DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

GE23122 – ENGINEERING PRACTICES LABORATORY MANUAL

(ELECTRONICS)

(2023 Regulation)

COLLEGE VISION

To be an institution of excellence in Engineering, Technology and Management Education & Research. To provide competent and ethical profess sionals with a concern for society.

COLLEGE MISSION

- To impart quality technical education imbibed with proficiency and humane values.
- To provide right ambience and opportunities for the students to develop into creative, talented and globally competent professionals.
- To promote research and development in technology and management for the benefit of the society.

DEPARTMENT VISION

To produce globally competent Electronics and Communication Engineers with a commitment to serve the society

DEPARTMENT MISSION

- **M1:** To impart training with the best of teaching expertise supported by excellent laboratory infrastructure and exposure to recent trends in the industry.
- **M2:** To ensure that the students are molded into competent Electronics and Communication Engineers with the knowledge of computer applications and worthy citizens of the country.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO’s)

PEOI: To provide students with sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze and solve engineering problems and to prepare them for post graduate studies and for successful careers in industries

POE2: To develop the ability among students to define engineering problems in the fields of electronics and communication engineering, and to employ necessary techniques, hardware, and communication tools for modern engineering applications.

POE3: To instill the values, skills, leadership and team spirit for comprehensive and wholesome personality, to promote entrepreneurial interest among students.

PROGRAMME OUTCOMES (PO's)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering Solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSO's)

PSO 1: An ability to formulate solutions for practical societal requirements using communication engineering.

PSO 2: To design and formulate solutions for industrial requirements using electronics and communication engineering.

PSO 3: To understand and develop solutions required in multidisciplinary engineering fields.

Subject Code	COURSE TITLE	Category	L	T	P	C
GE23122	**ENGINEERING PRACTICES LABORATORY (ELECTRONICS)**	**ES**	**0**	**0**	**2**	**1**

Objectives:

☐	To provide hands-on experience on various basic engineering practices in Electronics Engineering.

List of Experiments:

1. Study of electronic components and equipment – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO/DSO.
2. Measurement of electrical quantities using Multimeter Testing of electronic components.
3. Study of logic gates: AND, OR, EXOR and NOT.
4. Generation of Clock Signals.
5. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
6. Measurement of ripple factor of Half-wave and Full-wave Rectifiers.

Course Outcomes

	On completion the course, the students will be able to
☐	Fabricate the basic electrical circuits
☐	Implement the house wiring circuits
☐	Fabricate the electronic circuits
☐	Verify the truth table of logic gates
☐	Design the Half-wave and Full-wave Rectifiers using diodes and passive components

References:

1	Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, 2007
2	Jeyachandran K., Natarajan S. & Balasubramanian S., “A Primer on Engineering Practices Laboratory”, Anuradh Publications, 2007.
3	Jeyapoovan T., Saravanapandian M. & Pranitha S., “Engineering Practices Lab Manual”, Vikas Publishing Hous Pvt.Ltd, 2006.
4	Rajendra Prasad A. &Sarma P.M.M.S., “Workshop Practice”, Sree Sai Publication, 2002.

Lab Equipment Required:

S. No.	NAME OF THE EQUIPMENT	QUANTITY REQUIRED
1.	Soldering guns	10 Nos.
2.	Assorted electronic components for making circuits	50 Nos.
3.	Small PCBs	10 Nos.
4.	Multimeters	10 Nos.
5.	Digital trainer kit	5 Nos.
6.	CRO	8 Nos.
7.	Transformer	8Nos.
8.	Function Generator	8 Nos.

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
GE23122.1	3	3	3	2	-	-	2	-	3	2	-	3	-	1	1
GE23122.2	3	3	2	2	-	-	2	-	3	2	-	3	-	1	1
GE23122.3	3	3	3	2	-	-	2	-	3	2	-	3	-	1	1
GE23122.4	3	3	3	2	-	-	-	-	3	2	-	3	-	1	1
GE23122.5	3	3	3	2	-	-	-	-	3	2	-	3	-	1	1
Average	**3**	3	**2.6**	**2**	-	-	**2**	-	**3**	**2**	-	**3**	-	**1**	**1**

INDEX PAGE

STUDY OF ELECTRONIC COMPONENTS AND EQUIPMENTS

EXP. NO.:
DATE:

AIM

To study about the various Electronic Components and Equipment's.

TYPES OF ELECTRONIC COMPONENTS

ACTIVE COMPONENT

Definition

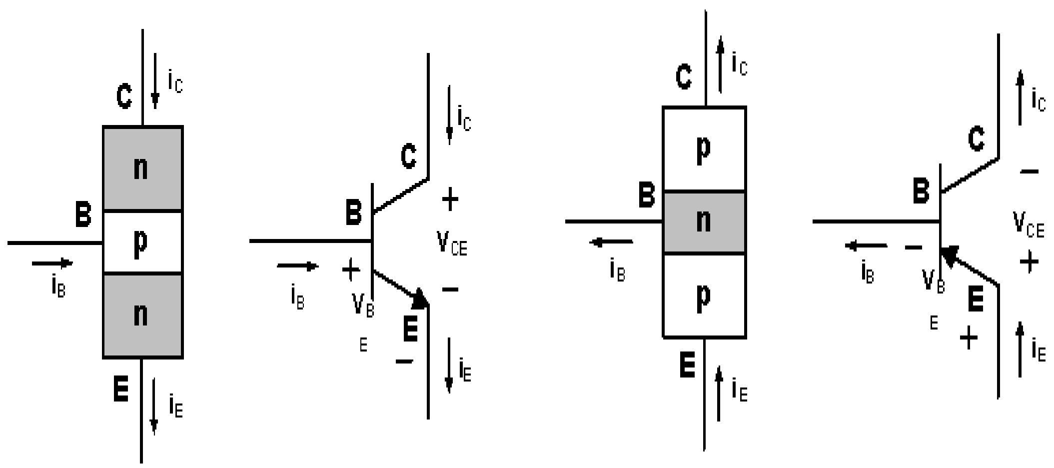
Active components are those that require electrical power to operate. This could include the power supply, fans, storage device, transistors, diodes and other integrated circuits.

