STUDY OF INSTRUMENTS AND THEIR USES

Generally Instruments are divided into two types

1. Generating type
2. Measuring type

1. **Generating type:-**
    - a. Function Generator(FG)
    - b. Transistor Power supply(TPS)
    - c. Audio Frequency Generator(AFG).
2. **Measuring type:-**
    - a. Cathode Ray oscilloscope (CRO)
    - b. AC/DC mili voltmeter (AC/DC MVM)
    - c. Vacuum tube Voltmeter (VTVM)
    - d. Digital Multimeter (DMM)

a. Function Generator (FG):-

A function generator is a versatile instruments that delivers different waveforms. The most common output waveforms of the FG are sine, triangular, square, and saw tooth waves. The frequency of the waveforms may be adjusted from a function of Hertz (Hz) to several hundred kilohertz.

Although function generators cover both audio and RF frequencies, they are usually not suitable for applications that need low distortion or stable frequency signals. When those traits are required, other signal generators would be more appropriate.

Function generators are used in the development, test and repair of electronic equipment. For example, they may be used as a signal source to test amplifiers or to introduce an error signal into a control loop.

b. Transistor Power Supply (TPS):-

TPS is designed to provide a stabilised voltage that can be varied from 0.5volts at supply converted over 5 ranges of 10volts each with facility for time limit of which may be selected by a switch, the supply is designed to operate at a temperature up to 150°c overload protection is provided to the limit as well as the circuit is suddenly overloaded the protection circuit automatically switches on when the overload is removed or temporarily disconnected from the opposite terminals. The instruments operate on the main supply of 210v to 250v & 50Hz frequency.

c. Audio Frequency Generator(AFG):-

It is a device for providing known and controlling voltage that stimulates radio frequency signals. A typical audio generator has following points.

1. An oscillator associated modulating system of voltmeter for stabilizing a reference level of voltage, power and shield that prevents oscillatory power from reading output terminals an apparatus under test by means of other passing through alternator.
2. The principle objective of AFG is the develop at its output terminal an adjustable and an accurate voltage for audio frequency range of 20Hz to 20KHz its input, to know that generator used to shield so that voltage introduced into the receiver by linkage from AFG are small and the distortion production is small.

d. Cathode Ray Oscilloscope(CRO):-

Generally referred to as an oscillator, it is a basic tool for electrical engineering. It provides a 2-D visual display of the signal wave shape on a screen allowing the engineer to see various signal parts of circuits. It is only by seeing the waveform that can correct errors, mistake in the circuit.

A CRO can be adjusted with 0.54Hz. it can allow viewing signal within time upon at a few nanosecond & can provide a no of waveform displayed on the screen simultaneously.

The vertical deflecting system provides calibrated deflection from 10mv/div to 50mv/div for both channels. The trigger circuit provides stable sweep triggering beyond the bandwidth of vertical deflecting system, calibrated with sweep rates with 0.58 m/div to 0.1 m/div.

e. AC/DC Voltmeter

Electronic multimeter utilizes the amplifying properties of a vacuum tubes & transistor transfer the power required for operating the deflecting system of DMMC. The power drawn from the circuit can be intercepted as that of the multimeter circuit which has a high resistance.

AC/DC has a dial in its face which deflects the voltage when it is operating. There is a range selecting whole. The use of this knob is to keep the voltage in different manner in either Ac or Dc.

To adjust the pointers of the dial to 0, the middle switch is provided and the switch is adjusted to keep the pointer at 0.

f. Vacuum Tube Voltmeter(VTVM):-

It is made up of multi range instruments by employing a potentiometer at the input circuits. By knowing range selection switch to switch position the desired voltage can be obtained. A vacuum tube voltmeter consist of an operating voltmeter and electron is used. It is used for measuring Ac/Dc voltage.

Application of VTVM:-

A VTVM can be accurately measures the DC voltage in an electronic circuit. A conventional VTVM does not incorporate a circuit scale, but current values can be found indirectly. A rectifier is used in function with VTVM for measurement of AC voltage. The rectifier converts Ac to Dc for amplification to grid value.

g. **Digital Multimeter(DMM):-**

It is a digital voltmeter with suitable adaption and modification used for measuring AC/DC voltage, AC/DC current & resistance. It can give better accuracy and sensitivity.

AIM OF THE EXPERIMENT 2

Study and use of single beam dual trace CRO to view waveforms and measure its amplitude & frequency.

EQUIPMENTS REQUIRED

1. CRO
2. Function generator(FG)
3. TPS
4. AC mill voltmeter/Digital multi meter

PROCEDURE

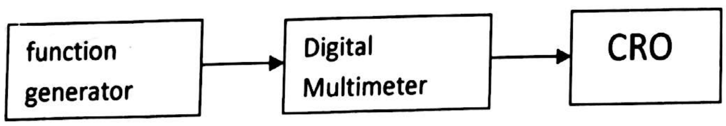
1. **Measurement of frequency:-**
   Connect the function generator to CRO vertical I/P terminal (Y1/CH-1). set FG to frequency 1KHz and calculate the frequency from CRO. Similarly calculate the frequency of 2KHz & 5KHz etc.

2. **Measurements of Voltage:-**
   Set the AC voltage from FG i.e. 1vrms and measure the voltage from CRO . similarly measure 2V,4V & 5Vetc.

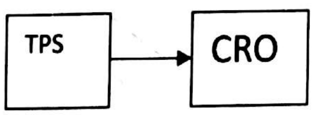
3. **Measurement of D.C. voltage:-**
   Set the TPS voltage i.e. 10V,20V & 30V etc. and measure the voltage from CRO.

BLOCK DIAGRAM:-

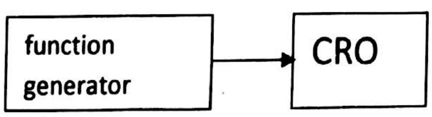
AC voltage measurement



DC voltage measurement



Frequency measurement



TABULATION

Measurement of frequency

Sl no.	Input frequency from AFG in Hz/KHz	No. of division inX-axis = a	Time/div (b)	Total time=(a*b)	F=1/T In Hz/KHz	% of error

Measurement of A.C. Voltage

Sl no.	AC voltage from FG in Volts.	No. of division in Y-axis = a	Volt/div= b in volts	Peak to peak voltage= (a*b)in volts	RMS volt. $V_0/2\sqrt{2}$	% of error

Measurement of D.C. Voltage

Sl. no.	Input voltage from TPS in volts.	No. of division in Y-axis = a	Volt/div= (b)	Total voltage = (a *b)	% of error

BASIC ELECTRONICS LABORATORY

INSTRUCTION MANUAL

FOR

OUTPUT CHARACTERISTICS OF PNP/NPN TRANSISTOR

DEPARTMENT OF ELECTRONICS

&

TELECOMMUNICATION ENGINEERING

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

AIM OF THE EXPERIMENT:-

Output characteristics of PNP/NPN transistor in common emitter configuration and measure of dc current amplification factor from the graph ($\Delta I_C / \Delta I_B$).

APPARATUS REQUIRED	Quantity
1. Bread board or universal trainer	1
2. Transistor power supply(TPS)	2
3. D.C. micro ammeter	1
4. Digital-multi meter	1
5. Transistor	1
6. Resistor(22k, 1K)	2

PROCEDURE:-

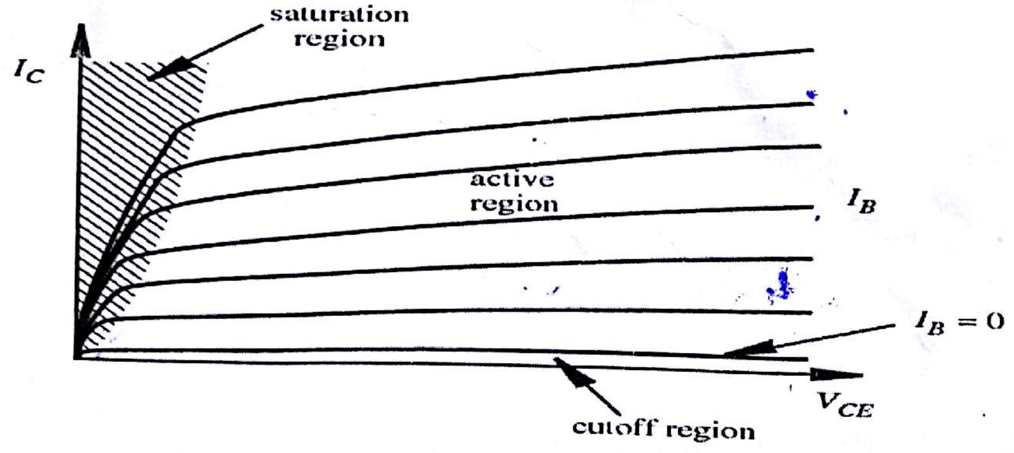
Connect the instruments and components as per the circuit diagram given below, on bread board by following the proper rules of it.

