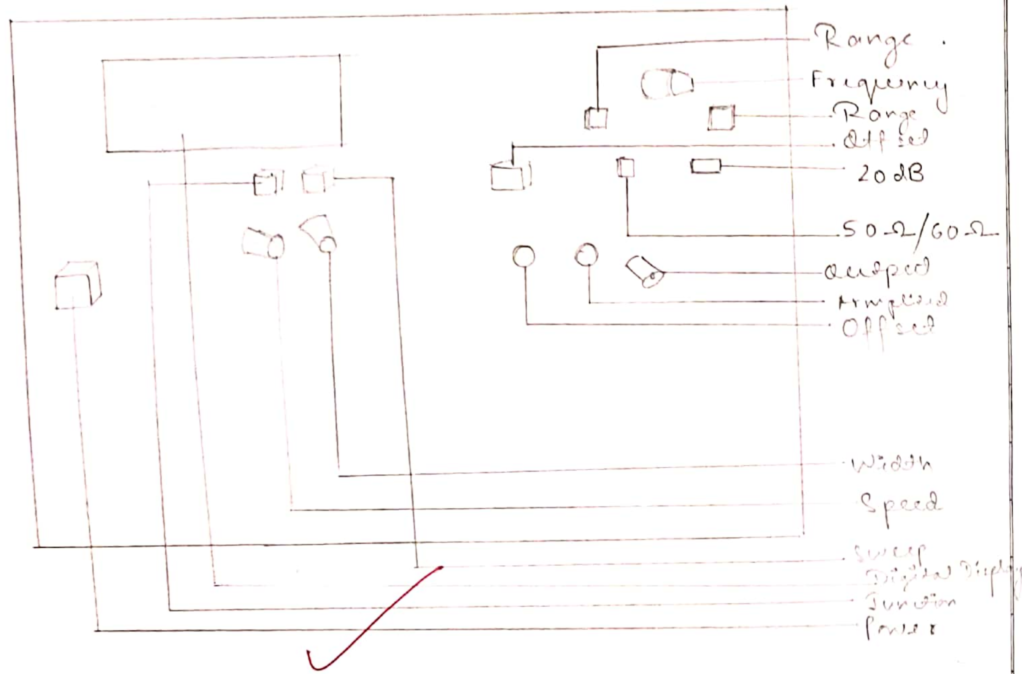
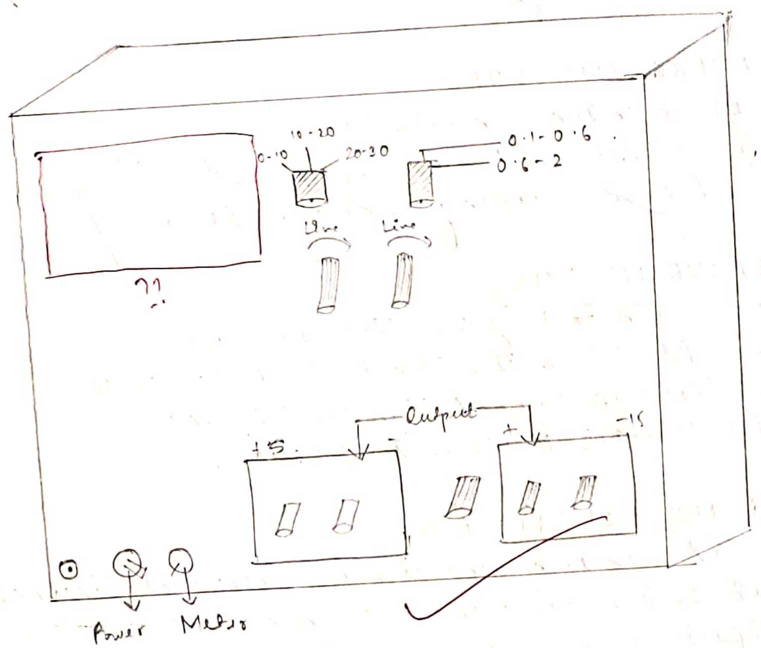


FUNCTION GENERATOR (F.G.)



TRANSISTOR POWER SUPPLY (TPS)

Expt. No. 1 Page No. 2

that need low distortion or stable frequency signals. When these 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 control loop.

b) TRANSISTOR POWER SUPPLY (TPS):-

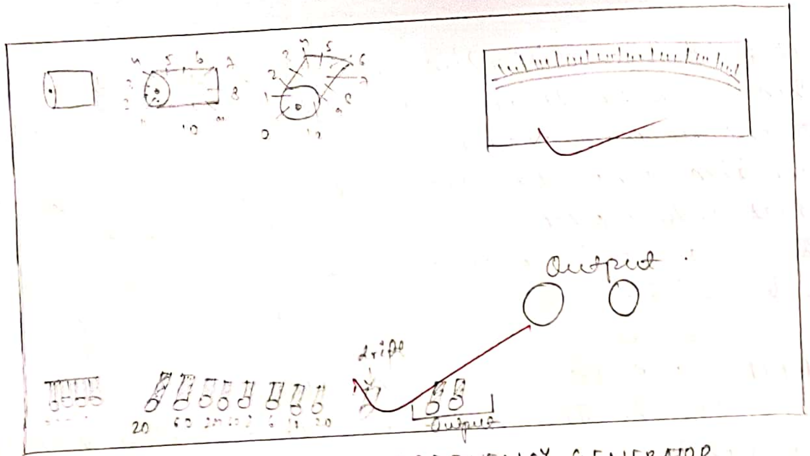
TPS is designed to provide a stabilised voltage that can be varied from 0.5 volts at supply converted over 5 ranges of 10 volts each with facility for time limit of which may be selected by a switch. The supply is designed to operate at a temperature up to 50°C overload protection is provided to the limit as well as the circuit is suddenly overloaded the protection to the 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 230V & 50 Hz frequently.

c) AUDIO FREQUENCY GENERATOR:-

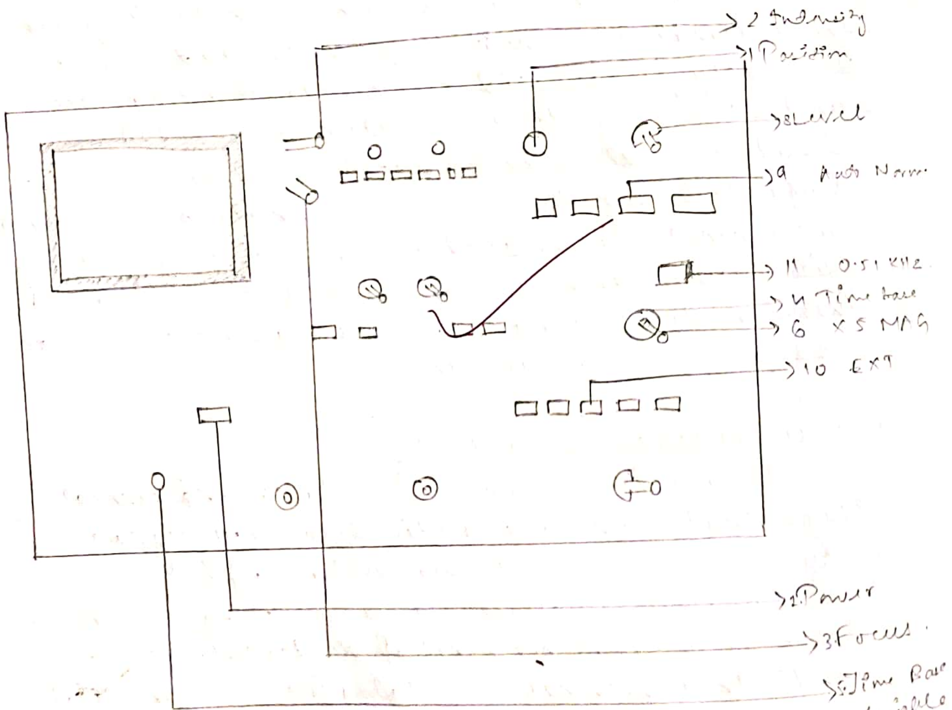
It is a device for providing known and controlling voltage that stimulates radio frequency signals. A typical audio generator has following parts.

1. An oscillator associated modulating system for stabilizing a reference level of voltage, power and shield that prevents auxiliary power from reaching

Teacher's Signature :



AUDIO FREQUENCY GENERATOR



(CATHODE RAY OSCILLATOR)

Date ....

Expt. No. 1 Page No. 3

output terminals are effective under test by means of other passing through attenuator.

2. The principal objective of AFG is the develop its output terminal at adjustable and an accurate voltage for audio frequency range of 20 Hz to 20 KHz its input, to know that generator used to check in that voltage introduced into the receiver by linkage from AFG are small and distortion produced is small.