TRANSISTORS

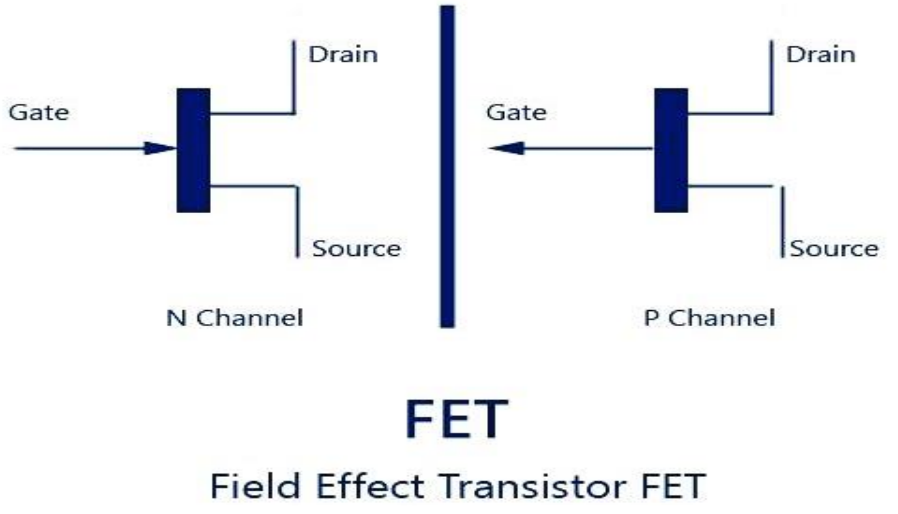
A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals.

TYPES OF TRANSISTORS

1. **Bipolar Junction Transistor**

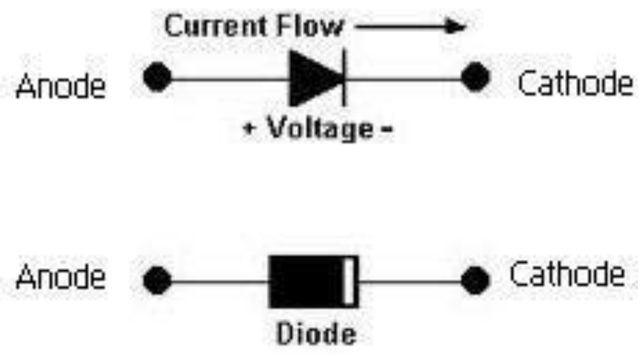


2. **Field Effect Transistor**



DIODES

An electronic device with two active terminals, an anode and a cathode, through which current passes more easily in one direction (from anode to cathode) than in the reverse direction. Diodes have many uses, including conversion of AC power to DC power, and the decoding of audio-frequency signals from radio signals.



TYPES OF DIODES

a. PN Junction Diode
b. PIN Diode
c. Zener Diode
d. Tunnel Diode

PASSIVE COMPONENTS

Definition

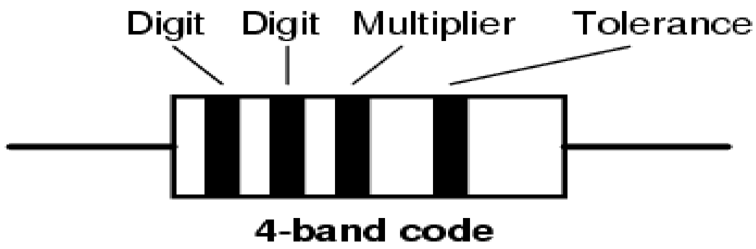
A passive component is a module that does not require energy to operate, except for the available Alternating Current (AC) circuit that it is connected to. A typical passive component would be a inductor, resistor, transformer, or capacitor.

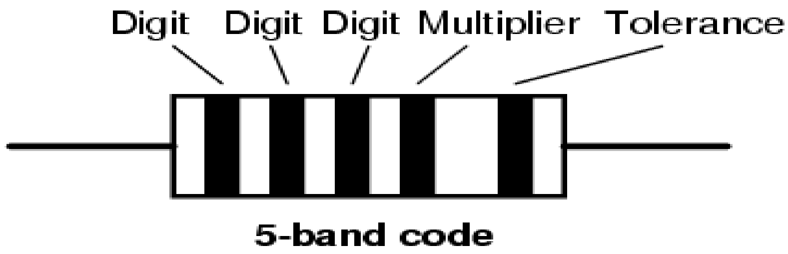
RESISTOR

A resistor is an electrical component with two terminals that is used to limit or regulate the flow of electrical current in electronic circuits. Its purpose is to reduce current flow as well as lower the voltage levels in the circuit.

RESISTOR COLOUR CODING

There are colors coded to mark the value of R in ohms. The first band gives the first digit of the numeric value of R. The second band gives the second digit. The third band gives the decimal multiples of the color, which gives the number of zeros after the second digit.





For example, if the first band is red with value 2, the next band with green of value 5, and the third band with red of value 2, then the value of resistor is **R=25*100= 2500Ω.**

Color	Digit	Multiplier	Tolerance (%)
Black	0	10^0 (1)	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20

RESISTANCE TOLERANCE

The amount by which the actual resistance can be different from colour coded value. This tolerance is given in percentage. For example, a 2000Ω resistor with 10% tolerance can be a resistance 10% above or below the coded value. The resistance ranges between 1800Ω to 2200Ω. The tolerance for gold is 5% and the tolerance for silver is 10%.

Sl. No.	C1	C2	C3	TOLERANCE	VALUE (ohms)

CAPACITOR

Electronic component that stores an electric charge and releases when required. It is used to regulating power as well as for conditioning, smoothing and isolating signals. The capacitance or the potential storage by the capacitor is measured in Farads which is symbolized as ‘F’.

INDUCTOR

An inductor (also choke, coil or reactor) is a passive two-terminal electrical component that stores energy in its magnetic field. For comparison, capacitor stores energy in an electric field and a resistor does not store energy but rather dissipates energy as heat. The unit of inductance is Henry and it is denoted as H.