Set I_B at different values by varying V_{BB} . Apply dc voltage V_{CE} from TPS at the interval of 1v for a constant I_B value and measure I_C by the multimeter.

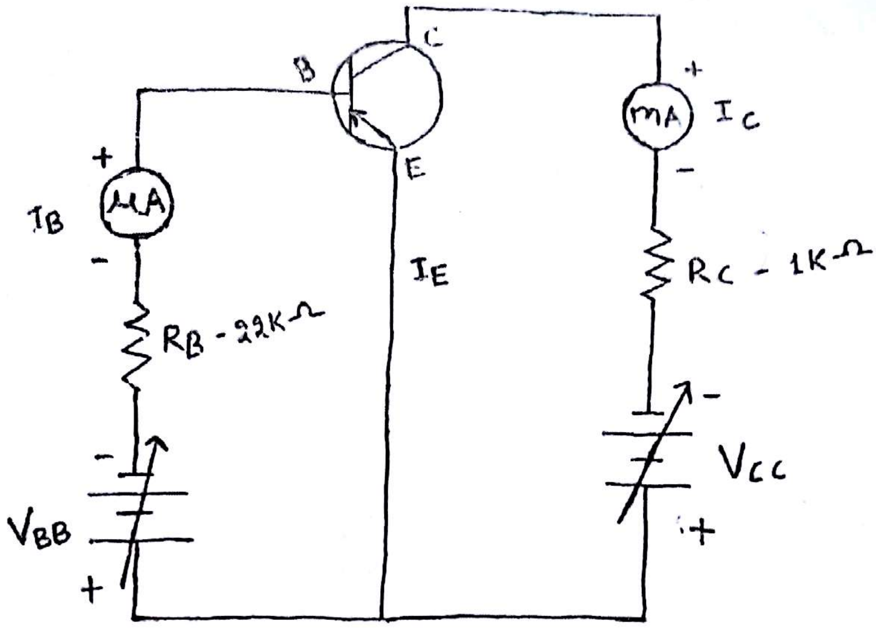
Plot the ΔI_C and ΔI_B in the graph and calculate the current amplification factor by using the above formula.

Output Characteristics

Output characteristic is drawn taking Vce in X-axis and Ic in Y-axis for different Ib values.



circuit diagram for PNP transistor:-



Note: For NPN transistor the supplies and meters polarities will be reverse of the above circuit.

PRECAUTIONS:-

Check the connection before switched on.

TABULATION:-

Sl. no.	V_{CE} in volt	I_B in μA	I_B inμA	I_B inμA	I_B inμA
		I_C in mA	I_C in mA	I_C in mA	I_C in mA

BASIC ELECTRONICS LABORATORY

INSTRUCTION MANUAL

FOR

STUDY OF HALF WAVE & FULL WAVE RECTIFIERS

DEPARTMENT OF ELECTRONICS

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TELECOMMUNICATION ENGINEERING

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

AIM OF THE EXPERIMENT:-

Study of Half wave, Full wave Rectifiers without Capacitor Filter. Record of waveforms, measurement of avg, rms value and ripple factor.

EQUIPMENTS REQUIRED :-

1. CRO(0-20MHz)
2. Training Board
3. Patch chords

Procedure:-

1. Test your transformer: Give 230V, 50Hz source to the primary coil of the transformer and observe the AC waveform of rated value without any distortion at the secondary of the transformer.
2. Connect your circuit to the secondary terminals of the transformer.
3. Connect your CRO across the load.
4. Keep the CRO switch in ground-mode and observe the horizontal line and adjust it to X-axis.
5. Switch the CRO into DC mode and observe the waveform. Note down its Amplitude Vm and frequency from the screen along with its multiplication factor.
6. Calculate V_{dc} using the relation :

   $V_{dc} = V_m/\pi$ (halfwave)

   $V_{dc} = 2V_m/\pi$ (full wave)
7. Switch the CRO into AC mode and observe the waveform. Note down its Amplitude V_m and frequency from the screen along with its multiplication factor.

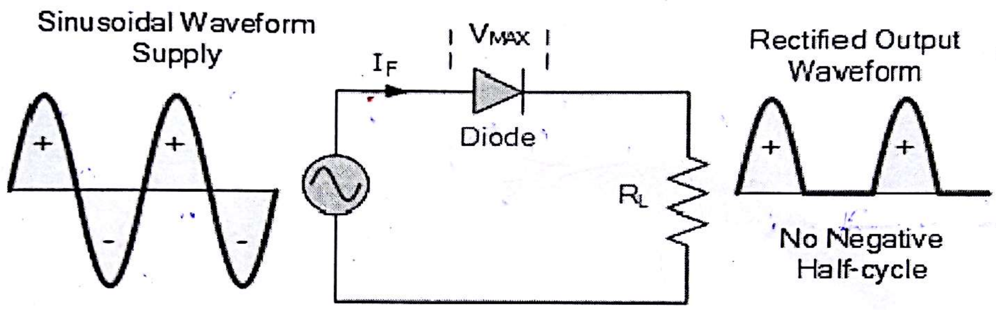
8. Calculate V_{ac} using the relation: $V^2_{rms} = V^2_{ac} + V^2_{dc}$

$V_{rms} = V_m/2$ (half wave)

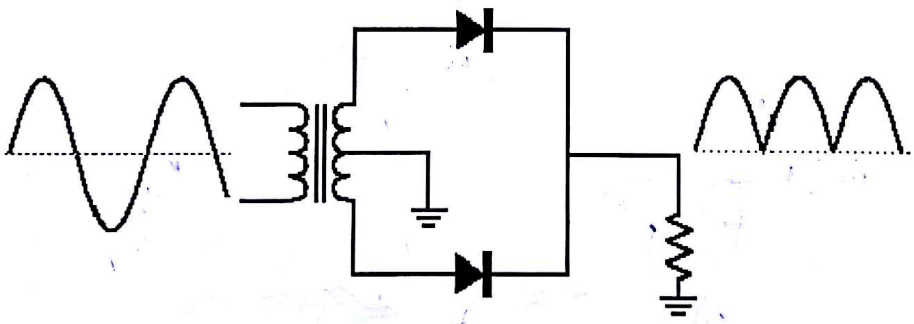
$V_{rms} = V_m/\sqrt{2}$ (full wave)

9. Calculate the Ripple Factor from given formula: $\gamma = V_{ac}/V_{dc}$.

CIRCUIT DIAGRAM OF HALF-WAVE RECTFIER



CIRCUIT DIAGRAM OF FULL-WAVE RECTFIER



BASIC ELECTRONICS LABORATORY

INSTRUCTION MANUAL

FOR

SEMICONDUCTOR DEVICES AND THEIR TESTING

DEPARTMENT OF ELECTRONICS

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TELECOMMUNICATION ENGINEERING

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

AIM OF THE EXPERIMENT 1

Familarity with electronic components and devices

EQUIPMENTS REQUIRED

1. Resistors
2. Capacitor
3. Diode(PN diode & zener diode)
4. Transistor
5. Digital Multimeter

STUDY OF DIFFERENT RESISTORS AND COLOUR CODING:

Resistors are very important part of every electronics and electrical circuits. Resisters are passive components as they are not capable of amplifying or processing an electrical signal. The component which offers an opposition to electric current flow is known as resistor and their values of resistance are expressed in ohms. The ohm is denoted by the Greek letter omega Ω.

They mainly categorized as fixed and variable resistors.

FIXED RESISTORS

The resistors of this category are fixed means their values cannot be altered. Its fixed value can change with ±1% or ±5% or ±10% or ±20% of its fixed value.

The resistors may also be classified as Linear and Non-linear type.