2. a) CATHODE RAY OSCILLOSCOPE

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

A CRO can be adjusted with 0.5 Hz. It can allow viewing signal within time upon at a fine resolution and can provide a number of waveform displayed on the screen simultaneously.

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

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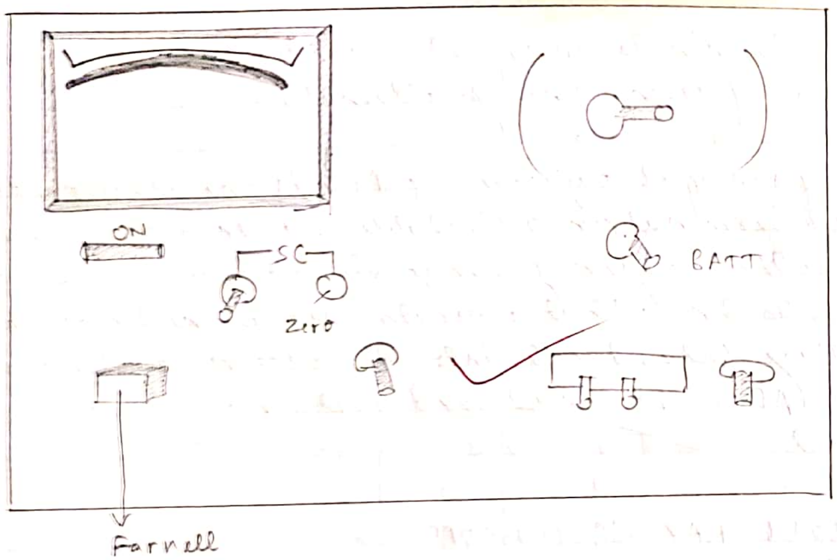
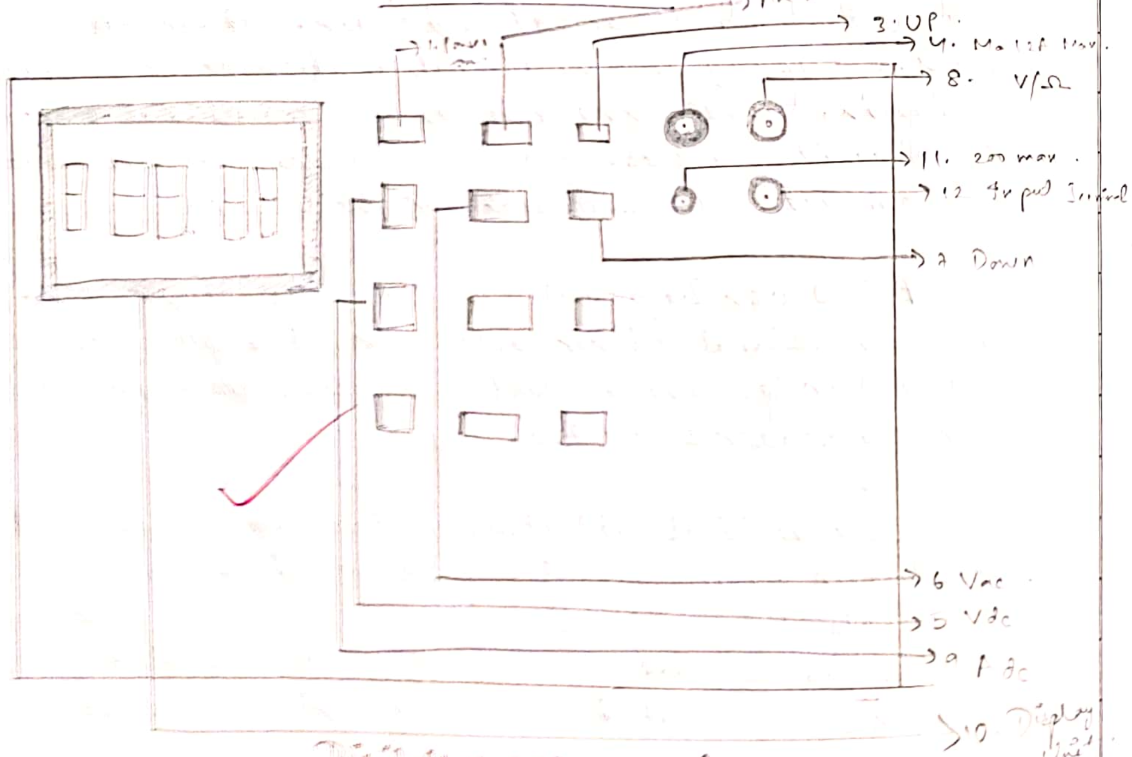
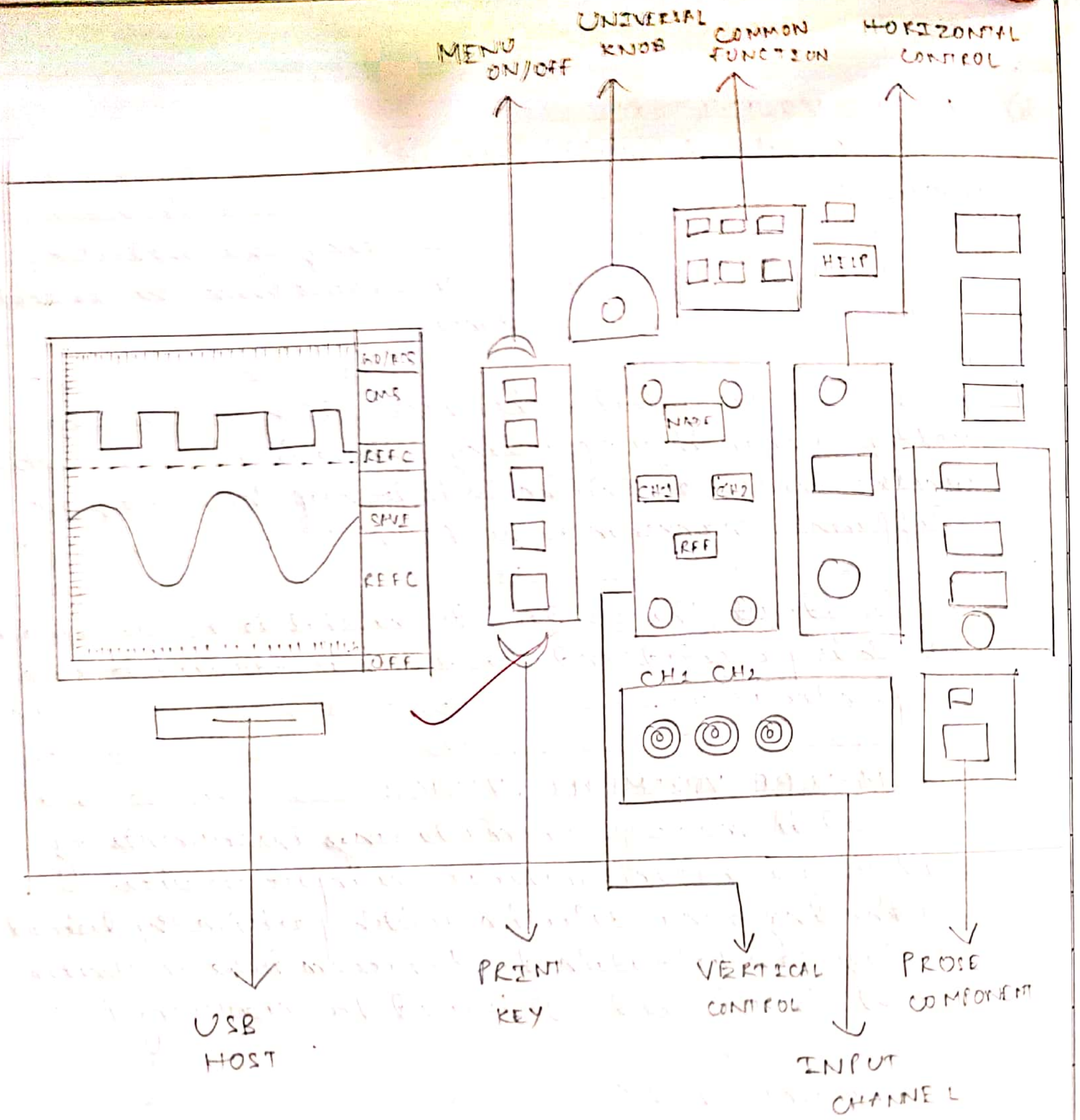


