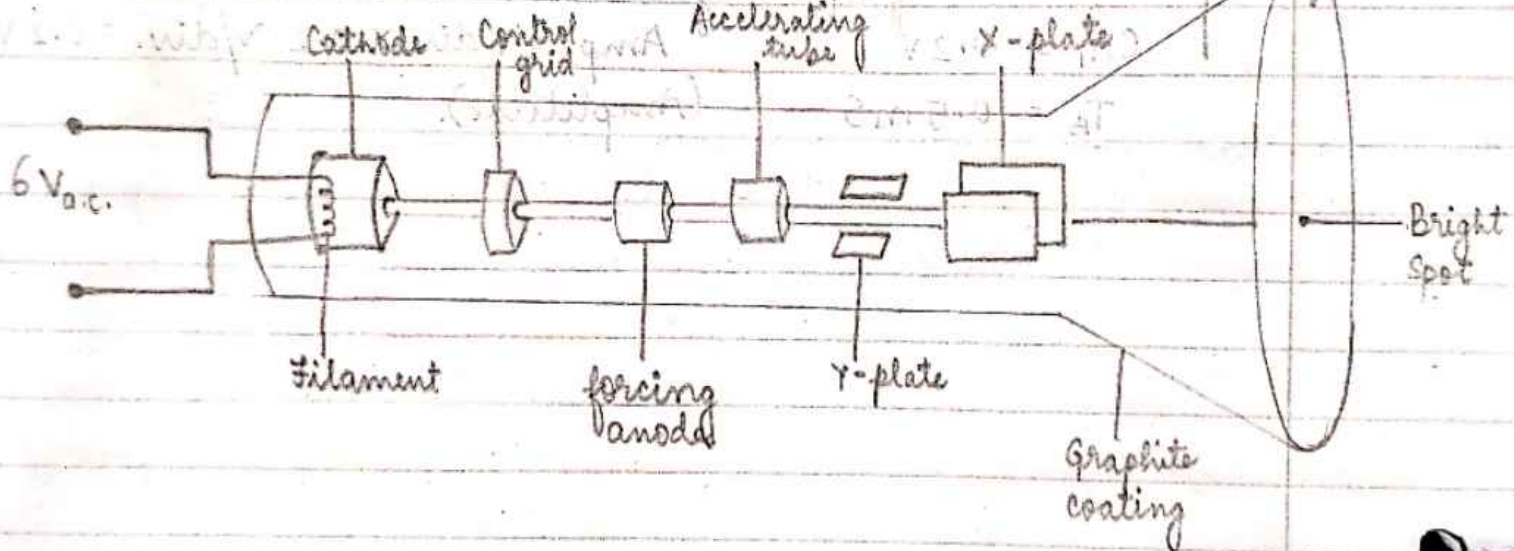
Name: Robert M. Smith Experiment No. 8 Date: 2/1/81
Faculty No. 1000 Class 201 P.No. 87

largis tegris militibus in transmissis

0.5A	FA	0.5m2
0.5A	FA	0.5m2

$$100.0 = 2.3 \times 10^3 \times \Delta T$$
$$SHWT = 1000000$$

$\sqrt{2} = \sqrt{2}$



CATHODE RAY TUBE.



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Date 6/3/24 Experiment No. 9 P.No. 38
Name Ridhi Mulchandani Faculty No. Class D-4/10/I-year

OBJECT:- Study the C.R.O. (Cathode Ray Oscilloscope)

C.R.O:- It's the most important and versatile instrument in laboratories. It gives a visual induction of a signal wave form. It is used for trouble shooting in radio and television receivers and for laboratory measurement. The oscilloscope can measure voltage, amplitude, frequency and phase shift.

BLOCK DIAGRAM:- The figure shows all the sub-systems but there are the minimum stage required which are:-

- (i) VERTICAL DEFLECTION SYSTEM:- It consists of an input alternator and number of amplifier stages. The gain of amplifier can be controlled with the help of alternator. The wave form to be displayed is connected to and earth.



Corrected copy for C.R.O. (Cathode ray Oscilloscope)

C.R.O. :- It is the most important and versatile instrument in laboratory. It gives a visual indication of a signal wave form. It is used for trouble shooting in radio and television receivers and for laboratory measurement. The oscilloscope can measure voltage, amplitude, frequency and phase shift.

Block Diagram:- The figure shows all the sub-systems but there are the main stages involved which are:-

- (i) VERTICAL DEFLECTION SYSTEM:- It consists of an input attenuator and number of amplifier stages. The gain of amplifier can be controlled with the help of attenuator. The wave form to be displayed is connected to vertical control.



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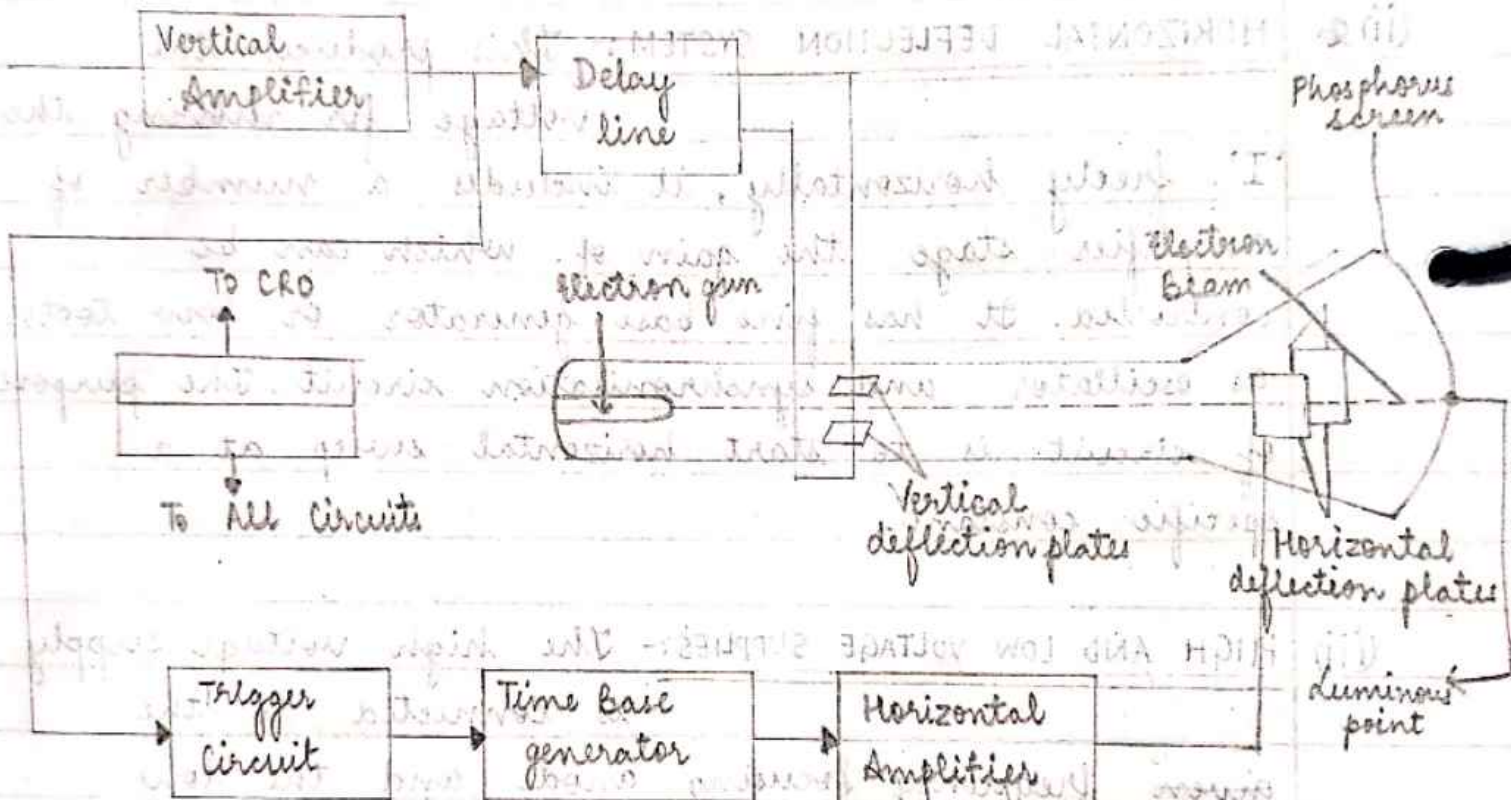
Date 6/3/24 Experiment No. 9 P.No. 39

Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

(ii) **HORIZONTAL DEFLECTION SYSTEM:-** This produces the voltage for moving the 'I' freely horizontally, it includes a number of amplifier stage the gain of which can be controlled. It has fine base generator or low tooth as oscillator and synchronisation circuit. The purpose of circuit is to start horizontal sweep at a specific constant.

(iii) **HIGH AND LOW VOLTAGE SUPPLIES:-** The high voltage supply is connected to the given frequency focusing anode and the low voltage supply is given to the heater and control grid by varying the potential on focusing anode and cathode guide. The beam can be focusing and its intensity can be controlled.

EA



BLOCK DIAGRAM OF C.R.O.



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Date.....6/3/24.....Experiment No.....9.....P.No.....40
Name Ridhi Mulchandani Faculty No..... Class D-4/I-year/10

CATHODE RAY TUBE :- C.R.T. is a vacuum tube of special geometrical shape. It converts an electrical signal into visible one. There is a cathode which is heated by a heater to emit electrons with high velocity, finally focused at the screen which is coated with fluorescence material then a spot of light is obtained on screen. The electron beam from cathode is deflected by suitable. As a result, a visual wavelength is obtained on screen. The main parts of C.R.T. are:-

- 1) GLASS ENVELOPE :- It's a conical highly evolved glass having and supports the various electrodes. The inner wall of C.R.T. between the map and screen are coated with a conducting material.
- 2) THE ELECTRON GUN :- Cathode is an electrode which kept at -ve point of when it is

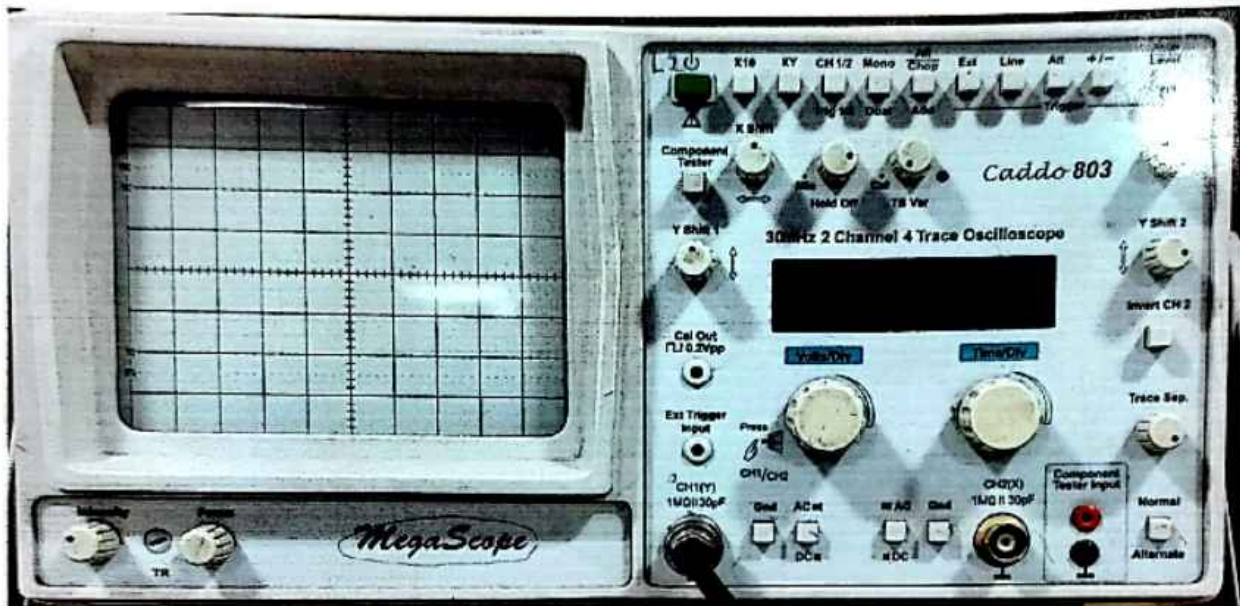


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Date _____

CATHODE RAY TUBE :- C.R.T. is a vacuum tube of special geometrical shape. It contains an electron gun at one end which is heated up to emit electrons with high velocity. These electrons are focused at the screen which is coated with fluorescent material. When a spot of light is obtained on screen, the electron beam from cathode is deflected by suitable A.C. voltage. The main part of C.R.T. are :-

1. GLASS ENVELOPE :- It is a curved highly polished glass having lead support to the various electrodes. The inner wall of C.R.T. tube is coated with a conducting material.