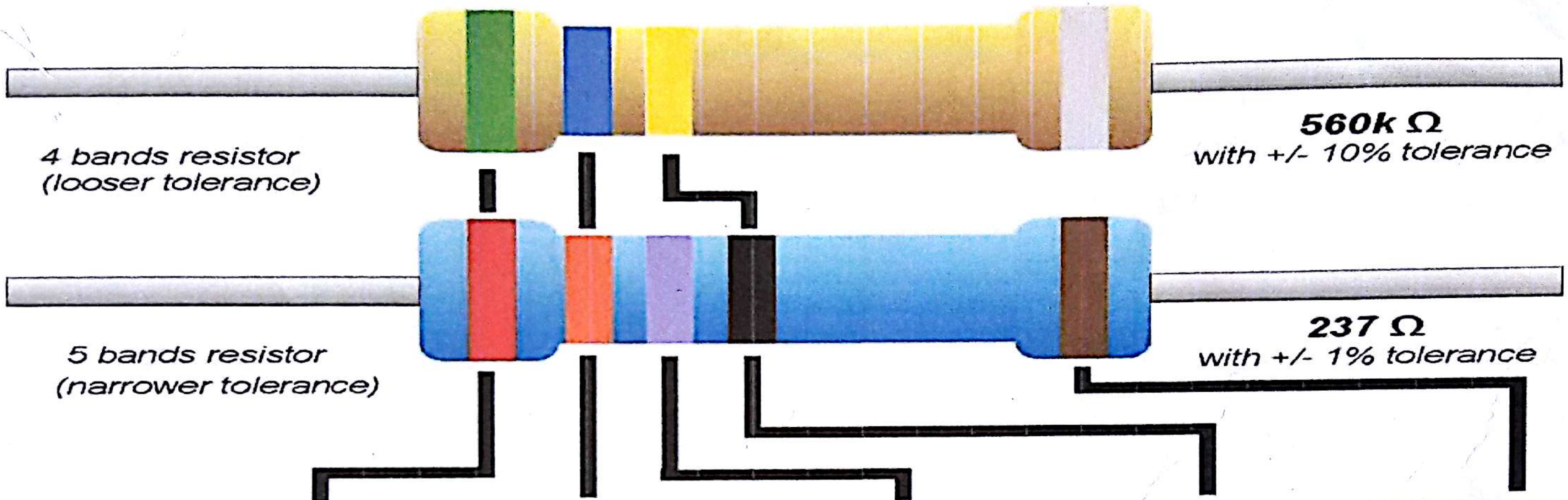
LINEAR RESISTORS

Are those resistors in which current flow is proportional to the voltage applied across it.

NON-LINEAR RESISTORS

Are those resistors in which current flow is proportional to the change in voltage across it. Such resistors are thermistors, VDR, LDR etc.

Resistor Color Code



Color	1st Band	2nd Band	3rd Band	Multiplier	Tolerance
Black	0	0	0	x 1 Ω	
Brown	1	1	1	x 10 Ω	+/- 1%
Red	2	2	2	x 100 Ω	+/- 2%
Orange	3	3	3	x 1K Ω	
Yellow	4	4	4	x 10K Ω	
Green	5	5	5	x 100K Ω	+/- 5%
Blue	6	6	6	x 1M Ω	+/- .25%
Violet	7	7	7	x 10M Ω	+/- .1%
Grey	8	8	8		+/- .05%
White	9	9	9		
Gold				x .1 Ω	+/- 5%
Silver				x .01 Ω	+/- 10%

IMPORTANT TERMS RELATED TO RESISTORS

RESISTANCE

The value of resistor is expressed as resistance in ohms. Resistance values in hundreds of ohms is expressed in ohms, in thousand of ohms is expressed in kilo ohms, millions of ohms in Mega ohms. The nominal values of resistors are generally specified at room temperature of 25°C.

TOLERANCE

Tolerance and accuracy have same meaning. Accuracy is the tolerance to which the value of the resistance is made.

It expresses the maximum deviation in resistance from its nominal value. For example, if a 100 ohms resistor has ±5% tolerance we mean that its value can lie between 95 ohms to 105 ohms.

Resistor are available with various tolerance such as ±20%, ±10%,±5% in general and more precise with 1% or 2% or 0.5%. the tolerance is indicated by means of 4th colour band on resistor.

STABILITY

The resistor value once manufactured should not change by any means say by temperature, humidity or moisture. A resistance is said to be more stable if its value does not alter from its minimal value. This property is called as stability.

The term stability and tolerance should not be confused. For example a resistor of 1000±10% may have its value in between 900 ohms to 1100 ohms. But the same resistor may have its value as 985 ohms; this will try to remain constant in spite of its long use. This will be referred as stability.

As such the carbon composition resistor are less stable, carbon film resistors are fairly stable and metal films and wired wound resistors are most stable.

CARBON FILM RESISTANCE:

They are also called as cracked carbon film resistor. Thus resistor is manufacturing by deposition a carbon film by decomposing a suitable hydrocarbon vapour at high temperature on a ceramic substrate. The carbon film so produced becomes the integral part of the ceramic rod and highly stable film. The thickness of the film is controlled by various factors.

CAPACITOR

The capacitors are available in fixed and variable nature. These are classified accordingly to their dielectric. They are available in various shape and sizes.

MICA Capacitor

The thin sheet of mica ranging from 0.125 – 0.25mm is placed between the electrodes of copper on top lead foil of thickness 0.00625mm.

ELECTROLYTIC Capacitor

An electrolyte Capacitor used a very thin film of aluminium or titanium oxide as dielectric formed by an electrostatic process. They are available in form of polarized as non polarized type.

Non polarized capacitor are used in fans, ACs, Motors for self control start as well as improvement of power factor in electric circuit .Such capacitors cannot be used in AC circuits and to be connected with appropriate polarity in DC circuit.

The positive or plus sign is presented on the package and normally for fresh capacitor .This lead is longer than the negative terminal. The capacitor gets short circuited due to wrong connection .It may burn if applied voltage is exceeding the rating of capacitor.

TYPES OF SEMICONDUCTOR DEVICES

Semiconductor devices are versatile units employed in a variety of applications in electronic equipments , amplifiers, oscillators, modulators, voltage and current sources, electronic switches ,voltage shifters and variable resistors. They are also employed as energy converters (for example light emitting diodes) and generating logarithmic and antilogarithmic functions. Semiconductor devices can be broadly classified into two areas.

1. BIPOLAR

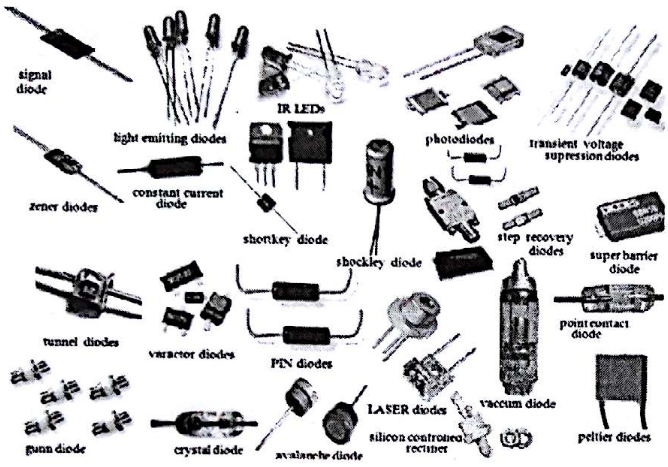
In bipolar devices the action of device depends upon the flow of type of charge carrier across forward or reverse biased PN junctions .For example in NPN bipolar transistor the flow of electrons across the reverse biased collector base junction is controlled by the forward biased base emitter junction. As electrons move into the base, some recombine with holes but the majority diffuse across the base and are swept up by the collector. Commonly used bipolar devices are transistors, diodes, unijunction transistors, thyristors, logic's such as TTL and linear IC'S.

2. UNIPOLAR

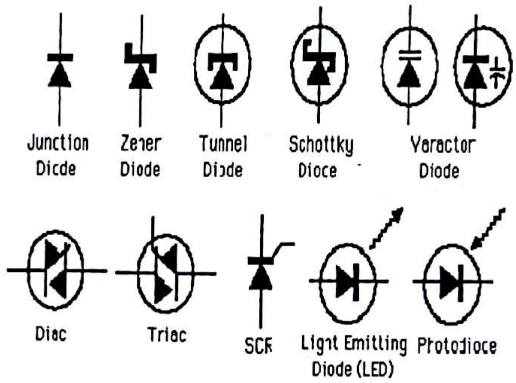
Unipolar devices use only majority carriers for current flow and this current is controlled by an electrostatic field , say between gate and source or gate and substrate. Typical examples of unipolar devices are junction FET'S ,MOSFET'S, CMOS LOGIC and linear IC'S.