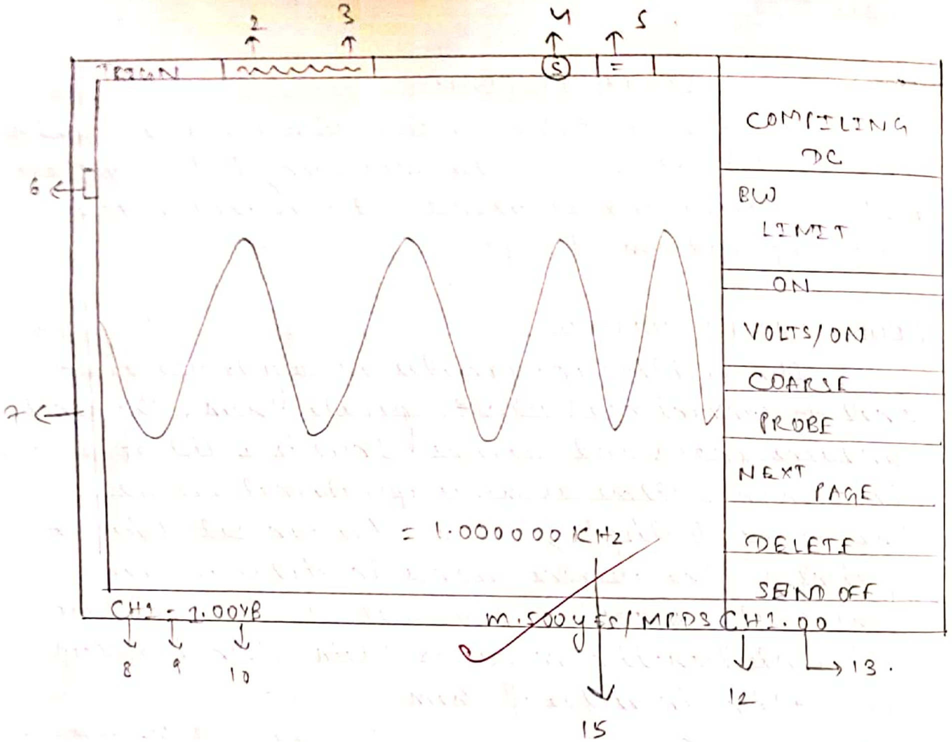
AC/DC VOLTMETER



Digital Multimeter (DMM).



FRONT PANEL CONTROL



USER DISPLAY INTERFACE

Stop: The oscilloscope has stopped acquiring waveform data.

Auto: The oscilloscope is in auto mode and is acquiring waveforms in the absence of triggers.

Scan: The oscilloscope is acquiring and displaying waveform data continuously in scan mode.

2. Display the position of the present waveform window in internal memory.

3. Marker shows horizontal trigger position. Turn the HORIZONTAL POSITION knob to adjust the of the marker.

4. Print key - Indicates whether the Print key option is set to print picture or save picture.
"Print key" option is set to "Print Picture".
"Print key" option is set to "Save Picture".

5. Back USB - Indicates whether the back USB option is set to USBTMC or Printer.
"Back USB" option is set to "USBTMC".
"Back USB" option is set to "Printer".

6. Show the trigger level symbol.

7. Show the channel symbol.

8. Signal coupling symbol.

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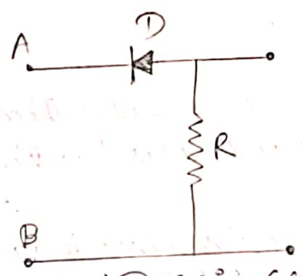
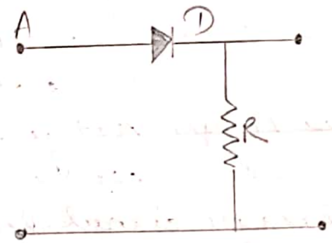
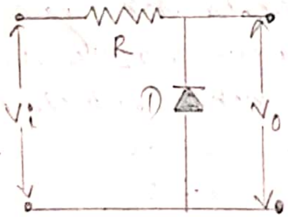


(a) Positive Clipper

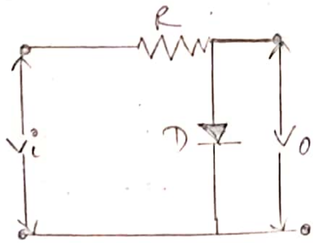


(b) Negative Clipper



(a)

Shunt (parallel) Negative Clipper.



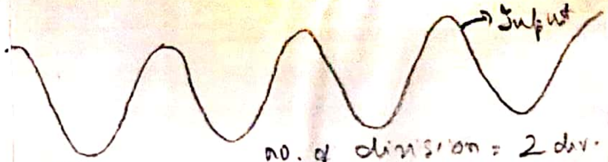
(b)

Shunt (parallel) Positive Clipper

Scanned by CamScanner

POSITIVE CLIPPER

$V_{p-p} = 10V$



$V_{p-p} = 10V$

no. of division = 2 div.

V/D = 5 V/D

$V_p = 5V$ ∴

No. of division = 1

Volt / Division = 5 V/D

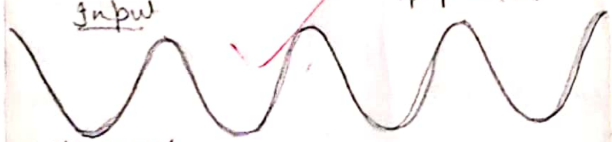
NEGATIVE CLIPPER

No. of D = 2 div

V/D = 5 V/div

$V_{p-p} = 10V$

Input



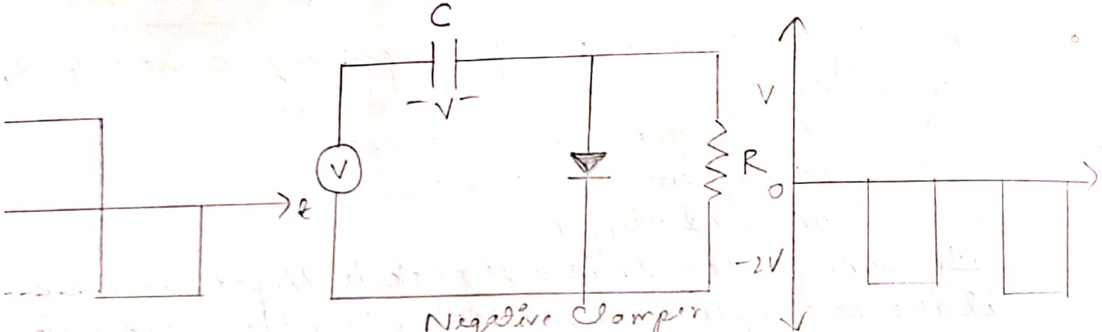
$V_{p-p} = 10V$

output

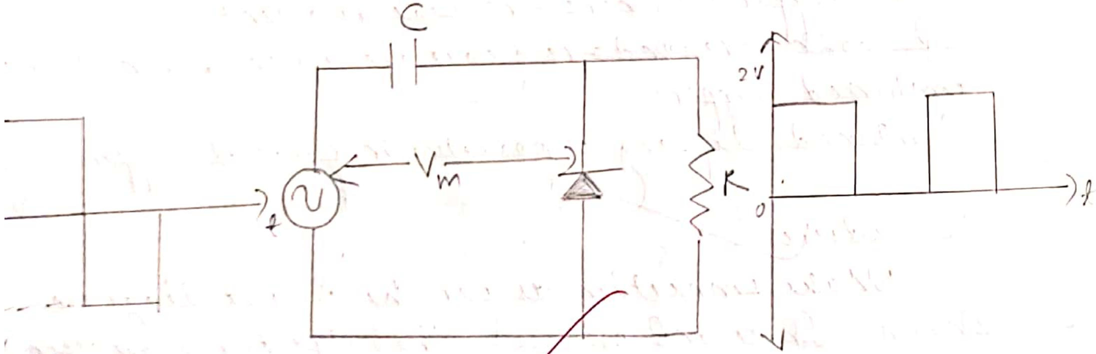
$V_p = 5V$.

No. of div = 1

V/D = 5 V/div



Negative Clamper



Positive Clamper

Expt. No. 2 Date

Page No. 11

- The magnitude of R and C are so chosen that the time constant $\tau = RC$ should be large enough to ensure that the voltage across capacitor does not discharge significantly during the interval, diode is non-conducting.

Procedure:-

Make connection as per the circuit diagram shown. Trace and measure the output voltage using CRO by applying V_{p-p} sine waveform audio generator / FG as input.

Conclusion:

~~The effect of different output waveform of clamper circuit~~ was observed, traced and measured.

Precaution:-

(i) The connection should be tight.

(ii) Resistance of 1 KΩ must be taken.

(iii) The effect of different output waveforms of clamper ~~circuit~~ circuit's output waveform is best observed at 1000 Hz of input waveform.