ELECTRONIC EQUIPMENTS

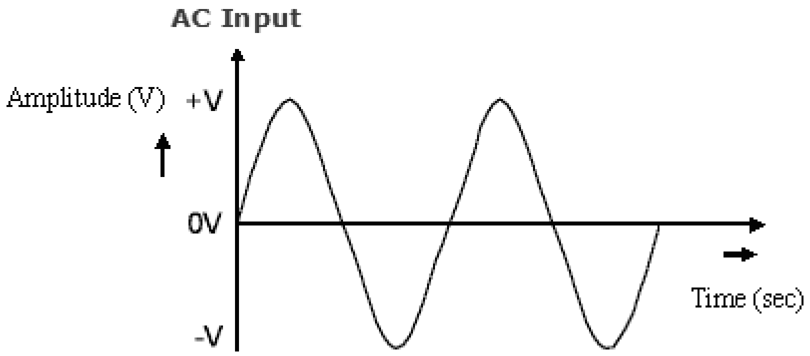
CRO (CATHODE RAY OSCILLOSCOPE)

It is typically divided into four sections which are display, vertical controllers, horizontal controllers, and Triggers. By seeing the waveform, we can analyze some properties like amplitude, frequency, rise time, distortion, time interval and etc. The applications of CRO’s mainly involve in the radio, TV receivers, also in laboratory work involving research and design. In modern electronics, the CRO plays an important role in the electronic circuits.

FUNCTION GENERATOR

A function generator is used to generate different types of electrical waveforms over a wide range of frequencies. Some of the most common waveforms produced by the function generator are the sine wave, square wave, triangular wave and saw tooth shapes.

AC Sine Waveform



Formula used

1. Peak to peak voltage $V_{(p-p)}$ = No. of divisions X Volts/Divisions
2. Maximum Voltage $V_m = V_{(p-p)} / 2$ (V)
3. Root Mean Square Voltage $V_{RMS} = V_m / \sqrt{2}$ (V)
4. Time period (T) = No. of divisions X Time/Divisions (Sec)
5. Frequency (f) = 1/T (Hz)

TABULATION

Sl. No.	Peak to Peak Voltage (V_{P-P} in Volts)	Maximum Voltage (V_m)	Root Mean Square Voltage (V_{rms})	Time period (T in sec)	Frequency (f in Hz)

RESULT

MULTIMETER

AIM

To measure the three basic electrical characteristics of voltage, current, and resistance.

APPARATUS REQUIRED

Sl. No.	Equipment / Components	Quantity
1	Digital Multimeter	1
2	Resistor	4
3	Capacitor	1
4	Diode	1
5	Bread Board	1
6	Connecting Wire	-

THEORY

A multi-meter or a multi-tester, also known as a VOM (Volt-Ohm meter), is an electronic measuring instrument that combines several measurement functions in one unit. A typical multimeter may include features such as the ability to measure voltage, current and resistance. Multimeters may use analog or digital circuits— analog multimeters (AMM) and digital multimeters (often abbreviated DMM or DVOM.) Analog instruments are usually based on a microammeter whose pointer moves over a scale calibrated for all the different measurements that can be made; digital instruments usually display digits, but may display a bar of a length proportional to the quantity being measured.

PARTS OF MULTIMETER

A Multimeter has three parts:

- Display
- Selection Knob
- Ports

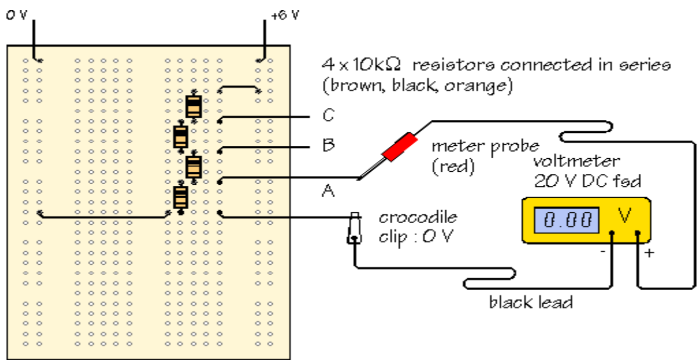
The **display** usually has four digits and the ability to display a negative sign. A few multimeters have illuminated displays for better viewing in low light situations.

The **selection knob** allows the user to set the multimeter to read different things such as milliamps (mA) of current, voltage (V) and resistance (Ω).

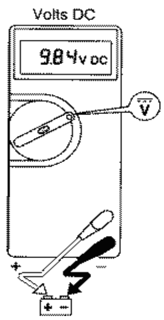
Two probes are plugged into two of the **ports** on the front of the unit. **COM** stands for common and is almost always connected to Ground or '-' of a circuit. The **COM** probe is conventionally black but there is no difference between the red probe and black probe other than color. **10A** is the special port used when measuring large currents (greater than 200mA). **mAVΩ** is the port that the red probe is conventionally plugged in to. This port allows the measurement of current (up to 200mA), voltage (V), and resistance (Ω). The probes have a *banana* type connector on the end that plugs into the multimeter. Any probe with a banana plug will work with this meter.

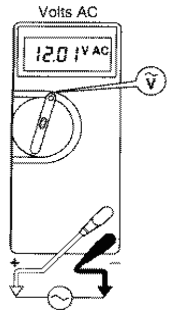
1. Voltage measurements:

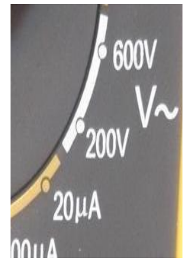
Build the circuit shown below using prototype board and four 10 KΩ resistors:



Using the multimeter as a voltmeter, measure the power supply voltage and then measure the voltages at points A, B and C. The four resistors are connected in series, making a chain known as a **potential divider**, or **voltage divider**. The total voltage is shared between the four resistors and, allowing for tolerance, each resistor receives an equal share.