2. THE HEATING COIL :- It is a coil which is kept at the point of where it is heated.



**FRONT PANEL OF CATHODE RAY OSCILLOSCOPE
(C.R.O.) GUIDED BY C.S. SRIVASTAVA SIR**



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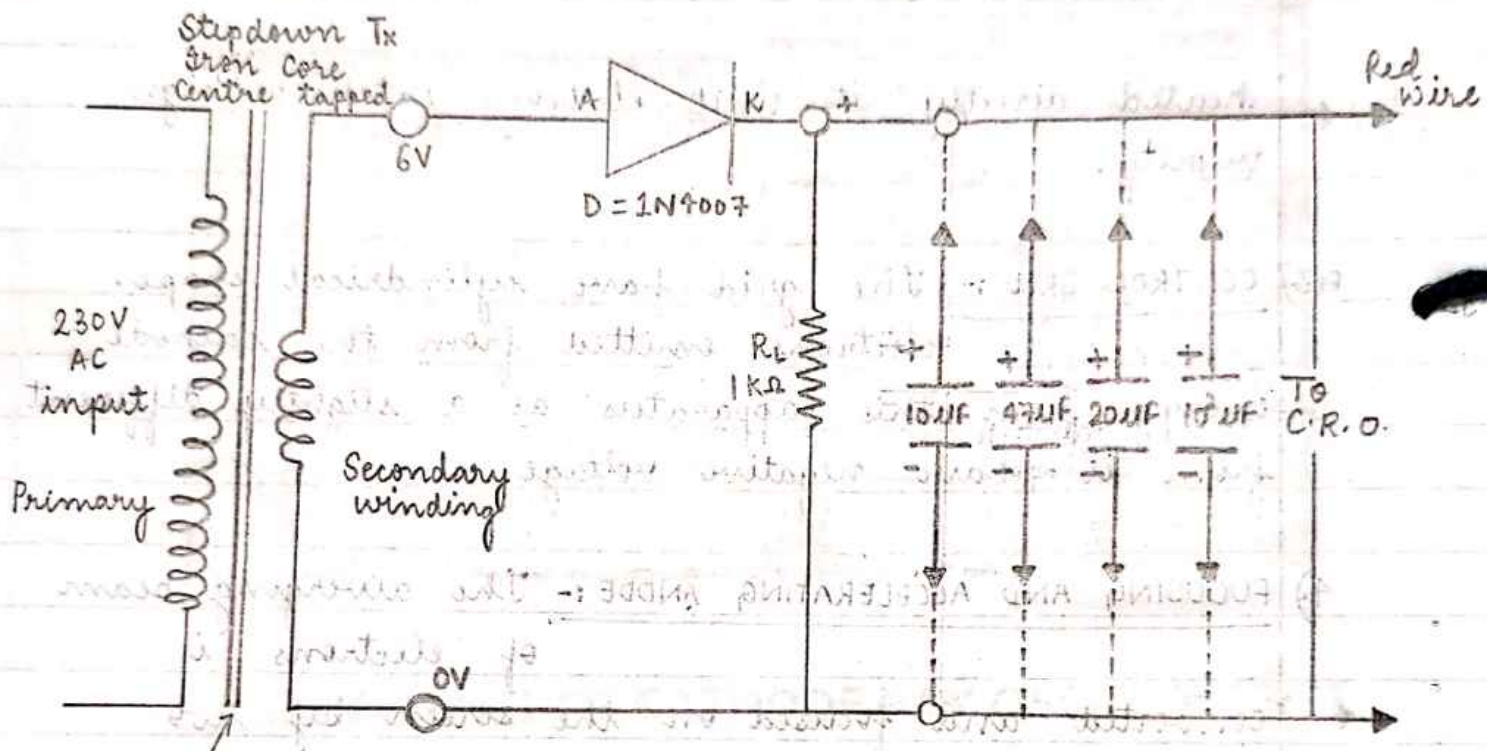
Date 6/3/24 Experiment No. 9 P.No. 41
 Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

heated directly its unit electrons catch a high velocity.

3) CONTROL GRID :- The grid have cylindrical shape. electrons emitted from the cathode energy from this apparatus as a slightly different from it have negative voltage.

4) FOCUSING AND ACCELERATING ANODE :- The diverging beam of electrons is converted and focused on the screen by two accelerating anodes which form an electronic tense. The electronic tense action is controlled by focus control. A potentiometer varies the voltage to the first anode.

5) THE FLUOROSCENT SCREEN :- This is the inside face of tube is coated with some flourscnt material such as zincothrace silicate, zinc oxide, phosphorus etc, when a beam of light is projected on it the colour of light depends on the type of material coated on the screen.



accelerating anode which forms the electron gun. The electronic tube is connected to the accelerating anode. A potentiometer varies the voltage to the first anode.

5) THE FLUORESCENT SCREEN:- This is the inside face of tube is coated with some fluorescent material such as zinc silicate, zinc oxide, phosphorus etc. When a beam of light is projected on it the colour of light depends on the type of material coated on the screen.



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Date 6/3/24 Experiment No. 10 P.No. 42

Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

OBJECT:- Study the characteristics of half wave rectifier. (Eff. $\approx 40, 41\%$)

MATERIAL REQUIRED:- P-N Junction diode, resistance, bridge board, and C.R.O and step down transformer.

THEORY:- A device is capable of converting a horizontal input wave from into a unidirectional input wave with form with non-zero component is called a rectifier.

A particle half wave rectifier with a resistive load is shown in the figure, during the +ve half cycle of input the diode conducts and all the input voltage is dropped across RL. During the -ve half wave cycle the diode is reverse biased and is in state and so the output voltage is zero. The filter is simply a capacitor connected from

Peak Inverse Vol. (PIV) = max. breakdown vol.



OBJECT:- Study the characteristics of half wave rectifier.

MATERIALS REQUIRED:- 4-11 Transformer, Diode, Resistor, Bridge board, and C.R.O. and step down transformer.

THEORY:- A diode is capable of allowing a unidirectional input wave form into a circuit. A circuit in which a unidirectional input wave form is called a rectifier.

A circuit which uses rectifier with a transformer is shown in the figure. The secondary of the transformer is connected to the input of the diode and all the input voltage is dropped across it. During the half wave cycle the diode is forward biased and is in state and the output voltage is zero. The filter is simply a capacitor connected from the output of the rectifier.



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Date 6/3/24 Experiment No. 10 P.No. 43

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

the rectifier output to ground, the capacitor quickly charges at the beginning of a cycle and slowly discharges through input voltage.

The variations in the capacitor voltage due to charging and discharging is called Ripple voltage. Generating ripple is the smaller ripple better filtering action.