Khadei 4/9/18

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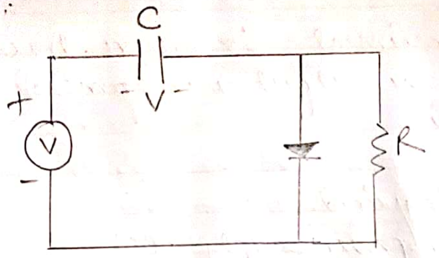
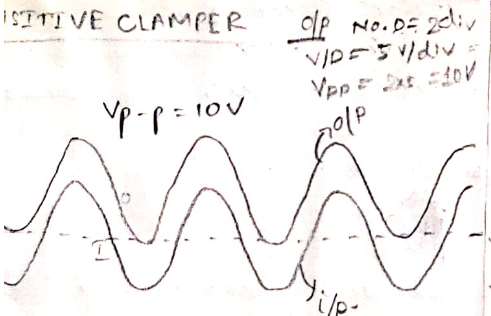


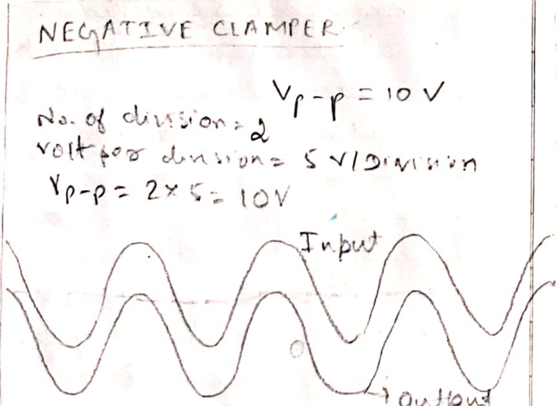
Negative



o/p No.D = 2div
V/D = 5 V/div
V_{pp} = 2x5 = 10V

P
No. div = 2div
V/D = 5 V/div
V_{p-p} = 2x5 = 10V

Khadei



No. of division = 2
volt per division = 5 V/Division
V_{p-p} = 2x5 = 10V
$V_{p-p} = 10V$

No. D = 2 div
V/D = 5 V/D
V_{p-p} = 5x2 = 10V

Khadei

STUDY OF RECTIFIERS

AIM OF THE EXPERIMENT :-

Study of half-wave, full-wave rectifier without capacitor filter. Record of waveforms, measurement of average rms value and ripple factor.

EQUIPMENTS REQUIRED:-

1) CRO (0 - 20 MHz)
2) Training record.
3) Patch cord.

THEORY:-

The process by which an alternating current (or voltage) is transformed into a direct current is called rectification.

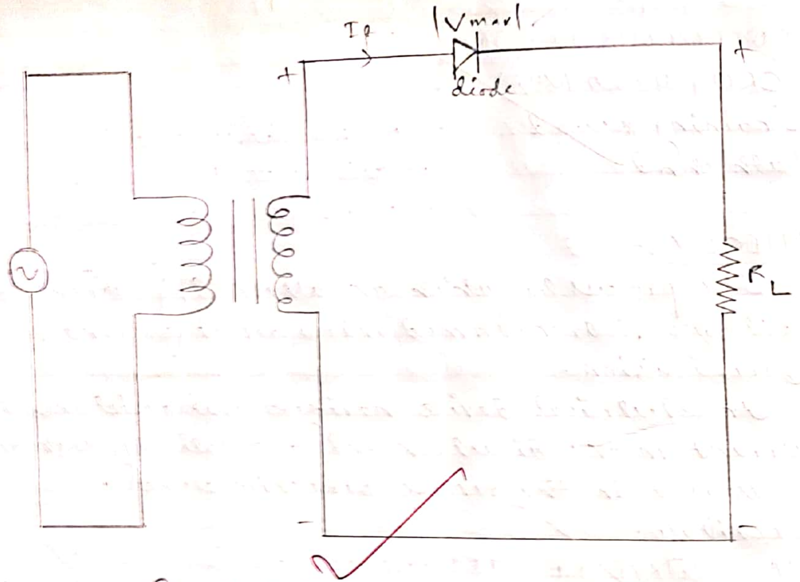
An electrical device having a low resistance to current in one direction and a relatively high resistance to current in the reverse direction serves as a rectifier.

HALF WAVE RECTIFIER:-

Since the negative half cycles of input voltage are cut off and are absent from the output load voltage in the circuit which uses a single diode, the circuit is referred to as a half-wave rectifier. The process of removing one half of the input signal to establish a DC level is called halfwave rectification.

FULL WAVE RECTIFIER:-

When two diodes are so connected that conduction occurs through one diode during one half



Circuit Diagram of halfwave Rectifier

Date ....

Expt. No. 3 Page No. 13

of the input voltage cycle and through the other diode during the next half of the cycle. a unidirectional current can flow through the load resistance during full cycle of the input voltage. Such a circuit is called a full wave rectifier. The D.C. level obtained from a sinusoidal rectifier input can be improved to 100 percent using a full wave rectifier and the process is called full-wave rectifier.

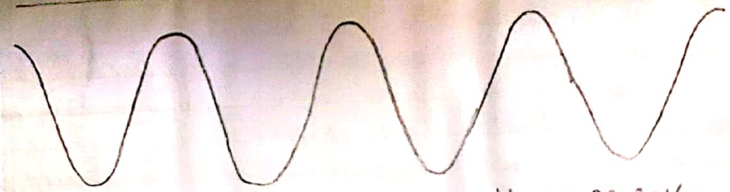
CENTRE TAPPED TRANSFORMER:- A popular full wave rectifier appears only with two diodes but requiring a center-tapped transformed to establish the input signal across each section of the secondary of the transformer.

PROCEDURE :-

- Transformer was fed 220V, 50Hz source was given to primary coil of the transformer and the AC waveform of rated value was observed without any distortion at the secondary of the transformer.
- The circuit was connected to the secondary terminals of the transformer.
- CRO was connected across load.
- CRO switch was kept in ground mode and horizontal line was observed and observed adjusted to x-axis.
- CRO was switched into DC mode and the waveform was observed. Amplitude Vm was noted down and frequency from the screen along with its multiplication factor was also noted down.

Teacher's Signature :

INPUT WAVEFORM OF FULL WAVE RECTIFIER



$V_{p\text{-}p} = 72.80V$

OUTPUT WAVEFORM OF FULL WAVE RECTIFIER

$V_{p\text{-}p} = 34.40V$

- V_{dc} was calculated using the relation:-
  $V_{dc} = V_m/\pi$ (half-wave)
  $V_{dc} = 2V_m/\pi$ (full-wave)
- The CRO was switched into AC mode and the waveform was observed. Amplitude V_m and frequency was noted down from the screen along with the multiplication factor.
- V_{ac} was calculated using the relation:-
  $V_{rms}^2 = V_{ac}^2 + V_{dc}^2$
  $V_{rms} = V_m/2$ (half-wave)
  $V_{rms} = V_m/\sqrt{2}$ (full-wave).
- Ripple factor was calculated from the formula $\gamma = \frac{V_{ac}}{V_{dc}}$

CALCULATION:-

- Half-wave Rectifier:-
  Input
  $V_{p\text{-}p} = 73V$

Output
$V_{p\text{-}p} = 36.80V$

Maximum voltage, $V_m = \frac{36.80}{2} = 18.4V$

$V_{rms} = \frac{V_m}{2} = \frac{18.4}{2} = 9.2V$

$V_{dc} = \frac{V_m}{\pi} = \frac{18.4}{3.14} = 5.85V$

$V_{ac} = (V_{rms}^2 - V_{dc}^2)^{\frac{1}{2}} = \sqrt{(9.2)^2 - (5.85)^2}$
$= \sqrt{84.64 - 34.22}$
$= \sqrt{50.42} = 7.10V$