DIODES

The cathode and anode ends of metal encased diodes can be identified by the diode symbol marked on the body. In case of glass encased diodes the cathode end is indicated by a strip, a series of strips or a dot. figure shows various shapes and biasing of diodes.



Types of Diode



A diode can be conveniently checked with an ohmmeter by measuring its forward and reverse resistance. Conventional diodes normally show a low value of forward resistance and a very high value of reverse resistance.

NORMAL DIODE

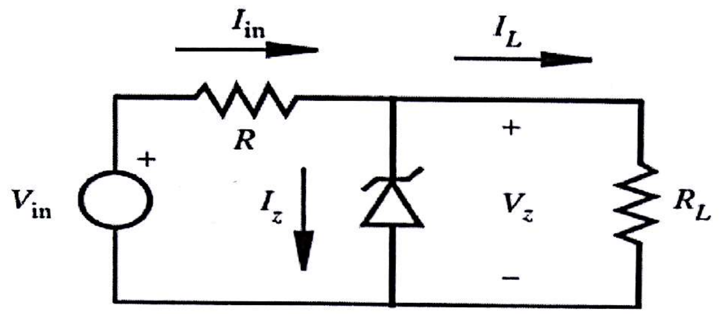
It is basically of two types, silicon diode or germanium diode. But the most convenient diode is silicon diode because Silicon diodes have a greater ease of processing, lower cost, greater power handling & less leakage . Silicon diode have cut-in voltage of 0.65V and that of Ge diode is 0.3V

ZENER DIODE

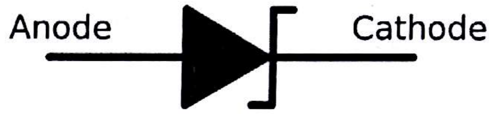
A silicon diodes has a very low reverse current, say 1μa at an ambient temperature at 25°C.However at some specific value of reverse voltage a very rapid increase occurs in reverse current. This potential is called breakdown avalanche and may be as low as 1 volt or as high as several hundred volts depending on the diode construction.

A zener diode has very high resistance at bias potentials below the Zener voltage .The resistance can be of several megohms.

At Zener voltage the Zener diode suddenly shows a very low resistance. say between 5 and 100Ω. A Zener diode behaves as constant voltage source in the Zener region of operation as its internal resistance is very low. The current through the zener diode is then limited only by the series resistance(see fig.).The value of series resistance is such that the maximum rated power rating of the Zener diode is not exceeded.



(fig: zener diode as regulator)



TESTING PROCEDURE

1. A Zener diode can be checked with an ohmmeter below the Zener voltage, when its operation is similar to silicon diode.

2. At Zener voltage it is tested by measuring the voltage appearing across it, when it is in the circuit. A simple arrangement is shown in figure.

TRANSISTORS(NPN &PNP)

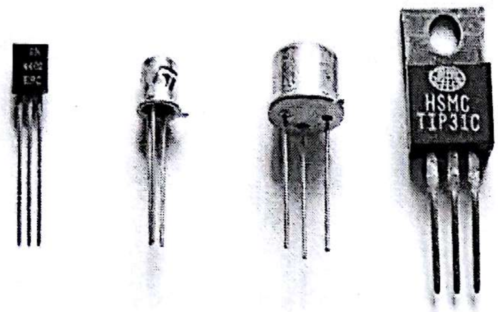
The most commonly used semiconductor is the transistor. In troubleshooting transistor circuits the following point should be kept in mind;

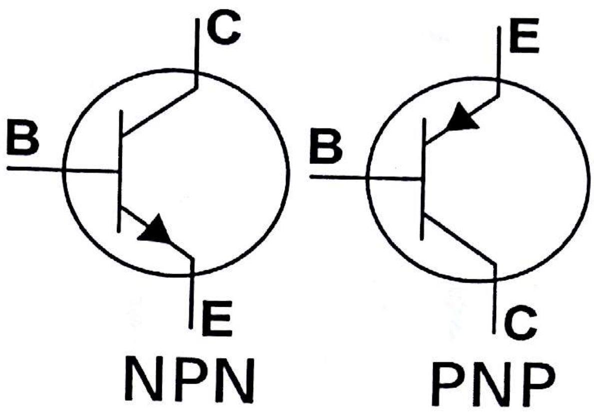
1. NPN& PNP devices are basically "off " devices while vacuum tubes are "on" devices.

2. Transistors are made up of two diodes a base emitter diode a base collector diode.in normal amplifier operation the base emitter diode is forward biased the base collector diode is reverse biased.

3. Shorting base to emitter turns off transistors, while forward biasing base emitter turns on transistors.

4.All transistors have leakage current across the reverse biased base collector diodes. for silicon transistors this current is several nanoampere . In germanium transistors the leakage current may even be several microampere .fig shows different designs, symbols and terminals for different transistors.





TESTING PROCEDURE

If the terminal marking in a bipolar transistor is not known and also identification of the devices has been erased .it is possible to identify the base emitter and collector terminals and the type of transistors using an ohmmeter. To do so proceed as follows

1.Make resistance measurement between each all of leads in both the forward resistance and reverse resistance directions. A resistance below 250Ω shows the ohmmeter is forward biasing ϕ junction.The highest forward is obtained between the emitter and collector leads. The third lead which is not connected to the ohmmeter is the base lead.

2. Next resistance measurement is made between the identified base and one of the other leads. If the ohmmeter indicates forward resistance when the negative lead of the ohmmeter is connected to the base of the transistor is a PNP type. The transistor NPN type if the forward resistance is indicated with the positive lead of the ammeter connected to the base.

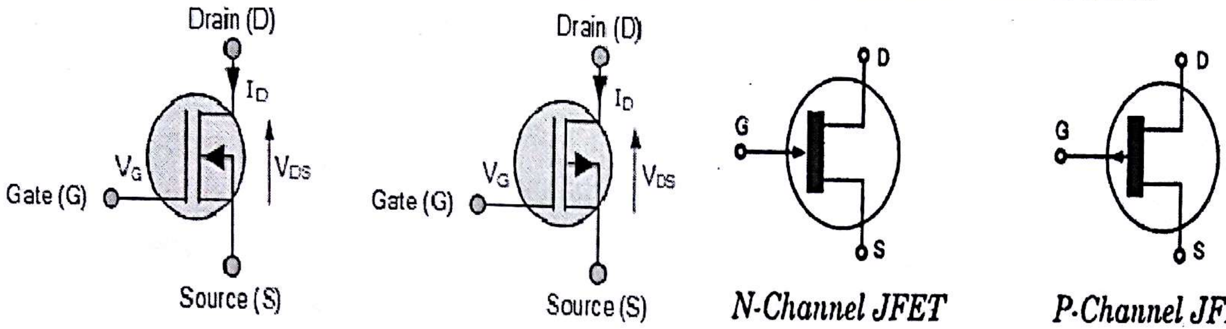
3. To identify which of the two unknown leads is the collector and which emitter the two resistance measurements are made between these two leads ,reversing the ohmmeter polarity for the second measurement. carefully observe the polarity that gives the lower resistance indication

(a) if a PNP transistor is under test the negative lead of the ohmmeter will be connected to the negative lead

(b) in case of NPN transistor , the positive lead of the collector lead

FIELD EFFECT TRANSISTORS(JFET&MOSFET)

Field effect transistors like bipolar transistors have three terminals. They are designated as source, drain and gate which corresponds in function of emitter, collector and base of junction transistors. source and drain leads are attached to the same block (channel of N or P Type semiconductor material).A band of oppositely doped material around the channel (between the source and drain leads)is connected to the gate lead.fig. shows the different terminals of FET.



N-channel P-channel *N-Channel JFET* *P-Channel JFET*

Schematic Symbols For JFETs

In the normal junction FET operation the gate source voltage reverse bias the PN junction, causing an electric field that creates a depletion region in source drain channel.in the depletion region the number of available current carriers is reduced as the reverse biasing voltage increases, making source, drain current a function of source drain voltages. with the input (gate-source)circuit reverse biased ,the FET pretends a high impedance to its signal source. This is contrast to low impedance of the forward biased junction bipolar transistor base emitter circuit .because there is no input current, FETs have less noise than junction transistors.fig shows the schematic symbol and biasing of N channel and p channel depletion mode field effect transistors .

JFET TESTING PROCEDURE

A junction FET can be checked with an ohmmeter .If one wishes to test the device and does not know the connections then proceed as follows

1.First find two connections in which a small current will pass in either direction. These are the source and drain connections.