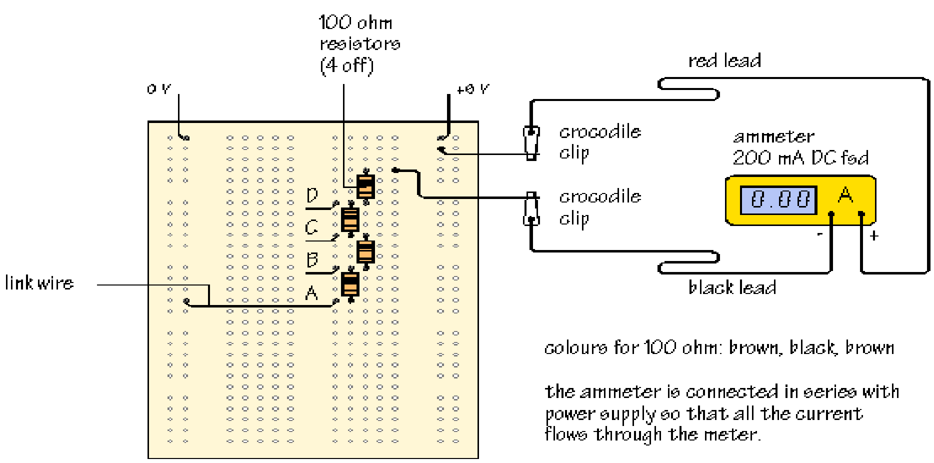


Procedure

1. Connect probes: black probe to COM terminal and red probe to terminal marked with 'V'
2. Set function to voltage measurement
3. Set to the appropriate range
4. Set the AC-DC selection - depends on what type of signal you want to measure
5. Touch the two points where you want to make measurement
6. Note the reading, adjust range if necessary
7. Take the more accurate reading.

2. Current measurements:

The diagram below shows a prototype board set up for the measurement of current:

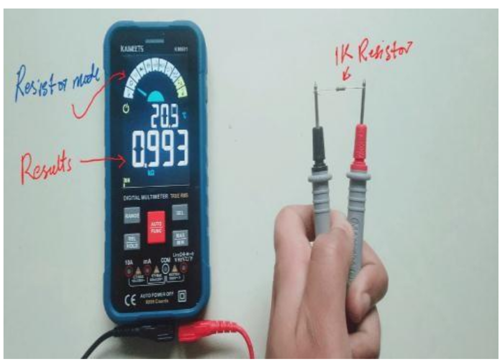


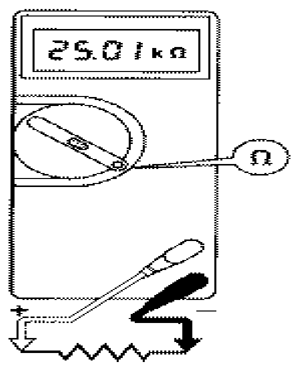
Note that the current must flow *through* the ammeter in order to reach the circuit. Take a reading of the current with the link wire to 0 V in position A. Write down the current value you observe:

Procedure

1. Connect probes: black probe to COM terminal and red probe to terminal marked with ‘A’
2. Set function to current measurement
3. Set to the appropriate range
4. Set AC-DC selection - depends on what type of signal you want to measure
5. Off the power to the circuit
6. Break the path which we want to make measurement
7. Connect the path with the two probes so that current now flow through the multimeter
8. On the power
9. Note the reading, change range if necessary
10. Take the more accurate reading.

3. Resistor testing





A resistor is the most used electronic component. It is a two terminals device with the ability to resist the flow of current through it.

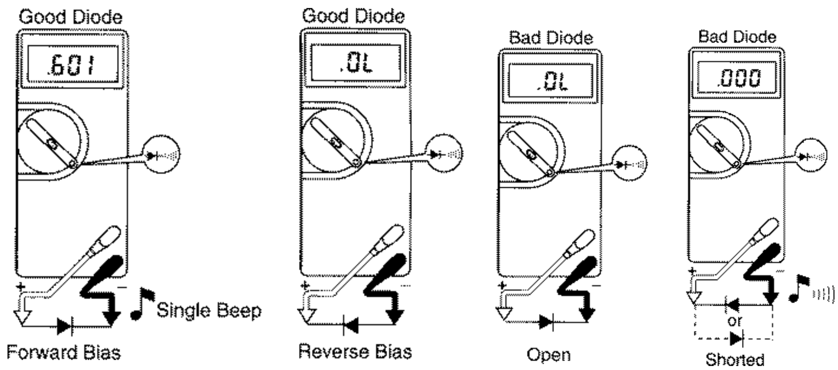
Procedure

1. Connect the positive (red) test lead to the ‘V/mA’ jack socket and the negative (black) lead to the ‘COM’ jack socket. Set the selector switch to the desired ‘OHM Ω’.
2. If the resistance to be measured is part of a circuit, turn off the power and discharge all capacitors before measurement.

3. Connect the test leads to the circuit to be measured.
4. The resistance value should now appear on the digital display.
5. If the resistance to be measured is part of a circuit, turn off the power and discharge all capacitors before measurement.

4. Diode testing

1. Connect the positive (red) test lead to the ‘V/mA’ jack socket and the negative (black) lead to the ‘COM’ jack socket.
2. Set the selector switch to the  position.
3. Connect the test leads to be measured.
4. Turn on the power to the circuit to be measured and the voltage value should appear on the digital display.



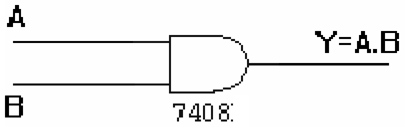
5. Capacitor testing

1. Take the capacitor and your multimeter
2. Set the multimeter to capacitor mode
3. Measure the capacitance value with your meter by connecting the black (-) probe to the negative terminal of the cap. And also connect the red (+) probe of the multimeter to the positive terminal of the capacitor.

RESULT

AND GATE

SYMBOL

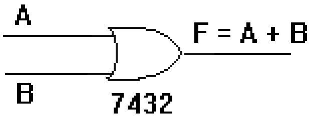


TRUTH TABLE

INPUT		OUTPUT
A	**B**	**Y=A.B**
0	0	0
0	1	0
1	0	0
1	1	1

OR GATE

SYMBOL

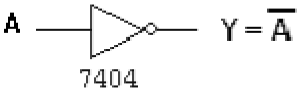


TRUTH TABLE

INPUT		OUTPUT
A	**B**	**Y=A+B**
0	0	0
0	1	1
1	0	1
1	1	1

NOT GATE

SYMBOL

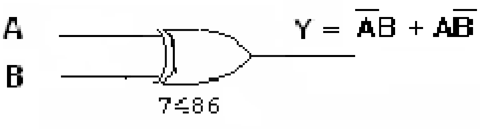


TRUTH TABLE

INPUT	OUTPUT
A	$\overline{A}$
0	1
1	0

XOR GATE

SYMBOL



TRUTH TABLE

INPUT		OUTPUT
A	**B**	**Y=A $\oplus$ B**
0	0	0
0	1	1
1	0	1
1	1	0

STUDY OF LOGIC GATES

EXP. NO.:
DATE:

AIM

To study about logic gates and to verify their truth tables.