Ripple factor is an indicator of the effectiveness of the filter and is defined as:

$$R = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$$

V_{rms} = Ripple voltage and V_{dc} = Peak/rectified value of voltage $R \downarrow$ by increasing the value of the filter capacitor or in load capacitor.



pure AC $\rightarrow$ pure DC.
Voltage Regulator / Zener diode

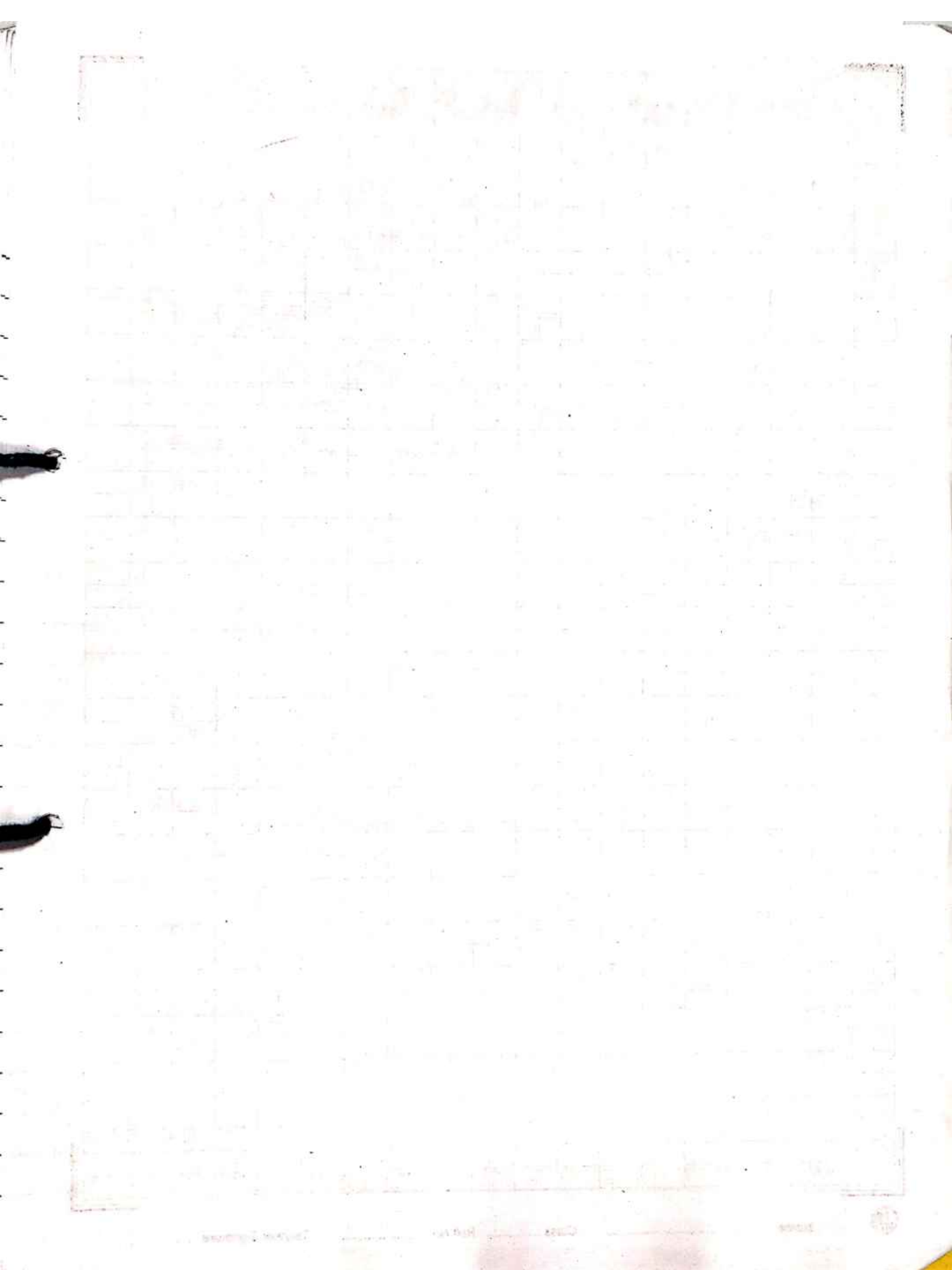
The rectifier output is connected to a load. At the beginning of a cycle, the capacitor charges to the peak value of the input voltage and then discharges through the load.

As the capacitor discharges, the voltage across it falls. This is called ripple voltage. The average value of the ripple voltage is called the ripple factor. A smaller ripple factor indicates better filtering action.

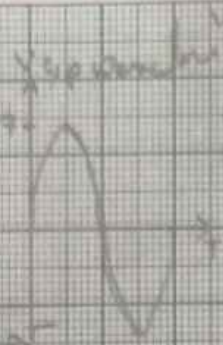
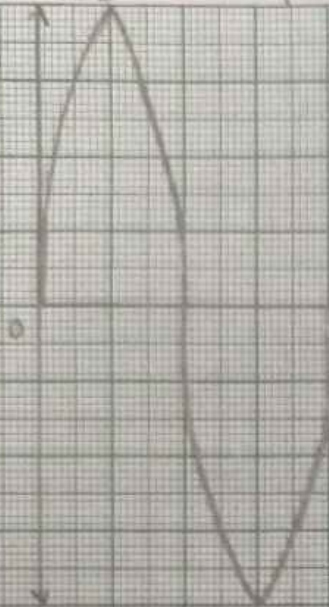
Ripple factor is an indicator of the effectiveness of the filter and is defined as:

$$R = \frac{V_{rms}}{V_{dc}} \sqrt{\frac{1}{1 - (V_{dc}/V_{rms})^2}}$$

where V_{rms} = ripple voltage and V_{dc} = peak-to-peak value of voltage. As the value of the filter capacitor or the load resistance increases, the ripple factor decreases.



230V AC Input



No capacitance

V_o

$C_2 = 10 \mu F$

V_o

V_o

$C_3 = 200 \mu F$

V_o

$C_5 = 200 \mu F$

V_o

$C_4 = 100 \mu F$

V_o

Scale

X-Axis

Unit = 10ms

Y-Axis

Unit = 5 Volt



Name

Class

Roll No.

Teacher Signature



Scanned with OKEN Scanner



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Date 6/3/24 Experiment No. 10 P.No. 44
 Name Ridhi Mulchandani Faculty No. Class D#I-year/10

CALCULATION:-

$$T = 4 \text{ div.} \times 5 \text{ ms/div.} = 20 \text{ ms}$$

$$F = \frac{1}{T} = \frac{1}{20 \times 10^{-3}} = 50 \text{ Hz.}$$

$$V_{\text{max}} = 1.4 \text{ div.} \times 5 \text{ V/div.} = 7.0 \text{ V.}$$

$$V_{\text{avg}} = \frac{V_{\text{max}}}{\pi} = \frac{7}{3.14} = 2.23 \text{ V.}$$

$$V_{\text{rms}} = \frac{V_{\text{max}}}{2} = \frac{7}{2} = 3.5 \text{ V.}$$

$$\text{Ripple Factor} = \sqrt{\left(\frac{V_{\text{rms}}}{V_{\text{avg}}}\right)^2 - 1} = 1.21$$

OBSERVATION TABLE:-

S.No.	Capacitor	V_{max}	Amplitude (v) of D.C (pulsating D.C)	Freq.	T = Div X Time
1.	No capacitance	7	7	50 Hz	20 ms
2.	10 μF	7	$7 - 1.5 = 5.5$	50 Hz	20 ms
3.	47 μF	7	$7 - 4 = 3$	50 Hz	20 ms
4.	200 μF	7	$7 - 6 = 1$	50 Hz	20 ms
5.	1000 μF	6.5	$6.5 - 6.5 = 0$	0 Hz	∞



Page No.