2. A current should pass from the third electrode(the gate) only in one direction to either of the two electrodes.

3. If conduction takes place when the gate is positive, one has an N-channel device. Whereas if conduction takes place when the gate is negative, the device is of the P-channel polarity.

One cannot, however, easily determine which electrode is the drain and which is the source, but these electrodes are to some extent electrically interchangeable.

MOSFET TESTING PROCEDURE

1. An ohmmeter can be used to check the MOSFET.

2. The gate-to-source insulation is checked with the highest range of the ohmmeter for NPN and PNP MOSFET.

3. A practically infinite reading is normally obtained for both polarities of test voltage.

4. The drain-to-source resistance normally has a comparatively low value and the ohmmeter readings are the same regardless of test voltage polarity.

LIGHT EMITTING DIODE(LED)

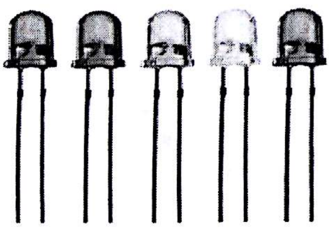
The light emitting diode is an opto electronic device. When forward biased ,this diode emits light of a particular colour depending upon the band gap, LEDs are made of gallium arsenide(GaAs), gallium arsenide phosphide(GaAsP) and gallium phosphide(GaP).these materials are doped to get N type and P type materials. when excited the electrons jump to higher energy levels and then fold back to lower energy levels , thereby giving off energy in the form of radiation.

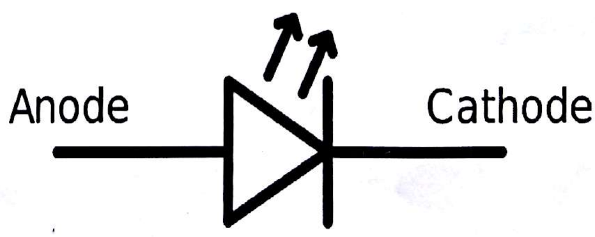
The different materials radiate the following colours of light:

1.GaAs---infrared radiation(invisible)

2.GaAsP-----red or yellow light (depending upon ratio of ingredients)

3.GaP-----red or green light





OBSERVATION TABLE

Measurement of Resistance

Sl.no	Colour code	Theoretical value	Experimental value	% of error

Measurement of Capacitance

Sl. no.	Theoretical value	Experimental value	% of error

Measurement of Diode potential

Sl. no.	types	Forward bias	Reverse bias
Si diode			
Zener diode			

Determination of Transistor Terminals

Sl. no	Types	specifications	V_{BE}		V_{CE}	
			Forward	Reverse	Forward	Reverse
1	PNP					
2	NPN					

BASIC ELECTRONICS LABORATORY

INSTRUCTION MANUAL

FOR

V-I CHARACTERISTICS OF PN DIODE

DEPARTMENT OF ELECTRONICS

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TELECOMMUNICATION ENGINEERING

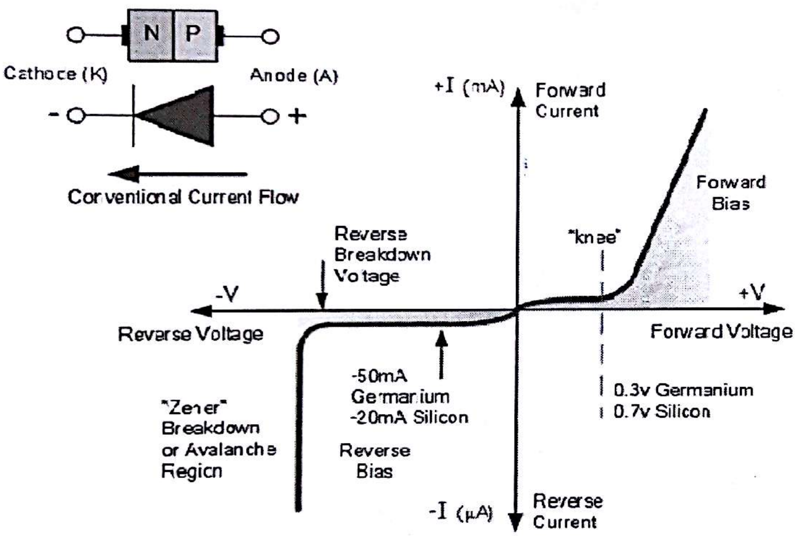
VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

AIM OF THE EXPERIMENT (3)

V-I characteristics of semiconductor diode(Silicon Diode)

REQUIREMENTS	Quantity
1. Bread board	1
2.Transistor power supply(TPS)	1
3.Digital-multi meter	2
4.Silicon diode	1
6.Resistor(1K)	1

Characteristic curve:



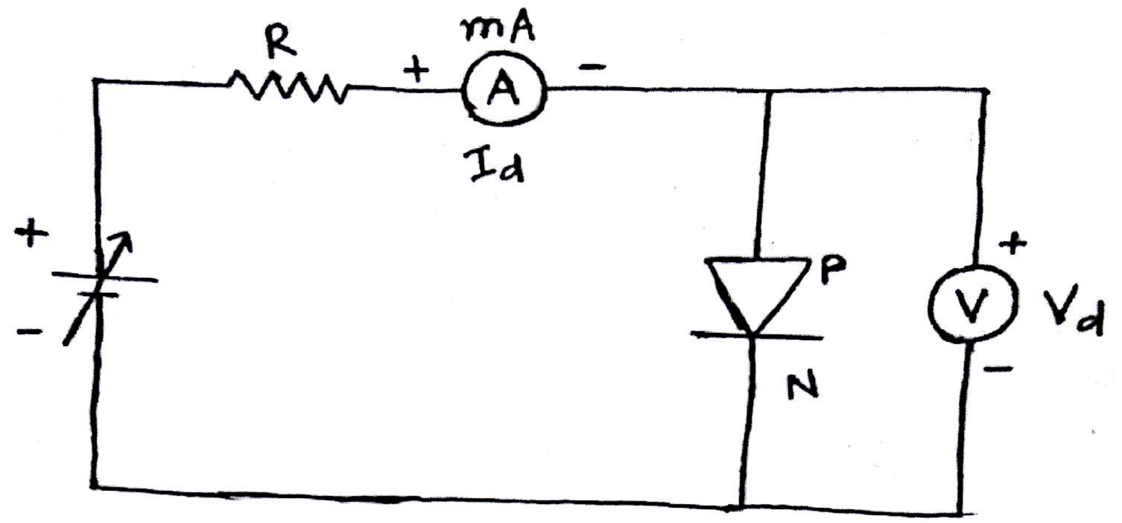
PROCEDURE

Connect the instruments and components as per the circuit diagram given below , by following the proper rules of bread board.

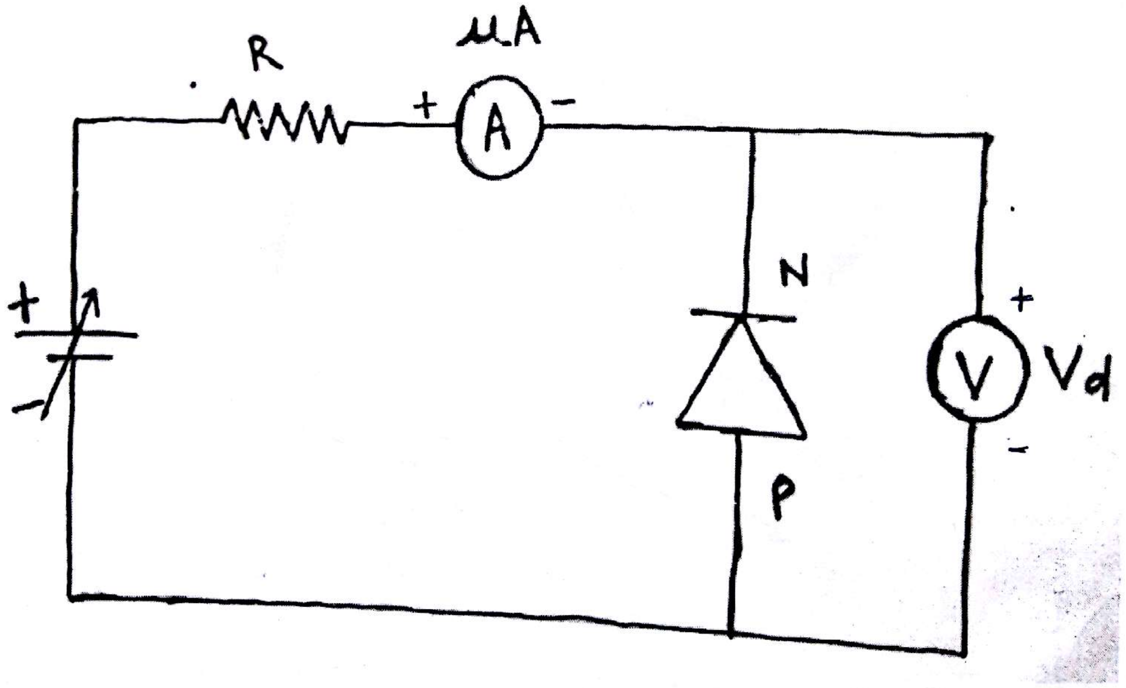
Apply dc voltage at the interval of 0.1v and 1v from TPS for forward and reverse bias respectively as input and measure output voltage (V_d) and current(I_d) in the multimeters.