APPARATUS REQUIRED

Sl. No.	Equipment / Components	Specification	Quantity
1	AND gate	IC 7408	1
2	OR gate	IC 7432	1
3	NOT gate	IC 7404	1
4	X-OR gate	IC 7486	1
5	IC Trainer kit	-	1
6	Patch Cord	-	As required

THEORY

Circuit that takes the logical decision and the process are called logic gates. Each gate has one or more input and only one output. OR, AND and NOT are basic gates. NAND, NOR and X-OR are known as universal gates. Basic gates form these gates.

AND GATE

The AND gate performs a logical multiplication commonly known as AND function. The output is high when both the inputs are high. The output is low level when any one of the inputs is low.

OR GATE

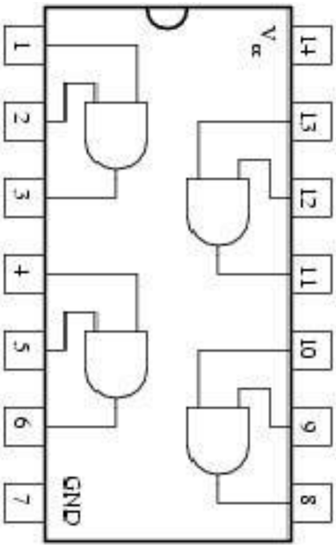
The OR gate performs a logical addition commonly known as OR function. The output is high when any one of the inputs is high. The output is low level when both the inputs are low.

NOT GATE

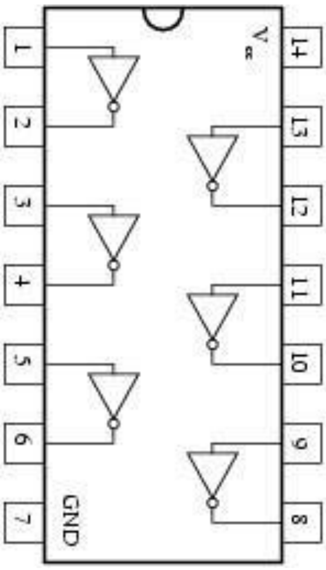
The NOT gate is called an inverter. The output is high when the input is low. Theoutput is low when the input is high.

INTERNAL PIN DIAGRAM

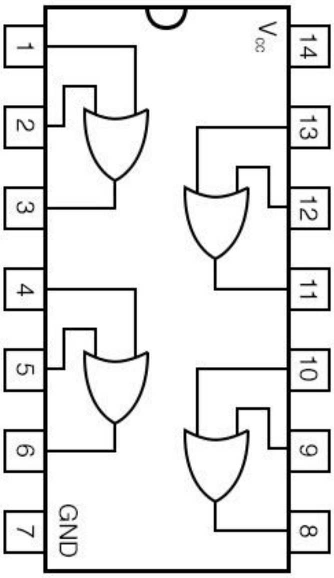
AND GATE (IC7408)



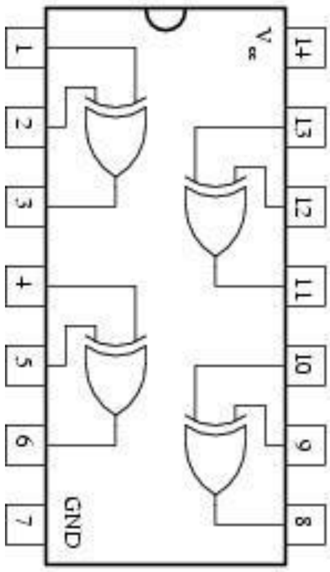
NOT GATE (IC7404)



OR GATE (IC7432)



XOR Gate (IC 7486)



Procedure

(i) Connections are given as per circuit diagram.