Date

Subject

Roll No.

Q.1. A particle of mass m is moving in a circular path of radius r with a constant speed v . Find the change in momentum when the particle completes one full revolution.

Sol.

$$P = mv$$

$$P_1 = mv \quad P_2 = mv$$

$$\Delta P = P_2 - P_1 = mv - mv = 0$$

$$\therefore \Delta P = 0$$

$$P_1 = mv \quad P_2 = mv$$

Q.2. A particle of mass m is moving in a circular path of radius r with a constant speed v . Find the change in momentum when the particle completes one full revolution.

$$P = mv$$

$$P_1 = mv \quad P_2 = mv$$

$$\Delta P = P_2 - P_1 = mv - mv = 0$$

$$\therefore \Delta P = 0$$



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Date 6/3/24 Experiment No. 10 P.No. 45

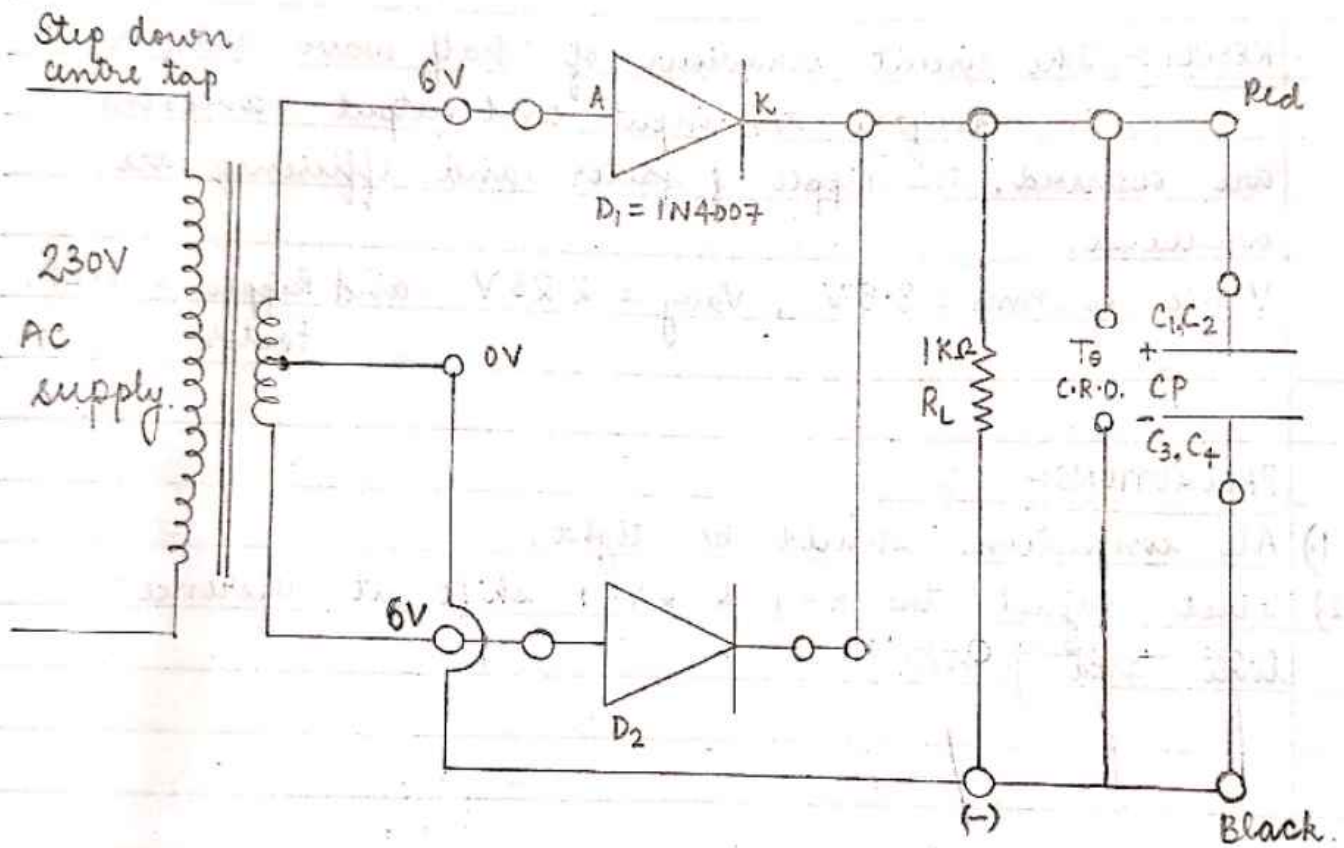
Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

RESULT:- The circuit behaviour of half wave rectifier is analyzed the input and output waveform are observed, the Ripple factor and efficiency are evaluated.

Value of rms = 3.5V , $V_{\text{avg}} = 2.23\text{V}$ and Ripple factor = 1.21 .

PRECAUTIONS:-

- 1) All connections should be tight.
- 2) First adjust the X-1 & Y-1 shift at reference line and process.





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Date 6/3/24 Experiment No. 11 P.No. 46
Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

OBJECT:- Study the characteristics at full wave rectifier using two diodes and center tap transformer.

APPARATUS REQUIRED:- Transformer, rectifier, diodes (two), resistors ($1\text{ K}\Omega$), capacitors, C.R.O., conducting wires.

THEORY:- In full wave rectifier, when AC supply is applied at input, during both the half cycles current flow through the load in the same direction.

CENTRE-TAP FULL WAVE RECTIFIER:- A centre-tap full wave rectifier circuit employs a transformer with secondary winding tap at the centre point. The two diodes D_1 and D_2 are connected in the circuit so that each one of them uses half cycles of input and AC voltage.



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Q.1. Explain the following terms:
a) Rectifier
b) Inverter

Ans. Rectifier is a device which converts AC into DC. Inverter is a device which converts DC into AC.

The first part of the question is about Rectifier. It is a device which converts AC into DC. There are two types of Rectifier: Single Phase Rectifier and Three Phase Rectifier.

The second part of the question is about Inverter. It is a device which converts DC into AC. There are two types of Inverter: Single Phase Inverter and Three Phase Inverter.



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Date 6/3/24 Experiment No. 11 P.No. 47
Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

When the supply is switched on, alternating voltage appears across the terminal of secondary winding during half positive cycle diode D_1 is in forward biased and D_2 is reverse biased condition so D_1 conduct current during positive half cycle, diode D_2 is in forward bias and D_1 is in reverse bias in negative half cycle, thus D_2 conduct current. It may be observed that the direction of current through load resistance remains the same in both case.

After the rectification the pulsating DC output voltage in shunt capacitor filter higher the value of capacitance more will be DC component.



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When the supply is switched on, starting voltage appears across the terminals of secondary winding during half positive cycle when it is in forward biased and it is reverse biased condition as it is in reverse biased during positive half cycle. Thus it is in forward bias and it is in reverse bias during negative half cycle. Thus the direction of current will be observed that the direction of current through load resistance remains the same in both case.