CIRCUIT DIAGRAM:-

Forward bias:-



Reverse bias:-



PRECAUTION:

Check the connection before switched ON.

TABULATION:-

Forward bias				Reverse Bias			
Sl. no.	i/p volt	V_d	I_d	Sl. no.	i/p volt	vd	Id

BASIC ELECTRONICS LABORATORY

INSTRUCTION MANUAL

FOR

LOGIC GATES

DEPARTMENT OF ELECTRONICS

&

TELECOMMUNICATION ENGINEERING

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

AIM OF THE EXPERIMENT:

To study the functions of basic logic gates : AND, OR, NAND, NOT, NOR & EX-OR.

APPARATUS. REQUIRED:

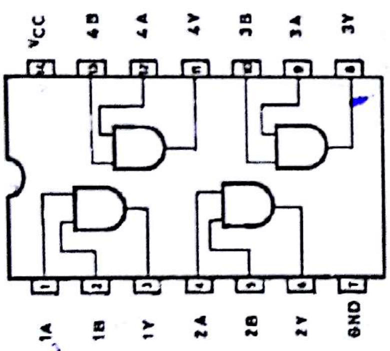
1. Multimeter 1no.
2. Logic I.C. Trainer

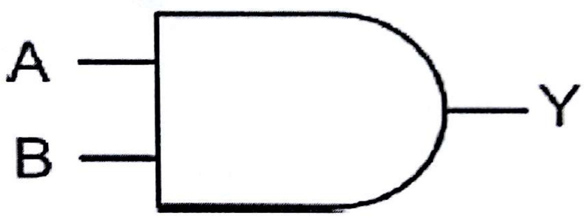
PROCEDURE:

i. **AND gate**

Identify the terminals of the 7408 quada, 2- input IC AND gate.Switch on the +5 Volt d.c from digital IC trainer i.e. IC power ON. (Ref. Trainer Block No.-5)

Use +3 volt for logic '1' and 0 Volt for logic '0'. A section of the IC shown in Fig .





$Y = A \cdot B$

Ten different switches are available 1 to 10 known as logic input switches. Choose any two input switch for two input signal voltage. Fed the signal voltage to any input pin of the IC and measure output voltage for the various combinations of the input voltage given in Table- 2 and verify the results with the truth table of the And gate given in Table-1.

TABLE 1

Gate	Logic Diagram	Function	Truth Table		
AND		Y = A AND B	INPUT		OUTPUT
		= A. B	A	B	Y
		= A^B	0	0	0
		= AB	0	1	0
			1	0	0
			1	1	1

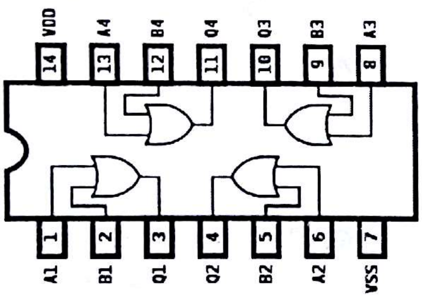
TABLE 2

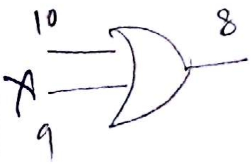
A	B
0 V	0 V
0 V	5 V
5 V	0 V
5 V	5 V

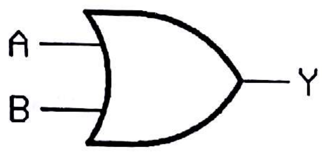
Check if the output voltages for the logic levels '1' and '0' correspond to the values given in table- 1.

ii. **OR gate**

Repeat (i) for a 7432 quad, 2- input IC OR gate, a section of which is shown in fig







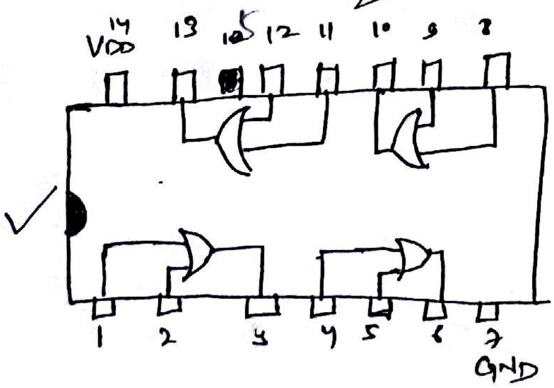
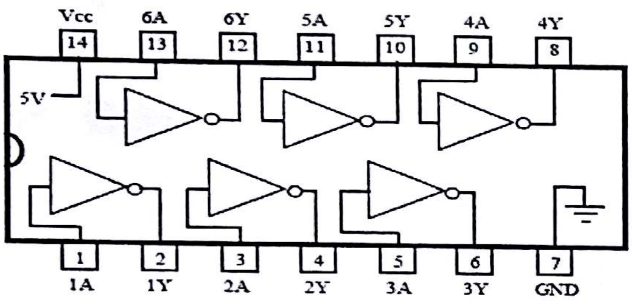


TABLE 3

Gate	Logic Diagram	Function	Truth Table		
			A	B	Y
OR		Y= A OR B			
		= A + B	0	0	0
			0	1	1
			1	0	1
			1	1	1

iii. **NOT gate**

Repeat (i) for a 7404 hex IC inverter, a section of which is shown in fig.



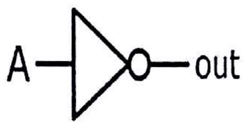
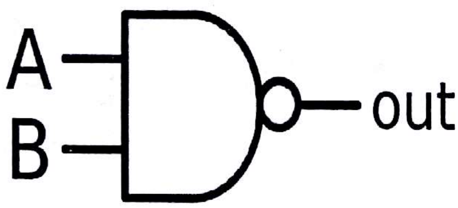


TABLE 4

Gate	Logic Diagram	Function	Truth Table	
NOT		Y= NOT A	A	Y
		= A	0	1
			1	0

iv. **NAND gate**

Repeat (i) for a 7400 quad, 2- input IC NAND gate, a section of which is shown in fig



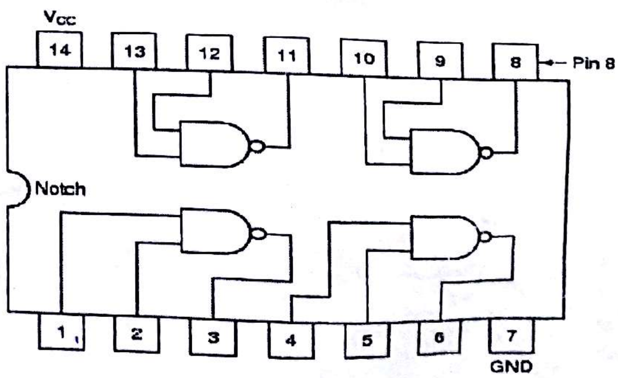
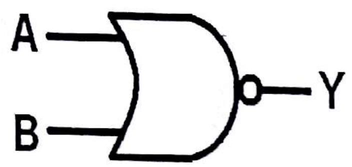


TABLE 5

Gate	Logic Diagram	Function	Truth Table		
			A	B	Y
NAND		Y= A NOT AND B	0	0	1
		= A NAND B	0	1	1
		= A. B	1	0	1
		=A ↑B	1	1	0
		= $\widehat{AB}$			

v. **NOR gate**

Repeat (i) for a 7402 quad, 2- input IC NOR gate, a section of which is shown in fig .