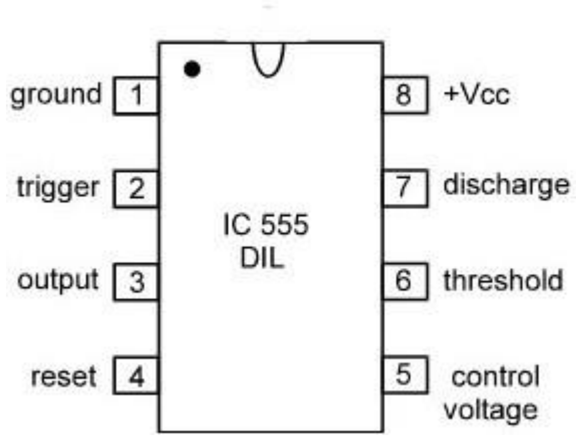
(ii) Switch ON the digital trainer kit

(iii) Inputs are given using the toggle switch

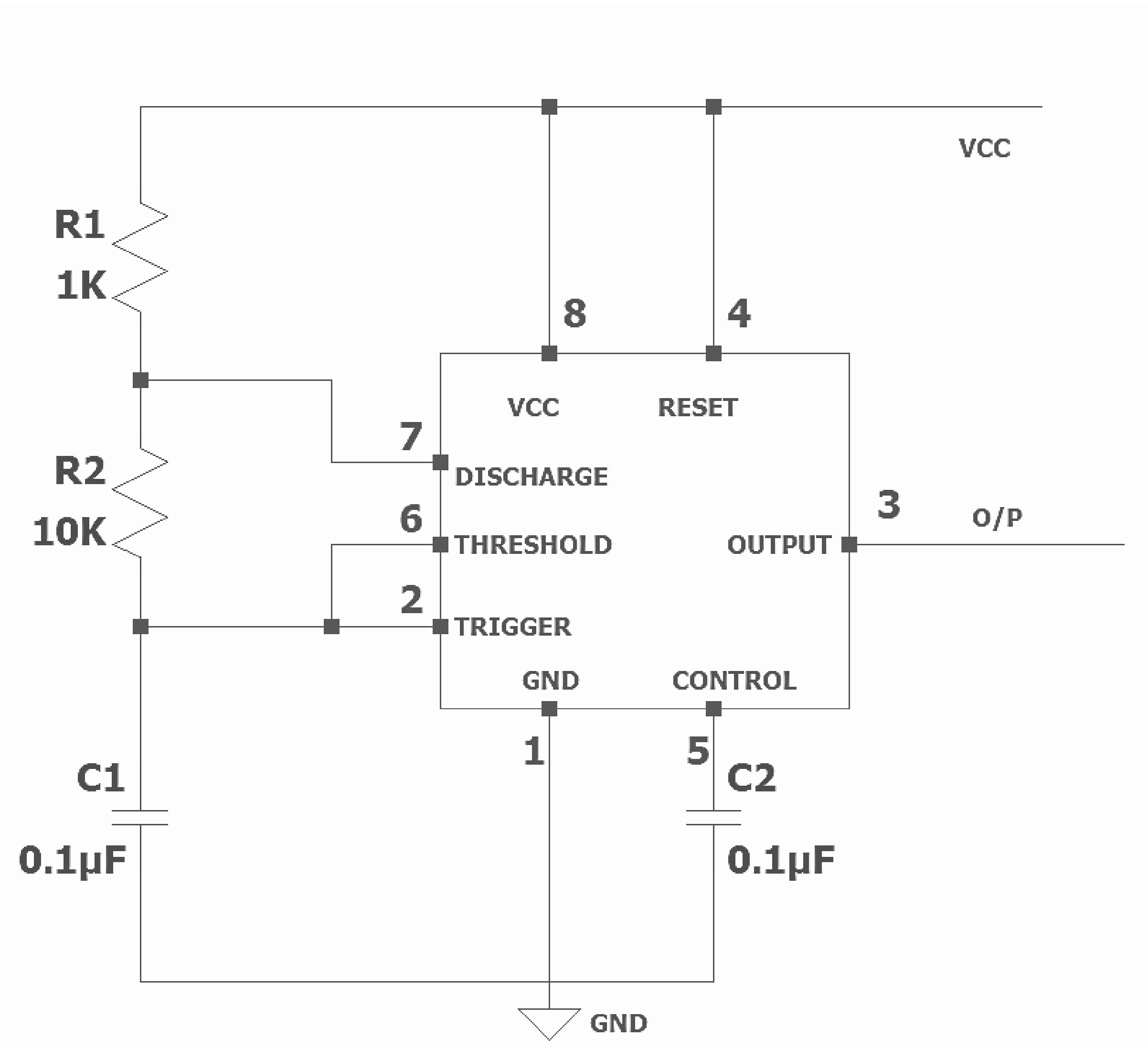
(iv) Observe the output and verify the truth table

RESULT

PIN DIAGRAM



CIRCUIT DIAGRAM



GENERATION OF CLOCK SIGNAL

EXP. NO.:
DATE:

AIM

To generate a clock signal using IC555 timer.

APPARATUS REQUIRED

Sl. No.	Equipment / Component	Type/Range	Quantity
1	IC555	Timer	1
2	Resistance	1KΩ ,10KΩ	1,1
3	Capacitors	0.1µF	2
4	CRO	(0-30)MHz	1
5	Regulated Power Supply	(0-30)V	1
6	Bread board	-	1
7	Connecting wires	-	As required

Theory

A clock circuit is a circuit that can produce clock signals. These signals are digital square waveforms, which alternate between on and off. This is important because many different types of integrated chips such as counter, digital potentiometers and many other types of ICs need clock signals in order to operate. With a 555 timer, we can produce clock signals of varying frequencies based on the values of the external resistors and capacitor that we choose. For the 555 timers to work, it must be operated in Astable mode. Astable mode is a mode in which there is no one stable state. The circuit switchesconstantly from low to high, which is representative of a digital square waveform that goesconstantly high to low, high to low, high to low, over and over again. So the Astable modeswitches constantly between HIGH and LOW states.

Procedure

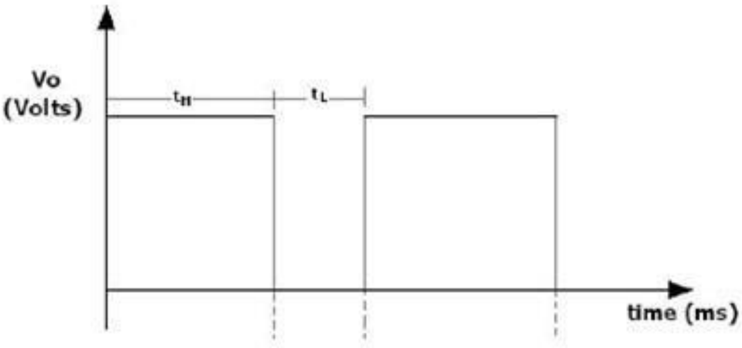
1. Connections are made as per the circuit diagram.
2. +5 Volts is given to the Vcc terminal.
3. Amplitude and time period of output waveform are noted down from pin no. 3 and capacitor waveform from pin no. 2.
4. Frequency of the given circuit is calculated using the formula.