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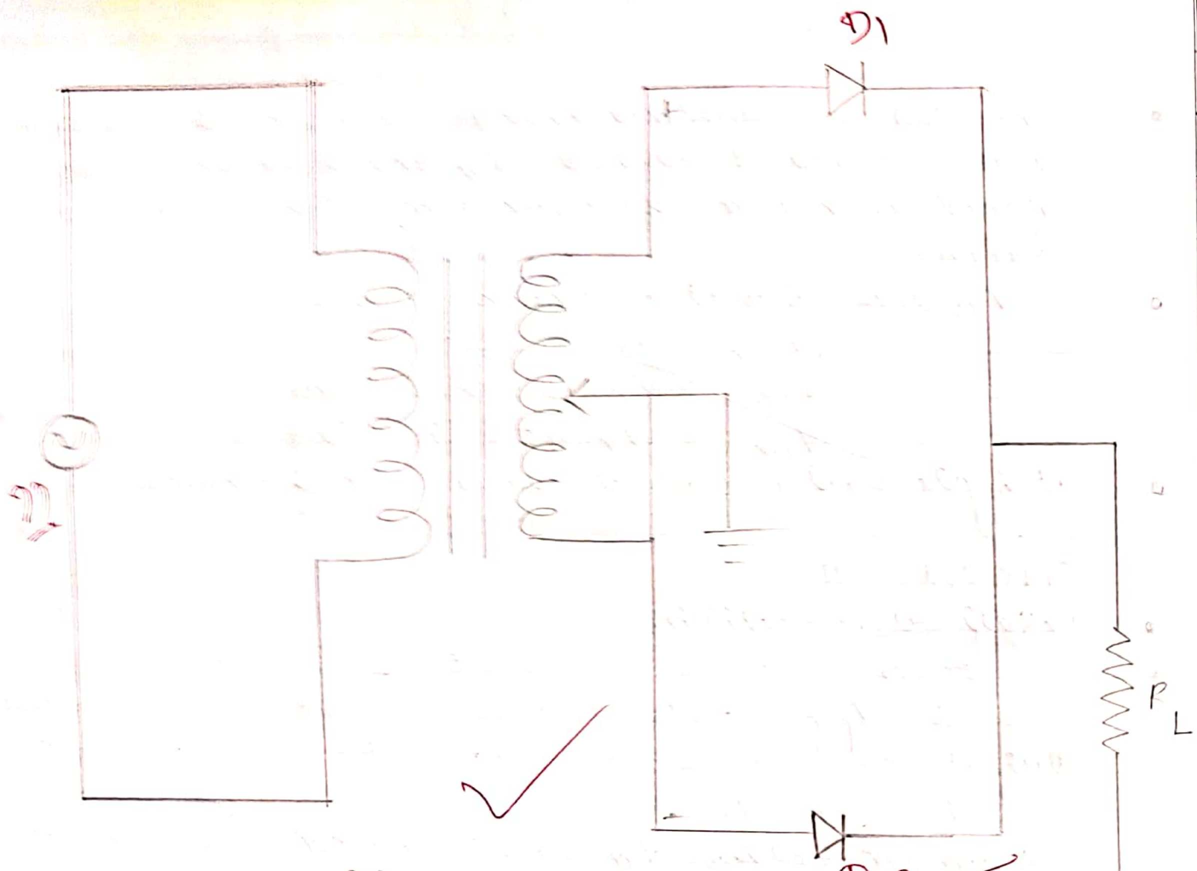

Circuit Diagram of full wave rectifier

CONCLUSION :-

The half-wave and full wave rectifier wave were studied without capacitor filter and waveform measurement of average rms value and ripple factor were recorded.

PRECAUTION :-

- Connections should be verified experimentally.
- But, performance is observed at 50 Hz and 230 V.

Aradei 26/9/18

Submitted By :-
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Teacher's Signature :

AIM OF THE EXPERIMENT :-

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

APPARTUS REQUIRED :-

	APPARTUS	QUANTITY
1.	Breadboard or universal trainer	1
2.	Transistor power supply (TPS)	2
3.	DC micrometer	1
4.	Digital multimeter	1
5.	Transistor	1
6.	Resistor (22K, 1K)	2

THEORY :-

The transistor is biased to operate in the active region. The micrometer and voltmeter are connected to measure the base current (I_B) and the voltage are used in the base-emitter circuit to measure the base current (I_B) and the voltage between base and emitter. Similarly, multimeter and voltmeter are connected on collector emitter circuit to measure collector current (I_C).

In this configuration we use emitter as common terminal for both input and output. Here, the input is applied between base emitter terminals. This type of configuration is mostly used in the application of transistor based amplifiers. In this configuration, emitter current is equal to the sum of $\boxed{I_E = I_C + I_B}$

PROCEDURE:-

- The instruments and components were connected on breadboard as per the circuit diagram by following the proper rules of it.
- The I_B was set at different values by varying V_{BB}
- The DC voltage V_{CE} was applied from TPS at the interval of 1V for a constant I_B value and I_C was measured by multimeter.
- The ΔI_C and ΔI_B graph was plotted in the graph and the current amplification factor was calculated by using the formula ($\Delta I_C / \Delta I_B$).

OUTPUT CHARACTERISTICS :-

It is drawn by taking V_{CE} in X-axis and I_C in Y-axis for different I_B value.

NOTE :-

For NPN transistor the supplied and meter polarities will be reverse of the above circuit.

PRECAUTIONS:-

The connection was checked before switching it on.

Scale:-

X-axis: 1 unit = 4 v

Y-axis: 1 unit = 1 mA

Current Amplification factor = $\frac{\Delta I_C}{\Delta I_B}$

$= \frac{4.5 - 3.1}{30 - 20} = 0.$

AIM OF THE EXPERIMENT:-

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

EQUIPMENTS REQUIRED:-

	EQUIPMENTS	QUANTITY
1)	Op-amp trainer kit.	1
2)	Audio - Frequency generator.	1
3)	Decade Resistance box.	1
4)	CRO	1
5)	Digital Multimeter	1

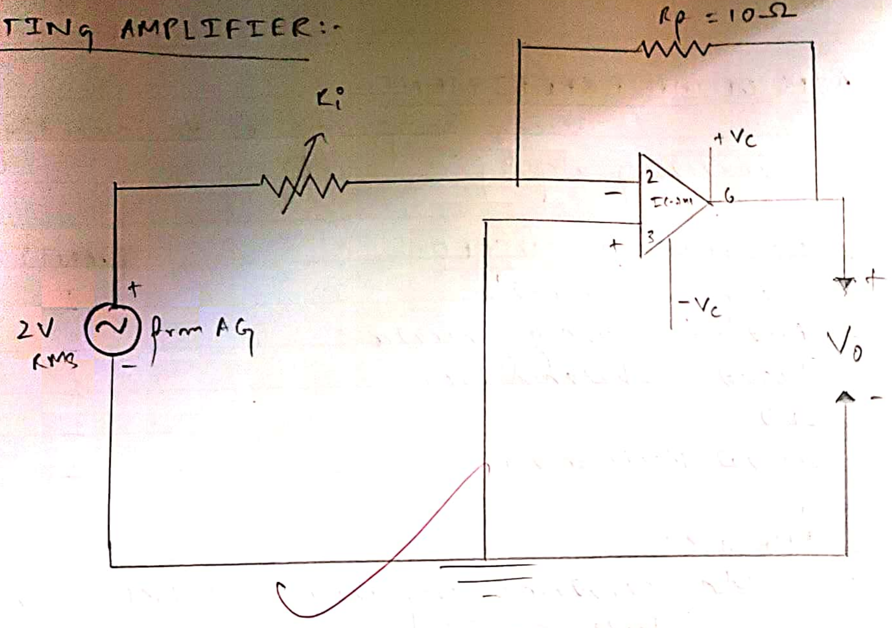
THEORY :-

An operational amplifier, or OP-AMP is a very high gain difficult amplifier with high input impedance and low input impedance. Typical uses of OP-AMP are to provide voltage amplitude changes (amplitude and polarity, oscillators, filter circuits and many types of instrumentation circuits).

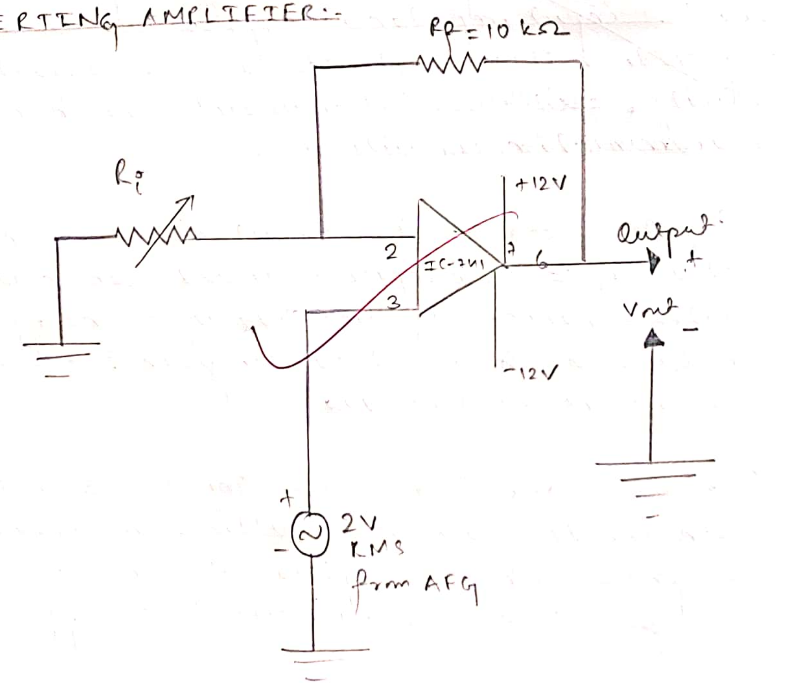
(i) **Single Ended Input:-** Input signal is connected to one plell (input with input at ground) which results in an output having the same polarity as the applied input signal. Also, the signal can be given to +ve input with the -ve one generated.

(ii) **Double Ended (Differential) Input:-** Signal is applied at both inputs, with the resulting amplified output in the phase with that applied between the plus and minus input. When separate signals are applied, then

INVERTING AMPLIFIER:-



NON-INVERTING AMPLIFIER:-



output is the difference $V_{i_1} - V_{i_2}$.