After the rectification the pulsating DC output voltage in series capacitor filter higher the value of capacitance more will be the r.m.s. component.



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Date 6/3/24 Experiment No. 11 P.No. 48

Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

CALCULATIONS:

$$T = 2 \text{ div.} \times 5 \text{ ms/div.} \\ = 10 \text{ ms.}$$

$$\text{freq.} = \frac{1}{T} = \frac{1}{10 \text{ ms}} = 100 \text{ Hz.}$$

$$V_{\text{max}} = 7 \text{ V.}$$

$$V_{\text{avg.}} = \frac{2 V_{\text{max}}}{\pi} = \frac{2 \times 7}{\pi} = 4.46 \text{ V.}$$

$$V_{\text{rms}} = \frac{V_{\text{max}}}{\sqrt{2}} = \frac{7}{\sqrt{2}} = 5 \text{ V.}$$

$$\text{Ripple factor} = \sqrt{\left(\frac{V_{\text{rms}}}{V_{\text{avg}}}\right)^2 - 1} = \sqrt{\left(\frac{5}{4.46}\right)^2 - 1} = 0.48$$



QUESTION

$$T = \frac{1}{f} \times \text{no. of cycles}$$

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

$$f = \frac{1}{T} = \frac{1}{100 \text{ Hz}}$$

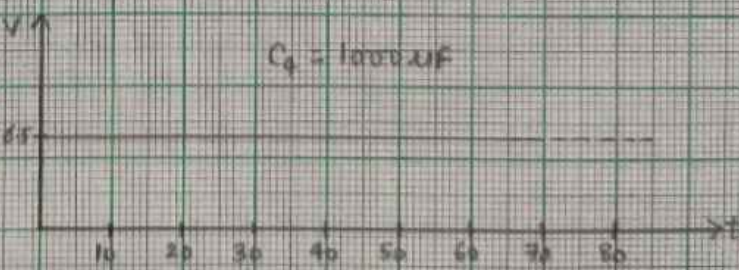
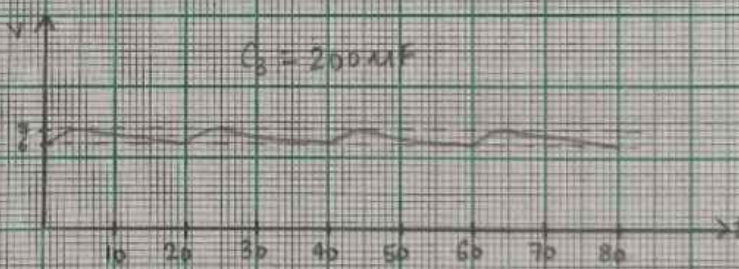
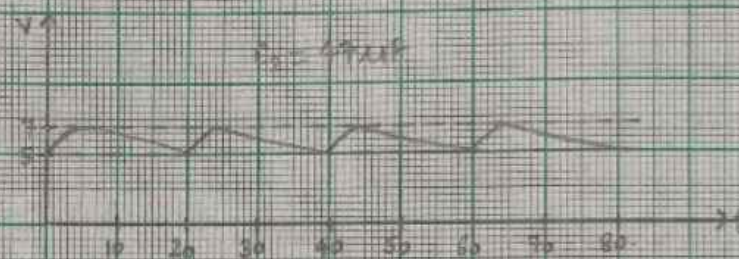
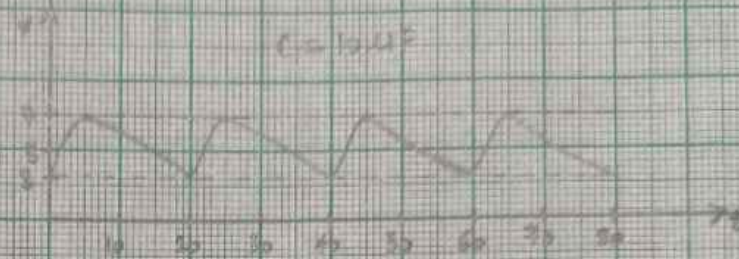
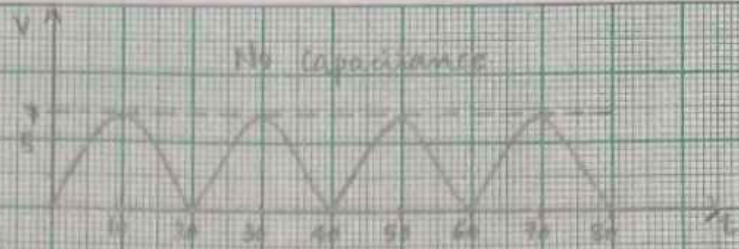
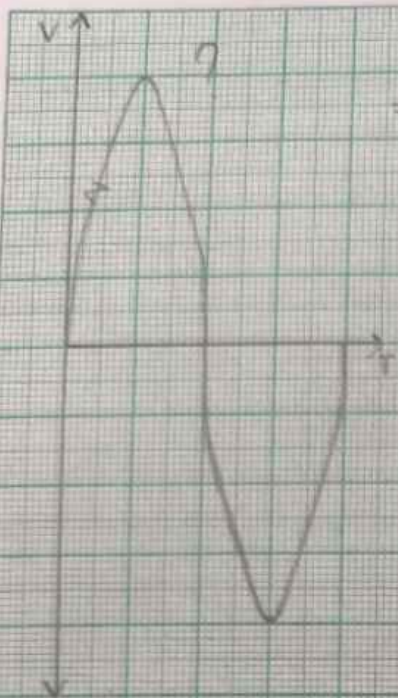
$$V_{\text{max}} = 4V$$

$$V_{\text{avg}} = \frac{V_{\text{max}}}{\pi} = \frac{4V}{\pi}$$

$$V_{\text{rms}} = \frac{V_{\text{max}}}{\sqrt{2}} = \frac{4V}{\sqrt{2}}$$

$$\text{Ripple factor} = \sqrt{\left(\frac{V_{\text{max}}}{V_{\text{avg}}}\right)^2 - 1} = \sqrt{\left(\frac{4V}{\frac{4V}{\pi}}\right)^2 - 1}$$

$$= 0.48$$



Scale

X-Axis 1 unit = 10ms

Y-Axis 1 unit = 5V



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Date 6/3/24 Experiment No. 11 P.No. 49

Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

OBSERVATION TABLE:-

S. No.	Capacitor	V _{max}	Amplitude (V) of D.C	Freq.	T = Div. X Time
1.	No capacitance	7V	7V	100 Hz	10ms
2.	10 μ F	7V	7 - 3 = 4V	100 Hz	5 X 2 = 10ms
3.	47 μ F	7V	7 - 5 = 2V	100 Hz	5 X 2 = 10ms
4.	200 μ F	7V	7 - 6 = 1V	100 Hz	5 X 2 = 10ms
5.	1000 μ F	7 6.5V	7 6.5 - 6.5 = 0	0	∞