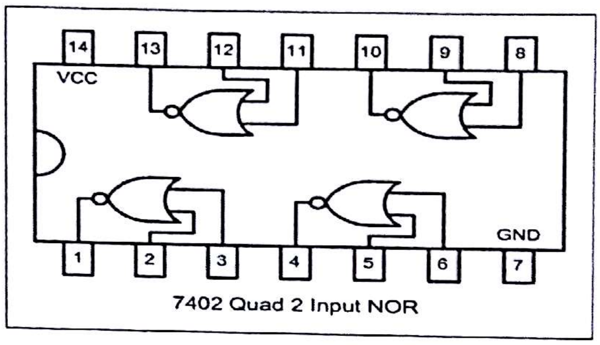
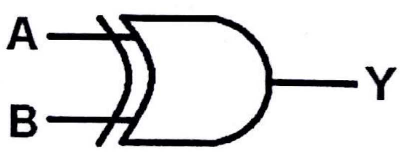


TABLE 6

Gate	Logic Diagram	Function	Truth Table		
			A	B	Y
NOR		Y= A NOT OR B	0	0	1
		= A NOR B	0	1	0
		= $\overline{A + B}$	1	0	0
			1	1	0

vi. **EX-OR gate**

Repeat (i) for a 7486 quad, IC EX-OR gate, a section of which is shown in fig .



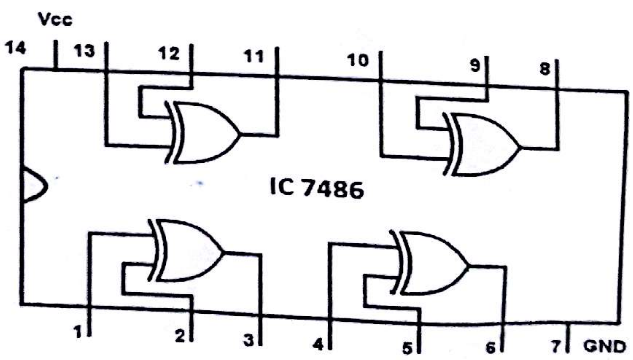


TABLE 7

Gate	Logic Diagram	Function	Truth Table		
EX-OR		Y= A EX-OR B	A	B	Y
			0	0	0
		= A(+) B	0	1	1
		=$A\bar{B}+\bar{A}B$	1	0	1
			1	1	0

BASIC ELECTRONICS LABORATORY

INSTRUCTION MANUAL

FOR

OPAMP AS INVERTING AND NON-INVERTING AMPLIFIER

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, ODISHA, BURLA

सिद्धिर्भवति कर्मजा

DEPARTMENT OF ELECTRONICS

&

TELECOMMUNICATION ENGINEERING

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA

AIM OF THE EXPERIMENT:- 7

To study the op-amp as an inverting amplifier and non-inverting amplifier

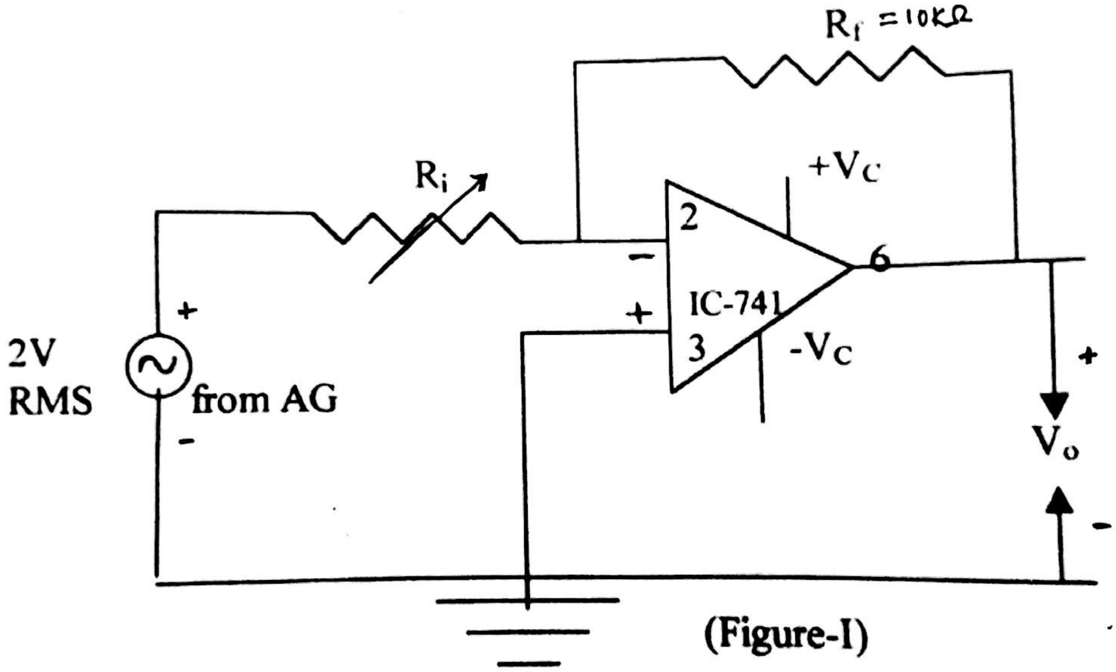
EQUIPMENTS REQUIRED:-

1. Op-AMP trainer kit
2. Audio frequency generator 1no
3. Decade resistance box 1nos
4. CRO 1no
5. Digital multimeter 1no

PROCEDURE:-

Apply sine wave 2V RMS from Audio signal generator at 1KHz frequency. Measure the output at different R_i.

Inverting amplifier:



(Figure-I)

$V_{out} \quad = \quad - (R_f/R_i)\, V_{in}$ for output AC 2V

(R_i=10 KΩ, 5 KΩ and 2.5KΩ)

TABLE-1

R_i	R_f	V_{in}	V_{out}	Experimental gain =Vo/Vi	Theoretical gain	Ø

Non – Inverting amplifier:

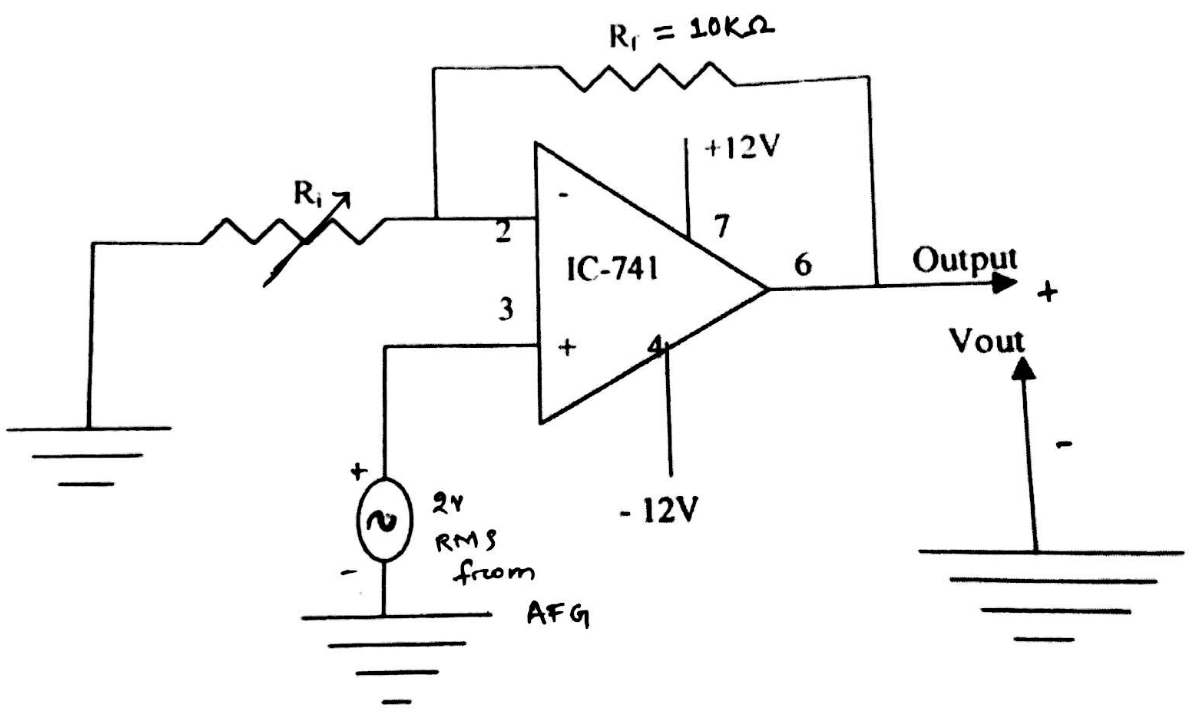


TABLE-II

R_i	R_f	V_{in} in volt	V_{out} in volt	Experimental gain =Vo/Vi	Theoretical gain	Ø

$$V_0 = (1 + R_f/R_i)\, V_{in}$$

Compare the experimental result with theoretical value and discuss

EXPERIMENT NO- 4 (A)

CLIPPER CIRCUIT

AIM OF THE EXPERIMENT:- To observe, trace & measure the effect on the output waveforms of different Clipper circuit.