(iii) **Common Mode Operator:-** If the same input, the operation is called common mode operation.

The signals that are opposite at the input are highly amplified, but the common input signal results in opposite signals at each collection, these signals cancelling, so the resulting output signal is zero.

- **Non-Inverting Amplifiers:-**

It is more widely used because of its more/better frequency stability. The voltage across R_i is V_i since $V_i \approx 0V$. This must be equal to output voltage, through voltage divider of R_i and R_f, so that

$$V_i = \left(\frac{R_i}{R_i + R_f}\right) V_0$$

$$\Rightarrow \frac{V_0}{V_i} = \frac{R_i + R_f}{R_i} = 1 + \frac{R_f}{R_i}$$

- **Inverting Amplifiers:-**

Output is obtained by multiplying the input by a fixed or constant gain, set by the input resistor (R) and feedback resistor (R_f) - this output also being inverted from the input.

$$V_0 = -\left(\frac{R_f}{R_i}\right) V_i$$

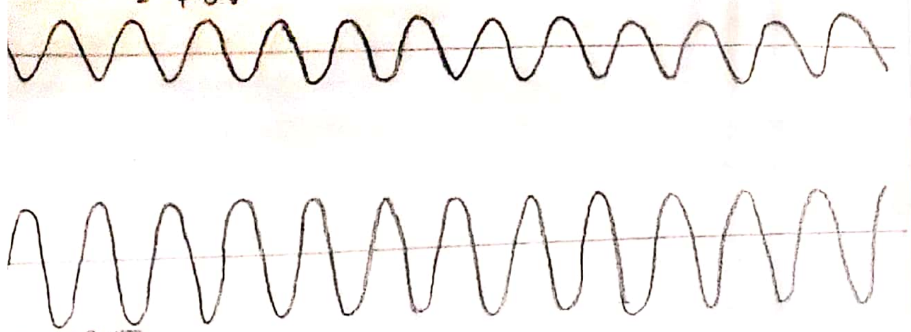
Teacher's Signature :

INVERTING AMPLIFIER

INPUT

No of volts / div = 1·4

$V_{p-p} = 1{\cdot}4 \times 5V$
$= 7{\cdot}0V$



OUTPUT

No of volts / div = 2

$V_{p-p} = 2 \times 5V$
$= 10V$

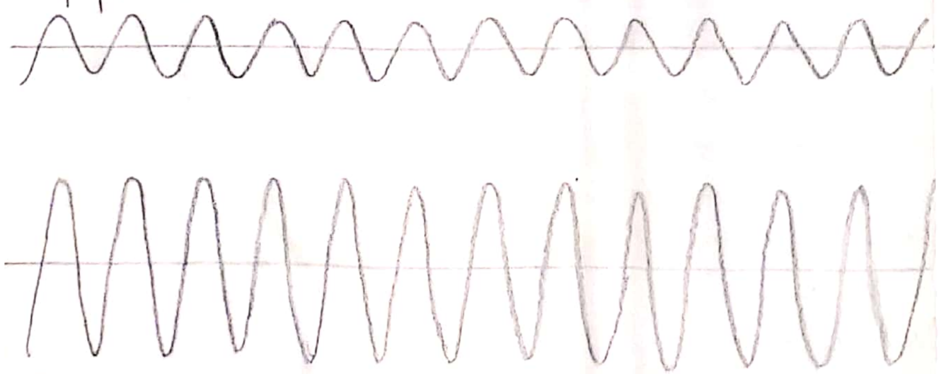
[signature]

NON-INVERTING AMPLIFIER

INPUT

No of volts / div = 1·2

$V_{p-p} = 1{\cdot}2 \times 5V = 6V$



Output

No of volts / div = 3·1

$V_{p-p} = 3{\cdot}1 \times 5V$
$= 15{\cdot}1\ V$

CALCULATION :-

- In inverting amplifier, $R_i = 10\,k\Omega$, $R_f = 10\,k\Omega$
  $V_{in} = 2V$ $V_{out} = -1.92$

  $$\text{Experimental gain} = \frac{V_o}{V_i} = \frac{-1.92}{2} = 0.96$$

  $$\text{Theoritical gain} = \frac{R_f}{R_i} = \frac{10}{10} = 1.$$

- In non-inverting amplifier, $R_i = 10\,k\Omega$ $R_f = 10\,k\Omega$
  $V_i = 2$ $V_{out} = 3.96$

  $$\text{Experimental gain} = \frac{V_o}{V_i} = \frac{3.96}{2} = 1.98$$

  $$\text{Theoritical gain} = 1 + \frac{R_f}{R_i}$$

  $$= 2.$$

PRECAUTION :-

1. The connection should be tight.
2. All the connections must be checked before going to the power supply.

CONCLUSION:-

It has been verified that experimental and theoritical gain is almost same.

Submitted By:-
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PE, N1.

Teacher's Signature :

Expt. No. 6 Date

AIM OF THE EXPERIMENT:-

Verification of truth tables for basic logic gates (AND, OR, NOT, NAND, NOR, EX-OR).

APPARTUS REQUIRED:-

1. Breadboard (1 no).
2. Logic I.C. Trainer
3. Multimeter.
4. Connecting Wires.

THEORY:-

A digital circuit which performs logical operation on one or more inputs but only one single output is given is called a logic gate. There are different types of logic gates of which a few are given below.

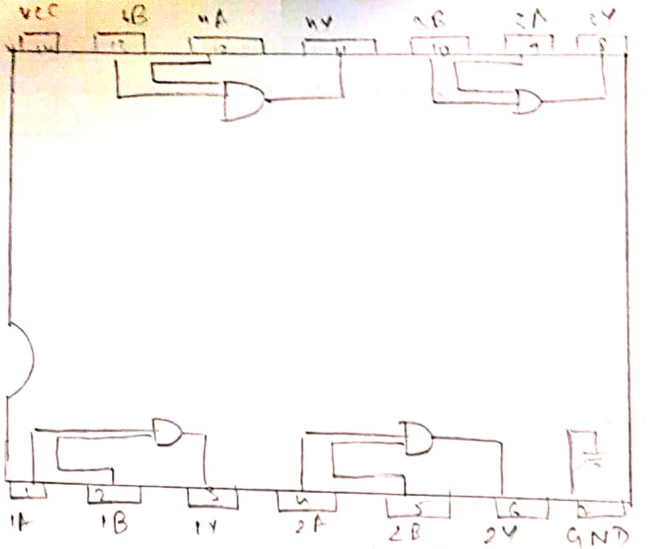
AND gate:-

The AND gate is a logic gate that has two or more inputs but only one output. The output of AND gate is HIGH when all inputs are HIGH. However, the output of AND gate is low if any one or all inputs are low.

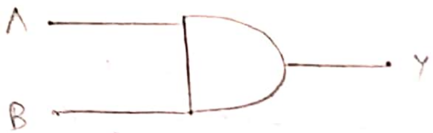
OR gate:-

An OR gate is a logic gate that has 2 or more inputs but only one output. The output of OR gate is low when all inputs are low and output is HIGH if any one or all the inputs are HIGH.

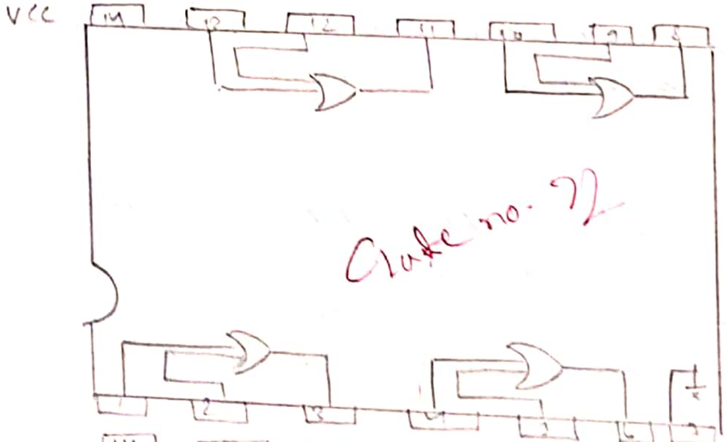
Teacher's Signature :

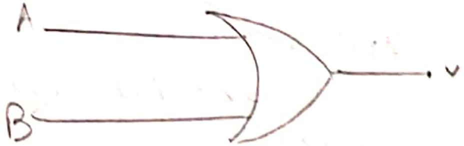


AND Gate.