Formula Used

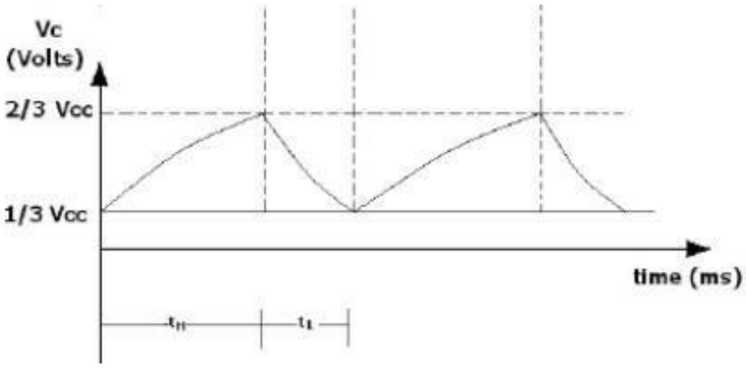
$T_{on} = 0.69\ ((R_1 + R_2)\ C$

$T_{off} = 0.69\ R_2C$

OUTPUT WAVEFORM



CAPACITOR WAVEFORM



TABULATION

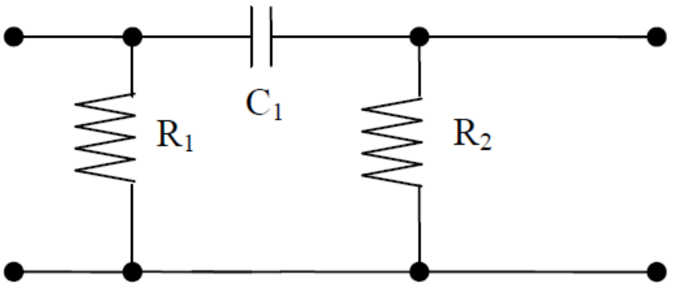
Amplitude (Volts)	Time period	
	T_{on}	T_{off}

$T = T_{on} + T_{off}$

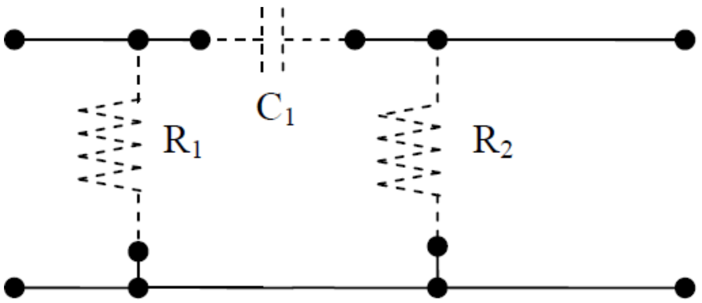
$F = 1/T$ (in Hz)

RESULT

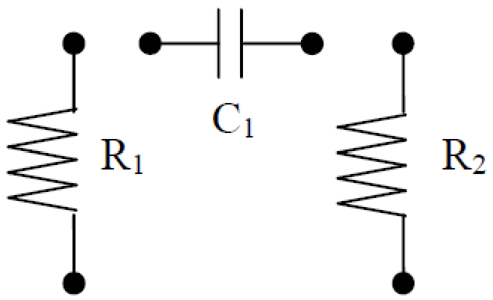
Given Circuit



Drawing



Back side of the PCB board



Front side of the PCB board

SOLDERING PRACTICE: COMPONENTS, DEVICES AND CIRCUITSUSING GENERAL PURPOSE PCB

EXP. NO:

DATE:

AIM

To practice soldering and desoldering the electronic circuit by assembling anddisassembling on the given Printed Circuit Board (PCB).

APPARATUS REQUIRED

Sl. No.	Equipment / Components	Range	Quantity
1	PCB board for given circuit	10w(or)35w	1
2	Soldering iron	60/40 grade	1
3	Solder	-	1
4	Flux	-	1
5	Electrician's Knife	-	1
6	Nose plier	-	1
7	Resistors	10kΩ	4
8	Capacitor	0.01µF	2

Procedure

Soldering

1. The given electronic circuit is studied.
2. The PCB board is cleaned.
3. The tip of the soldering iron is cleaned before heating and also the resistors andcapacitor which is to be soldered is cleaned.
4. The soldering iron is heated and the solder is applied to the tip of it.
5. The resistor (R) leads are bent to fit the holes on the board and they are inserted in theholes of the board as per the circuit diagram.
6. The hot tip is applied to the joints and the solder is applied.
7. The soldering tip is removed and the resistor is hold tightly till the solder is cooled andset.
8. The excess component lead is trimmed with side cutter.
9. The above steps are repeated to fix the other resistor and capacitor in the circuit.

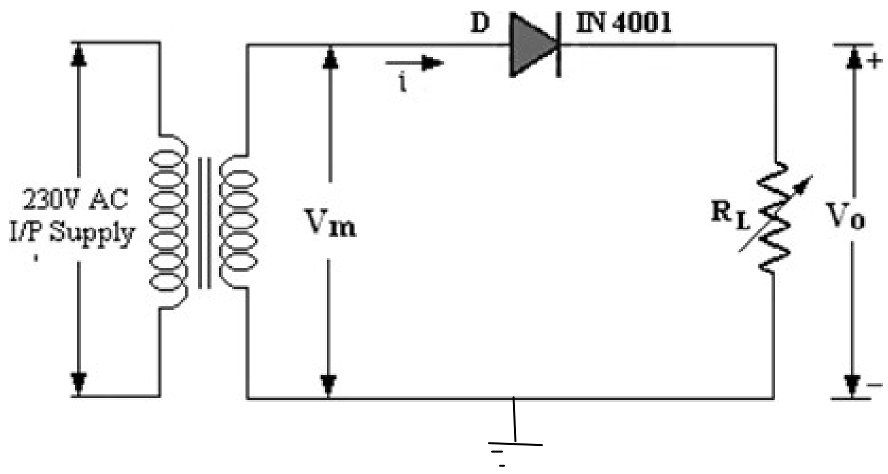
De-Soldering

1. The tip of the soldering iron is placed on the resistor- board joint until the solder ismelt.
2. When the solder is melted the resistor is removed with a tweezers and the molten solder isremoved.
3. The above steps are repeated to remove the other resistor and capacitor.
4. The resistors and capacitors are cleaned.