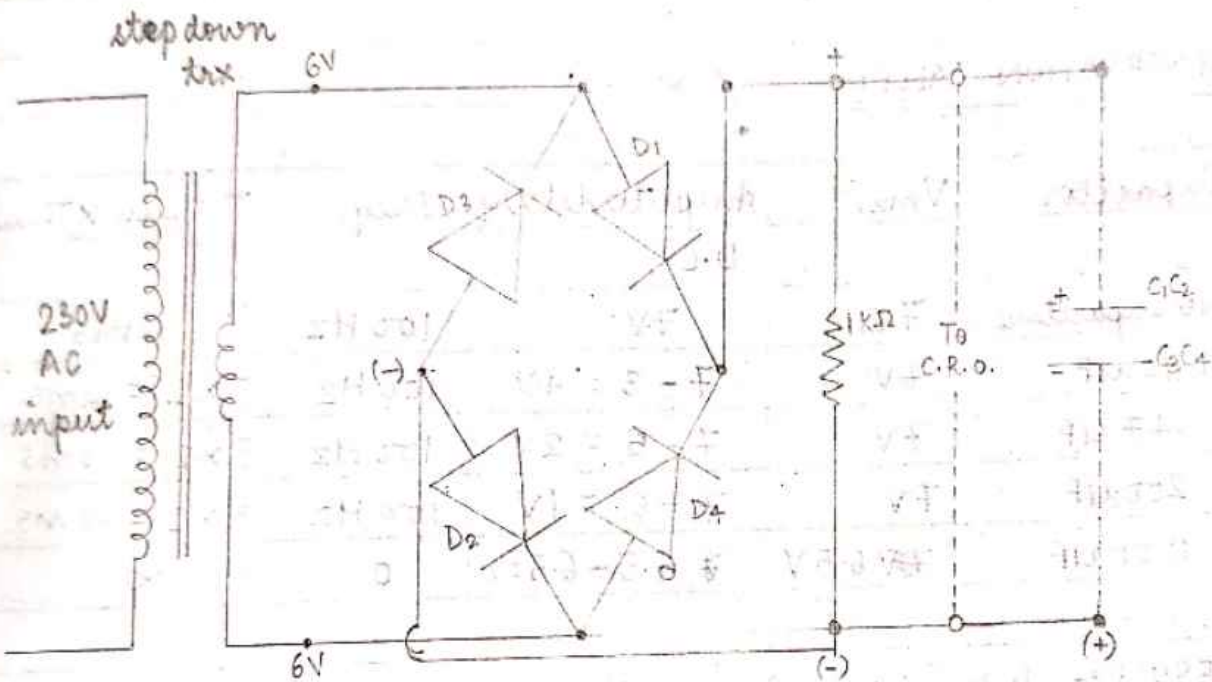
RESULT:- When we input AC voltage in full wave rectifier, we get D.C voltage at output and full cycle at the wave rectifier in it.

The value of $V_{rms} = 5V$

The value of $V_{avg} = 4.46V$.

PRECAUTIONS:-

- 1.) All connections should be tight.
- 2.) First adjust the X-1 & Y-1 shift at reference line and process.





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Date. 13/2/24 Experiment No. 12 P.No. 50
Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

OBJECT :- Study the characteristics of bridge rectifier using four diodes and transformer (T_x) without centre tap.

APPARATUS REQUIRED :- Transformer, four rectifier diodes, resistances ($1K\Omega$), capacitors, input AC voltage supply connecting wire, C.R.O.

THEORY :- In this rectifier an ordinary transformer is used in place of centre tap transformer. The circuit containing 4 diodes D_1, D_2, D_3, D_4 is connected to form the bridge. The AC supply to be rectified is applied to diagonally opposite of the bridge whereas the load resistance R_L is connected across the remaining two diagonally opposite end of the bridge.

When AC supply is switched on, the alternate voltage appears across the terminal of secondary winding. During +ve half cycles diodes D_1 & D_2



Page No. _____
Date _____

OBJECT:- Study the characteristics of bridge circuits using four diodes and transformer with and without center tap.

APPARATUS REQUIRED:- Transformer, four diodes, AC voltage supply, connecting wire, C.R.O.

THEORY:- In this method an ordinary transformer is used to place of center tap transformer. The circuit containing 4 diodes D₁, D₂, D₃, D₄ is connected to form the bridge. The AC supply to bridge is rectified in opposition to diagonally opposite of the bridge when the load resistance is connected across the remaining two diagonally opposite end of the bridge. When AC supply is available for the alternate voltage across the terminal of secondary winding during the half cycle of the sine wave.



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Date 13/2/24 Experiment No. 12 P.No. 51

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

are in forward bias whereas D_3 and D_4 are in reverse bias and D_1 and D_2 diodes conduct current and current flows through load resistance.

~~diode D_2 in~~

During negative half cycle D_4 and D_3 are in forward bias and D_1 & D_2 are in reverse biased so D_4 & D_3 conduct while D_1 & D_2 do not conduct current so during whole cycle current flow through load resistance.

After through the rectification, the pulsating DC voltage is passed through filter circuit to obtain pure DC voltage. In shunt capacitor filter higher the values of capacitance more will be the DC component.

12



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Date 13/2/24 Experiment No. 12 P.No. 52
 Name Ridhi Mulchandani Faculty No. Class D-4/I-year/10

CALCULATIONS:-

$$T = 2 \text{ Div.} \times 5 \text{ ms/Div.}$$

$$T = 10 \text{ ms.}$$

$$\text{Freq.} = \frac{1}{T} = \frac{1}{10 \text{ ms}} = 100 \text{ Hz.}$$

$$V_{\text{max.}} = 13 \text{ V}$$

$$V_{\text{avg.}} = \frac{2 V_{\text{max}}}{\pi} = \frac{2 \times 13}{\pi} = 8.27 \text{ V.}$$

$$V_{\text{rms}} = \frac{V_{\text{max}}}{\sqrt{2}} = \frac{13}{\sqrt{2}} = 9.2 \text{ V.}$$

$$\text{Ripple Factor} = \sqrt{\left(\frac{9.2}{8.27}\right)^2 - 1} = 0.5 \approx 0.48$$



Power Electronics

CALCULATIONS:

$$T = \frac{2 \pi \times 60}{\text{Div.}} \times \text{Time/Div.}$$

$$T = 10 \text{ ms}$$

$$f_{\text{avg}} = \frac{1}{T} = \frac{1}{10 \text{ ms}} = 100 \text{ Hz}$$

$$V_{\text{max}} = 19 \text{ V}$$

$$V_{\text{avg}} = \frac{2 V_{\text{max}}}{\pi} = \frac{2 \times 19}{\pi} = 12.1 \text{ V}$$

$$V_{\text{L-P}} = \frac{V_{\text{max}}}{\sqrt{2}} = \frac{19}{\sqrt{2}} = 13.4 \text{ V}$$