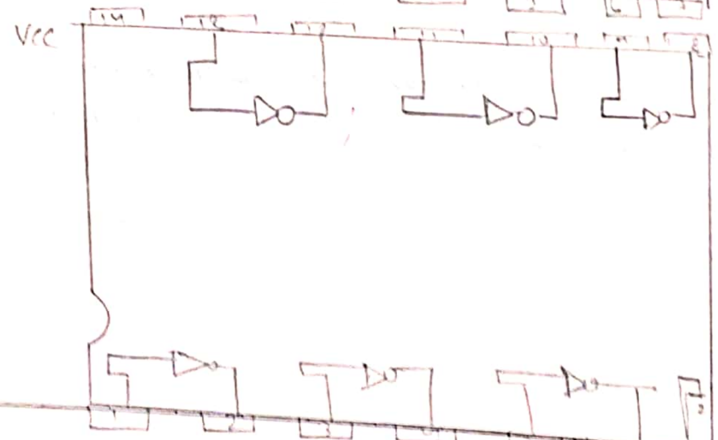


$Y = A \cdot B$





OR Gate.



NOT gate.

PROCEDURE :-

AND gate :- The terminals of the 7408 quad, 2-input IC AND gate was identified. The +5V dc from digital IC trainer was switched on i.e., IC power ON. +5 volts for logic '1' and '0' volts for logic '0' was used.

10 different switches were available 1 to 10 known as logic input switches. Any two input pin for IC was chosen and output voltage for the various combination of the input voltage were measured and the results with the truth table of the AND gate was verified.

Table - I.

Gate	Function	Truth Table			Voltage Reading		
		Input		Output			
		A	B	Y	A	B	Y
AND	Y = A AND B	0	0	0	0V	0V	0.25V
	= A.B	0	1	0	0V	5V	0.36V
	= A∧B	1	0	0	5V	0V	0.25V
	= AB	1	1	1	5V	5V	0.72V

Table - II.

Gate	Function	Truth Table			Voltage Reading		
		Input		Output	Input		Output
		A	B	Y	A	B	Y
OR	Y = A OR B	0	0	0	0V	0V	0.17V
	= A+B	0	1	1	0V	5V	3.92V
		1	0	1	5V	0V	3.92V
		1	1	1	5V	5V	3.92V

Teacher's Signature :

Table III.

Gate	Function	Truth Table Input A	Truth Table Output Y	Voltage Reading Input A	Voltage Reading Output Y
NOT	Y = NOT A	0	1	0V	3.91V
	$= \bar{A}$	1	0	5V	0.17V

Table - IV

Gate	Function	Truth Table Input A	Truth Table Input B	Truth Table Output Y	Voltage Reading Input A	Voltage Reading Input B	Voltage Reading Output Y
NAND	Y = A NOT AND B	0	0	1	0V	0V	3.959V
	= A NAND B	0	1	1	0V	5V	3.96V
	$= \overline{A.B}$	1	0	1	5V	0V	3.96V
	$= A \uparrow B$	1	1	0	5V	5V	0.17V
	$= A \hat{+} B$						

Table - V

Gate	Function	Truth Table Input A	Truth Table Input B	Truth Table Output Y	Voltage Reading Input A	Voltage Reading Input B	Voltage Reading Output Y
NOR	Y = A NOT OR B	0	0	1	0V	0V	3.82V
	= A NOR B	0	1	0	0V	5V	0.14V
	$= \overline{A+B}$	1	0	0	5V	0V	0.14V
		1	1	0	5V	5V	0.14V

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Table - IV,

Gate	Function	Truth Table Input A	B	Output Y	Voltage Reading Input A	B	Output Y
EX-OR	$Y = A$ EX-OR B	0	0	0	0V	0V	0.01V
	$= A \oplus B$	0	1	1	0V	5V	4.7V
	$= A\bar{B} + \bar{A}B$	1	0	1	5V	0V	4.7V
		1	1	0	5V	5V	0.06V

CONCLUSION:-

From the above given experiment of various gates, we conclude that different gates give right output according to their respective truth table.

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16/11/18

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GROUP - 4

Colour	1st band	2nd band	3rd band	Multiplier(Ω)	Tolerance
Black	0	0	0	$\times 1\Omega$	
Brown	1	1	1	$\times 10\Omega$	$\pm 1\%$
Red	2	2	2	$\times 100\Omega$	$\pm 2\%$
Orange	3	3	3	$\times 1k\Omega$	
Yellow	4	4	4	$\times 10k\Omega$	
Green	5	5	5	$\times 100k\Omega$	$\pm 5\%$
Blue	6	6	6	$\times 1M\Omega$	$\pm 25\%$
Violet	7	7	7	$\times 10M\Omega$	$\pm 0.1\%$
Grey	8	8	8		$\pm 0.05\%$
White	9	9	9		
Gold				$\times 0.1\Omega$	$\pm 5\%$
Silver				$\times 0.01\Omega$	$\pm 10\%$

resistance value in hundreds of ohm is expressed in kilo-ohms, etc. The nominal value of resistor are generally expressed at room temperature of 25°C.

(ii) **Tolerance**:- Tolerance and accuracy have same meaning. Accuracy is the tolerance to which the value of the resistance is made. Resistors are available with tolerance such as ±20%, ±10%, ±5% in general and more precise with 1% or 2% or 0.5%.

(iii) **Stability**:- A resistance is said to be more stable if its value does not alter from its nominal value. This property is called stability.

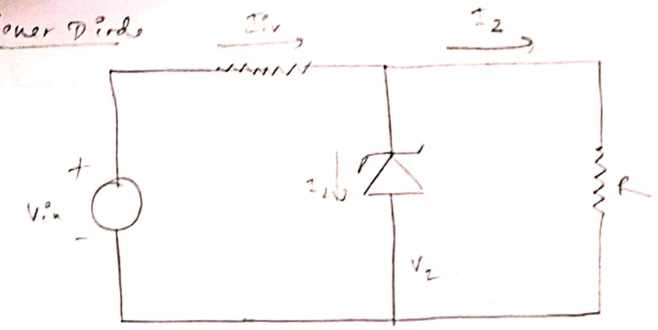
As such the carbon composition resistors are less stable, carbon film resistor are fairly stable and metal films and wired resistors are most stable.

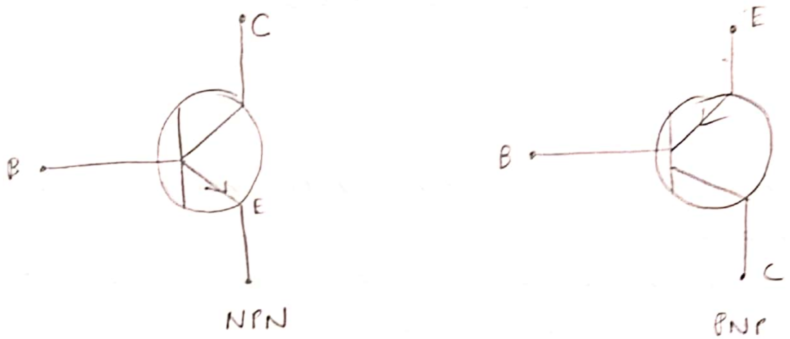
2. **Capacitors**:-

The capacitors are available in fixed and variable nature. They are classified as:-

- **Mica capacitor**:- The thin sheet of mica ranging from 0.125-0.25 mm is placed between the electrolyte of copper or tin lead foil of thickness 0.00625 mm.
- **Electrolytic capacitor**:- This uses a very thin film of aluminium or titanium oxide as formed by an electrostatic process. Non-polarised capacitors 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 circuit and to be connected with appropriate polarity in DC circuits.

Zener Diode





Types of Transistors:

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Observation Table: Measurement of Resistance.

Sl. no	Colour Code	Theoritical Value	Experimental Value	% of error.
1.	Brown, Black, red	$10 \times 10^2 \pm 5\%\ \Omega$	$0.98 \times 10^3\ \Omega$	2%
2.	Golden			
3.	Brown, green, orange.	$15 \times 10^3 \pm 15\%\ \Omega$	$14.5 \times 10^3\ \Omega$	3.14%
4.	Grey, Red, Orange. Silver	$82 \times 10^3 \pm 10\%\ \Omega$	$80 \times 10^3\ \Omega$	2.4%.

Measurement of Capacitance.

Sl no	Theoritical value (μF)	Experimental Value (μF)	% of error
1.	10	10.78	7.8%
2.	4.7	4.87	3.6%
3.	1	1.07	7%
4.	0.22	0.22	0%

Measurement of Diode Potential:-

Sl. no	Types	Forward Biased	Reverse Biased
1.	Si diode	0.656 V	0.001V
2.	Zener diode	0.003 V	0.064V

Determination of Transistor Terminals

Sl. no	Type	Specification	V_{BE} (in volts) Forward	V_{BE} (in volts) Reverse	V_{BC} (in volts) Forward	V_{BC} (in volts) Reverse
1.	PNP	—	0.003	0.004	OL	OL
2.	NPN		0.66	OL	OL	OL

Teacher's Signature :

CONCLUSIOON:-

Now after performing the experiment, we are familiar with varieties of electronic components and their usage.