APPARATUS REQUIRED:-

1. Transistor Power supply (TPS)
2. Audio signal generator/Function generator
3. CRO

COMPONENTS REQUIRED:-

1. Diode(IN4007)
2. Resistor(1K Ohm)
3. DC supply(1.5v)

PROCEDURE:-

Make connection as per the circuit diagram shown. Trace and measure the output voltage using CRO by applying $10V_{p\text{-}p}$ sine wave from Audio generator/ FG as input.

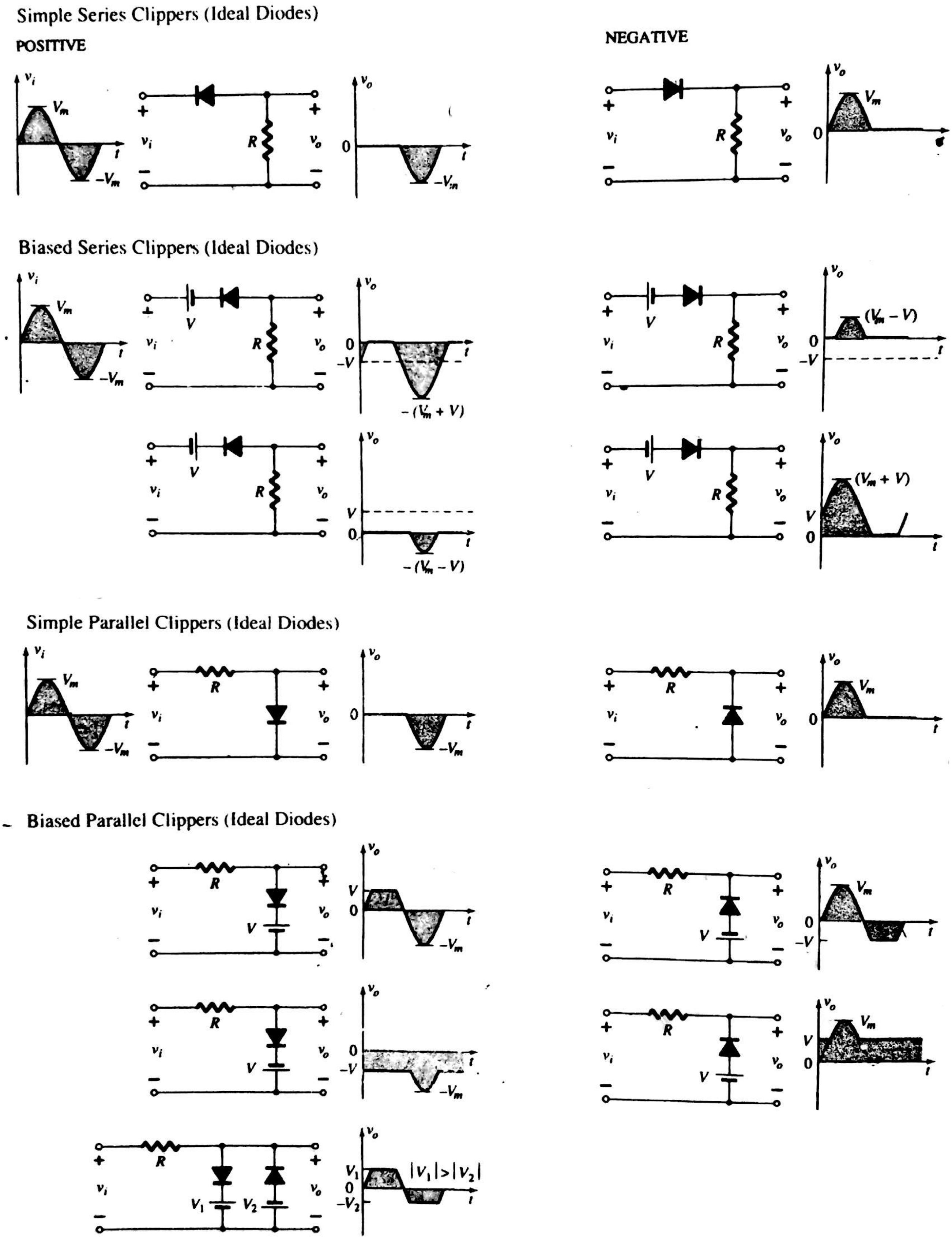


Figure 2.93 Clipping circuits

EXPERIMENT NO- 4 (B)

CLAMPER CIRCUIT

AIM OF THE EXPERIMENT:- To observe, trace & measure the effect on the output waveforms of the different Clamper circuit.

APPARATUS REQUIRED:-

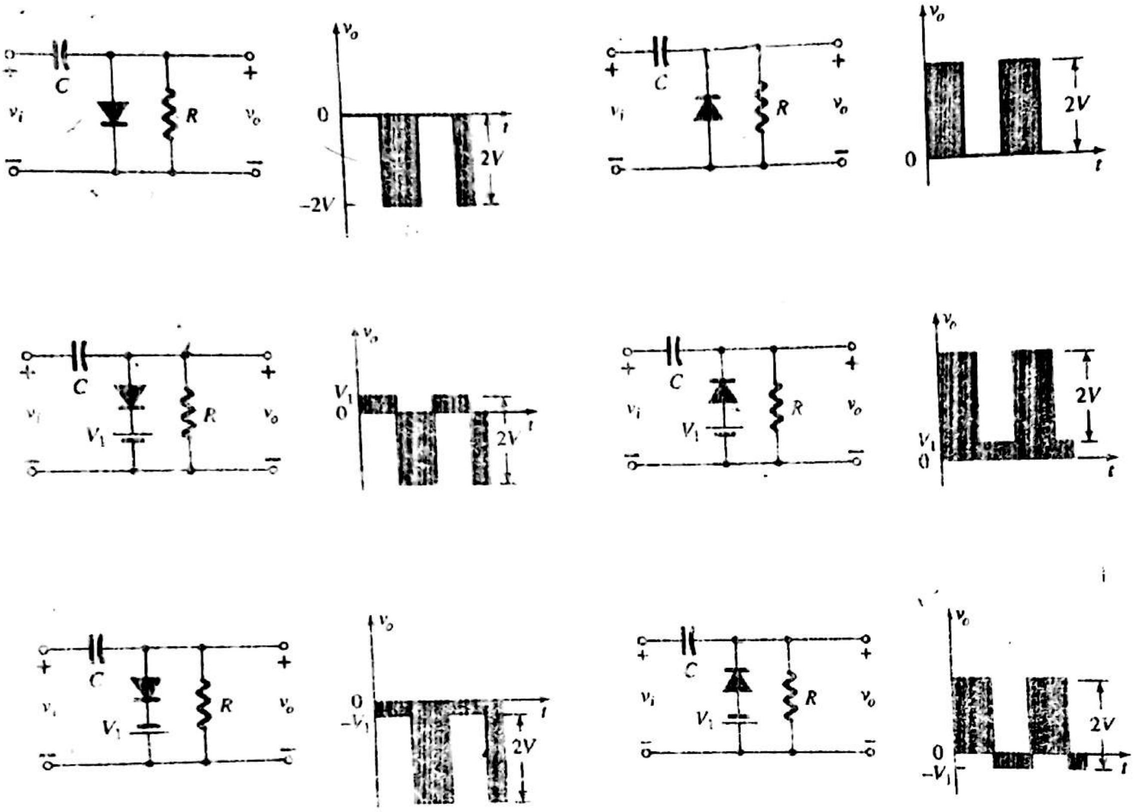
1. Transistor Power supply (TPS)
2. Audio signal generator/ Function Generator
3. CRO

COMPONENTS REQUIRED:-

1. Diode(IN4007)
2. Capacitor(0.1 microfarad)
3. Resistor (100K Ohm)
4. DC supply

PROCEDURE:-

Make connection as per the circuit diagram shown. Trace and measure the output voltage using CRO by applying $10V_{p-p}$ square wave from Audio generator / FG as input.



2 35 Clamping circuits with ideal diodes ($5\tau = 5RC \gg T/2$)