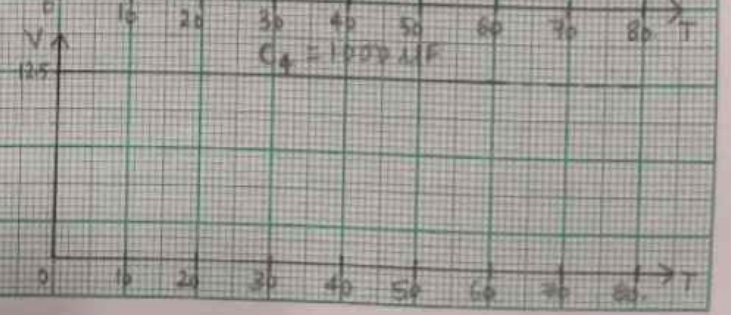
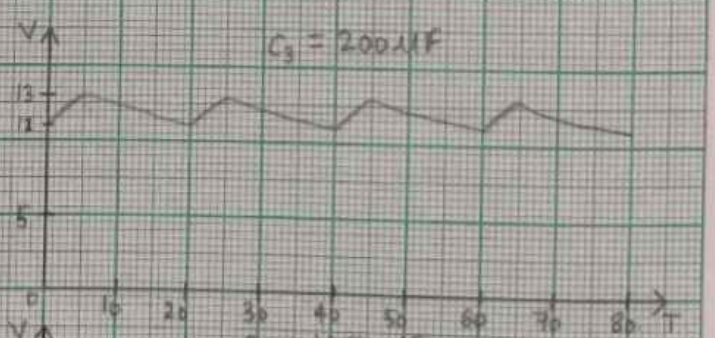
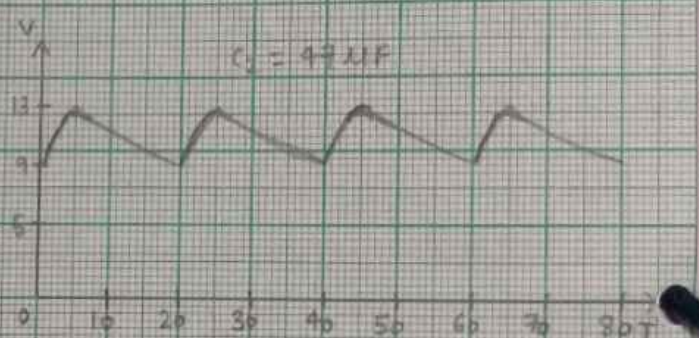
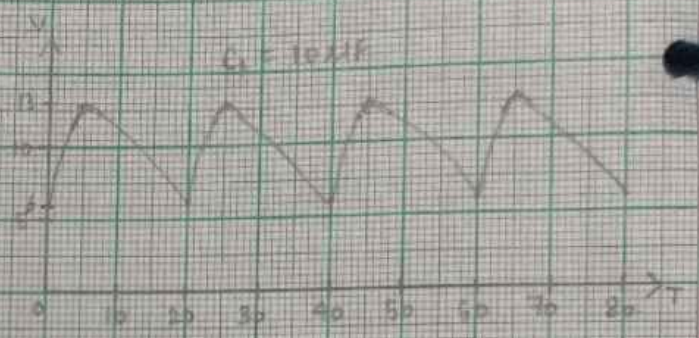
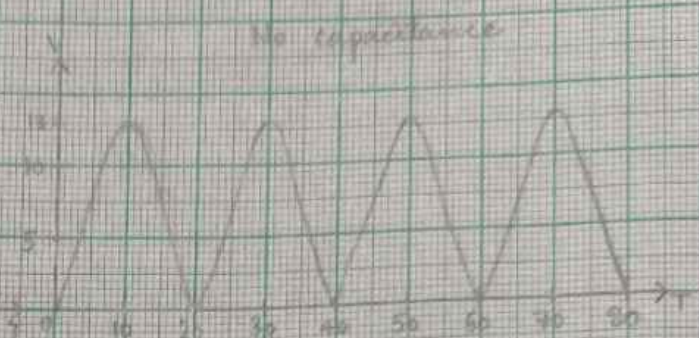
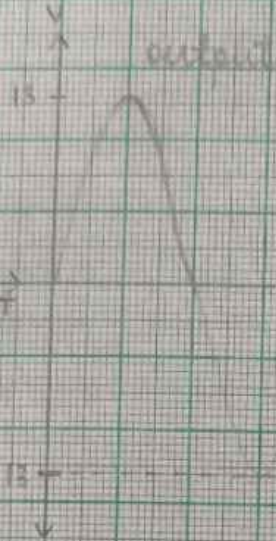
$$\text{Ripple factor} = \sqrt{1 - \left(\frac{V_{\text{avg}}}{V_{\text{L-P}}} \right)^2} = 0.2 \leq 0.2$$

230 V A.C
input

Scale

X-Axis = 1 unit = 10 ms

Y-Axis = 1 unit = 5 Volt





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Date 13/2/24 Experiment No. 12 P.No. 53

Name Ridhi Mulchandani Faculty No. Class D-4/I year/10

OBSERVATION TABLE:-

S.No.	Capacitor (μF)	DC pulsating V_{max} (volt)	Amplitude of ripple (V)	Time (ms)	Frequency (Hz)
1.	No capacitance	13V	13V	$2 \times 5 = 10ms$	100 Hz
2.	10 μF	13V	$13 - 6 = 7V$	$2 \times 5 = 10ms$	100 Hz
3.	47 μF	13V	$13 - 9 = 4V$	$2 \times 5 = 10ms$	100 Hz
4.	200 μF	13V	$13 - 11 = 2V$	$2 \times 5 = 10ms$	100 Hz
5.	1000 μF	12.5V	$12.5 - 12.5 = 0$	∞	0

RESULT:- When we input the AC voltage in rectifier we get filtered DC voltage at the output and in this rectifier full wave is rectified.

The value of $V_{rms} = 9.2V$

The value of $V_{avg} = 8.27V$

PRECAUTIONS:-

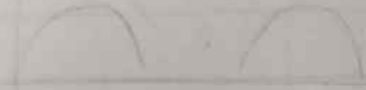
- 1) All connection must be tight.
- 2) Error should be checked in the calculations.

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JOINT



TABLE



Sl. No.	Input Voltage (V)	Output Voltage (V)	Regulation (%)
1	12V	12V	0
2	12V	12V	0
3	12V	12V	0
4	12V	12V	0
5	12V	12V	0

RESULT:- When we input the AC voltage in rectifier we get filtered DC voltage at the output and this rectifier full wave is rectified.

the value of $V_{in} = 12V$
the value of $V_{out} = 12V$

PRECAUTIONS:-

- 1) All connections must be tight.
- 2) Meter should be checked in the calculations.

Pamty Gulati