PRECAUTIONS:-

(i) The colour bands of the resistor should be observed carefully.
(ii) Appropriate range should be set in the multimeter.
(iii) The base, the emitter and collector of the transistor should be identified properly.

AIM OF THE EXPERIMENT :-

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

EQUIPMENTS REQUIRED:-

1. CRO (Cathode Ray Oscilloscope)
2. FG (Function Generator)
3. TPS (Transistor Power Supply)
4. AC millivolt-meter and digital multimeter.

THEORY:-

Cathode Ray Oscilloscope (CRO) is one of the pre-requisities of any electronic laboratory are known to be amongst one of the most flexible and adoptable instruments. A basic CRO is a test instrument that allows one individual to "plot" and view two-dimensional (2-D) graphs of electronic signals including voltage, current, phase difference, etc., mainly as a function of time and sometimes as a function of voltage. It has two input channels (vertical channels Y_1 and Y_2) along with an in-built X-channel with a knob to vary time quotient. The signals that needs to be analysed and studied is directly fed to any of the Y-channel where as the time function is available on the X-axis by default.

Block Diagram

- AC voltage measurement

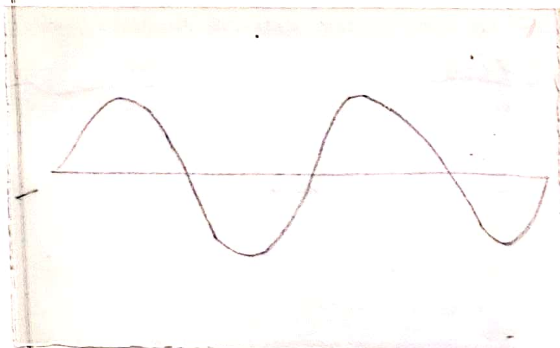
  Function Generator → Digital multimeter → CRO

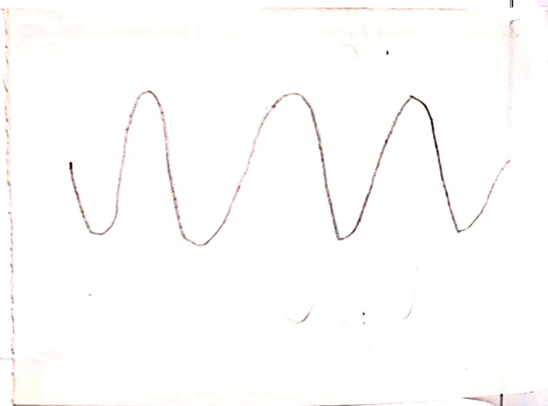
- DC voltage measurement.

  TPS → CRO

- Frequency measurement.

  Function Generator → CRO





Time/div=0.5
frequency=
2KHz

PROCEDURE

Measurement of Frequency - The function generator was connected to CRO's vertical I/P terminal (Y1 - CH1). The FG was set to frequency 1KHz and the frequency was calculated for 2kHz and 5kHz.

Measurement of AC voltage - The AC voltage was set from FG i.e., 1Vrms and the voltage was measured from CRO. Similarly, it was measured for 2V and 4V.

Measurement of DC voltage - The TPS voltage was set to 10V, 20V and 30V etc and the voltage was measured from CRO.

TABULATION:-

Measurement of frequency.

Sl.no	Input frequency from AFG in Hz/kHz	No. of div in X-axis (a)	Time/div (b)	Total time (a×b)	F=1/T (in Hz/KHz)	% error
1	1	2	0.5	1	1	0 %
2	2	1	0.5	0.5	2	0 %
3	5	1	0.2	0.2	5	0 %

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Date ....

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Measurement of AC voltage

Sl.no	AC voltage from FG (in volt)	No of division in Y-axis (a)	Volt/div = b (in volts)	Peak to peak voltage	RMS volt $(V_0/2\sqrt{2})$	% of error
1	2	3	2	6	2.12	6%
2	0.95	3	1	3	1.06	11%
3	0.8	3	1	3	1.06	13%

Measurement of DC voltage.

Sl.no	Input voltage from TPS (in volt)	No of division in Y-axis (a)	Volt/div (b)	Total volt (a * b)	% of error
1	10	1	10	10	0%
2	20	2	10	20	0%
3	30	3	10	30	0%

Precautions:-

(i) The instrument is carefully handled

(ii) The wire is properly connected.

(iii) The connection is properly checked.

Conclusion:-

Using the CRO and apparatus provided we checked and passed the AC voltage, DC voltage and frequency. The CRO has been properly checked and used.

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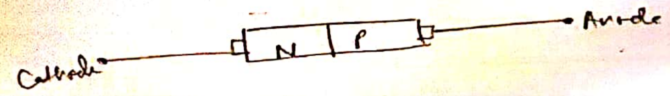
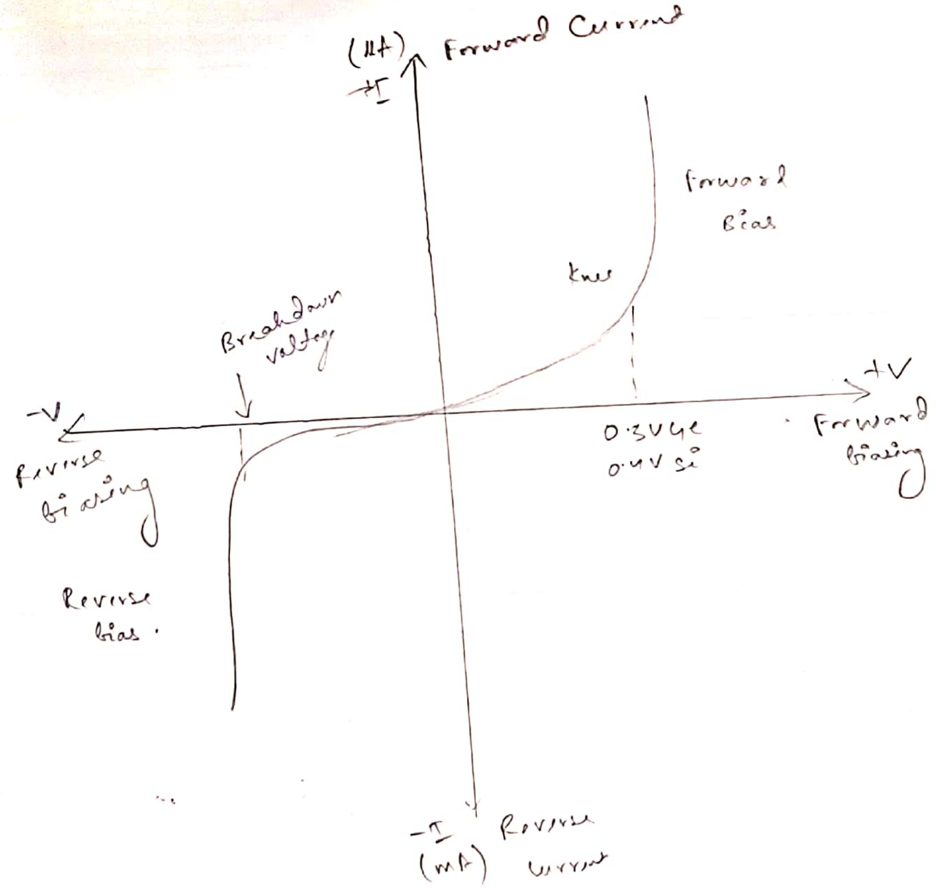
CHARACTERISTIC DIODE.





V-I characteristics

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Tabulation:-

Forward Bias

Sl.no	I/p voltage	Vd	Id (mA)
1.	0.1	0.157	0
2.	0.2	0.27	0
3.	0.3	0.37	0
4.	0.4	0.43	0.05
5.	0.5	0.47	0.1
6.	0.6	0.5	0.2
7.	0.7	0.513	0.3
8	0.8	0.53	0.5
9	0.9	0.54	0.6
10	1.0	0.548	0.7
11	1.1	0.556	0.8
12	1.2	0.563	1
13	1.3	0.570	1.1
14	1.4	0.575	1.2
15	1.5	0.60	1.3

Reverse Bias.

S.no	I/p voltage	Vd	Id (uA)
1	1.0	1.079	0.11
2	2.0	2.074	0.12
3	3.0	3.121	0.21
4	4.0	4.10	0.31
5	5.0	5.2	0.41
6	6.0	6.75	0.52
7	7.0	7.15	0.12
8	8.0	8.13	0.11
9	9.0	9.15	0.82
10	10.0	10.18	0.91
11	11.0	11.25	1.01
12	12.0	12.18	1.10
13	13.0	13.15	1.20
14	14.0	14.20	1.31
15	15.0	15.22	1.41

Precaution:-

(i) All connections should be properly closed.
(ii) Always connect voltmeter in parallel and ammeter in series.
(iii) All connections should be tight enough.

Conclusion:-

The knee voltage of Si-diode was found to be 0.6V

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