RESULT

HALF WAVE RECTIFIER

CIRCUIT DIAGRAM

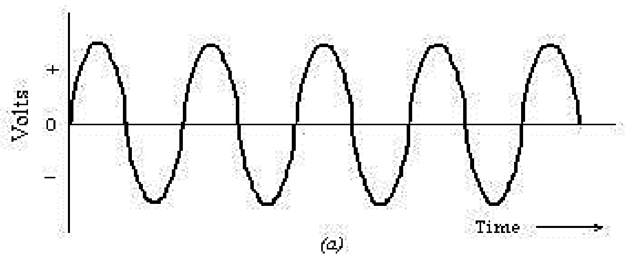


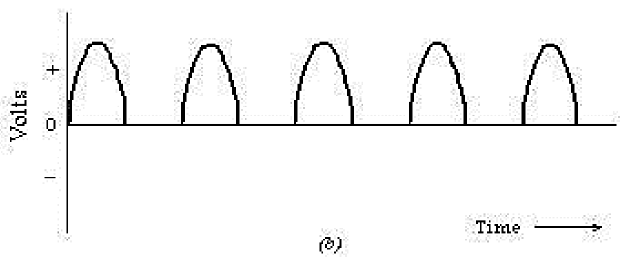
Where $R_L = 1K\Omega$

TABULATION

Waveform	V_m in Volts	V_{rms} in Volts	V_{dc} in Volts	Ripple Factor (γ) (no unit)	Time Period in Sec
Input			--	--	
Output					

MODEL GRAPH





MEASUREMENT OF RIPPLE FACTOR FOR HALF WAVE AND FULL WAVERECTIFIER

EXP. NO.:
DATE:

AIM

To study the characteristics of a half wave and full wave rectifier and to obtain the ripple factor for the same.

APPARATUS REQUIRED

Sl. No.	Equipment/ Components	Range	Quantity
1	Transformer	230V, (6-0-6)	1
2	Diode	IN4007	2
3	Resistor	1KΩ	1
4	CRO	30MHz	1
5	Bread Board	-	1
6	Connecting Wires	-	As required

FORMULA USED

Sl. No.	Parameter	Half Wave Rectifier	Full Wave Rectifier
1	Ripple Factor (γ) no unit	$r = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$ -	$r = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$ -
2	V_{rms} in Volts	$V_m/2$	$V_m/\sqrt{2}$
3	V_{dc} in Volts	V_m/π	$2V_m/\pi$
4	V_m in Volts	Peak Voltage	

THEORY

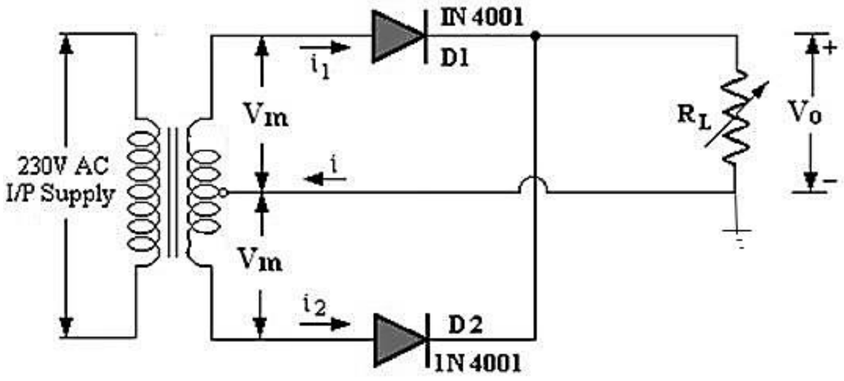
HALF WAVE RECTIFIER

In half wave rectification, the rectifier conducts current only during the positive half cycle of input AC supply. The negative half cycles of AC supply are suppressed no voltage appears across the load. Therefore the current always flows in one direction through the load through every half cycle.

FULL WAVE RECTIFIER

A full-wave rectifier converts the whole of the input waveform to one of constant polarity (positive or negative) at its output by reversing the negative (or positive) portions of the alternating current waveform.

FULL WAVE RECTIFIER

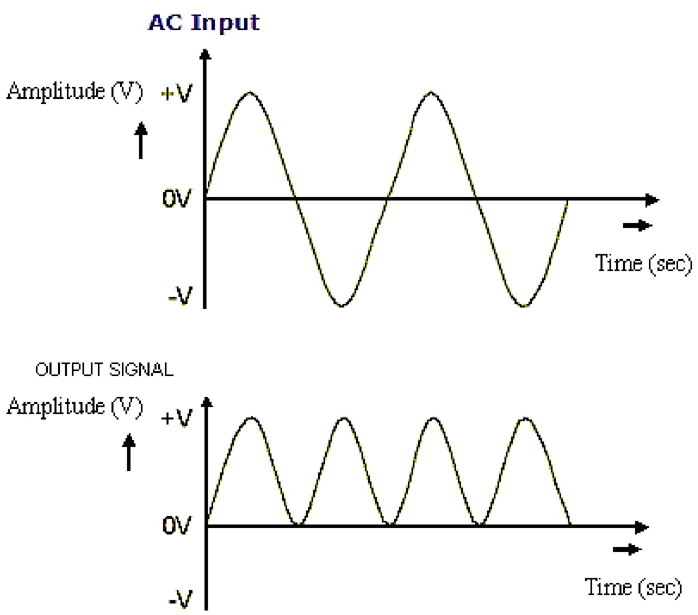


Where R_L=1KΩ

TABULATION

Waveform	V_m in Volts	V_{rms} in Volts	V_{dc} in Volts	Ripple Factor (γ) (no unit)	Time Period in Sec
Input			--	--	
Output					

MODEL GRAPH



RIPPLE FACTOR

The direct current (DC) produced by the rectifier is not a pure DC but a pulsating DC. In the output pulsating DC signal, we find ripples. These ripples in the output DC signal can be reduced by using filters such capacitors and inductors. In order to measure how much ripples are there in the output DC signal we use a factor known as ripple factor. The ripple factor is denoted by γ. The ripple factor tells us the amount of ripples present in the output DC signal.

VOLTAGE REGULATION

Domestic, commercial and industrial loads demand a nearly constant voltage supply. It is therefore, essential that the output voltage of a transformer stays within narrow limits as load and its power factor vary. The leaky reactance is the chief cause of voltage drop in a transformer and must be kept as low as possible by design and manufacturing techniques.

PROCEDURE

1. Connections are given as per the circuit diagram (Half Wave Rectifier).
2. Note the amplitude and time period of rectified output.
3. Measure V_{dc} and V_{rms}.
4. Calculate the ripple factor.
5. Draw the graph for voltage versus time.
6. Repeat the same procedure for Full Wave Rectifier.

RESULT