Jawaharlal Nehru Engineering College

Laboratory Manual

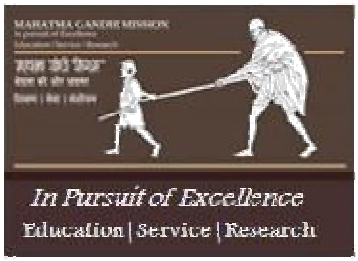
Elements of Electronics

For

First Year Students

Manual made by

Prof. P.R.Shirpewar



MGM'S

Jawaharlal Nehru Engineering College
N-6, CIDCO, Aurangabad
Department of Electronics &Telecommunication

Vision of the Department:

To develop **GREAT** technocrats and to establish centre of excellence in the field of **Electronics and Telecommunications.**

- ***G***lobal technocrats with human values
- ***R***esearch and lifelong learning attitude,
- ***E***xcellent ability to tackle challenges
- ***A***wareness of the needs of society
- ***T***echnical expertise

Mission of the Department:

1. To provide good technical education and enhance technical competency by providing good infrastructure, resources, effective teaching learning process and competent, caring and committed faculty.
2. To provide various platforms to students for cultivating professional attitude and ethical values.
3. Creating a strong foundation among students which will enable them to pursue their career choice.

Jawaharlal Nehru Engineering College

Technical Document

This technical document is a series of Laboratory manuals of Electronics and Telecommunication Department and is a certified document of Jawaharlal Nehru Engineering College. The care has been taken to make the document error-free. But still if any error is found. Kindly bring it to the notice of subject teacher and HOD.

Recommended by,

HOD

Approved by,

Principal

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1. Departmental Library
2. Laboratory
3. HOD
4. Principal

FOREWORD

It is my great pleasure to present this laboratory manual for first year engineering students for the subject of Elements of electronics keeping in view the vast coverage required for visualization of concepts of Electronics.

As a student, many of you may be wondering with some of the questions in your mind regarding the subject and exactly what has been tried is to answer through this manual.

Faculty members are also advised that covering these aspects in initial stage itself, will greatly relived them in future as much of the load will be taken care by the enthusiasm energies of the students once they are conceptually clear.

H.O.D.

LABORATORY MANUAL CONTENTS

This manual is intended for the First year students of all engineering branches in the subject of Elements of Electronics. This manual typically contains practical/Lab Sessions related Basic Electronics covering various aspects related to the subject to enhance understanding.

Students are advised to thoroughly go through this manual rather than only topics mentioned in the syllabus as practical aspects are the key to understanding and conceptual visualization of theoretical aspects covered in the books.

Good Luck for your Enjoyable Laboratory Sessions.

Prof. P.R.Shirpewar

SUBJECT INDEX

1. Do's and Don'ts in the laboratory.

2. Lab Experiments:

    1. Study of various equipments- CRO, Function generator, power supply and multi-meter

    2. Study of various components (Active and Passive)- Resisters, capacitors, Inductors, Diode, Transistor ,SCR,DIAC, TRIAC, IGBT, MOSFET,JFET

    3. Study and construct Half wave, Full Wave and Bridge Rectifier without filter.

    4. Study and construct Half wave, Full wave and Bridge Rectifier with filter.

    5. Zener diode as a voltage regulator.

    6. Three terminal voltage Regulator (Dual power supply) using IC 7805,7905

    7. Study of basic logic gates such as AND, OR, NOT gate.

    8. To Perform Market Survey and prepare a report on basis of survey for a product Digital Cameras.

    9. To Perform Market Survey and prepare a report on basis of survey for a product Touch Screen mobile.

    10. Study of NAND Gate as universal gate.

3. Quiz on the subject.

4. Conduction of Viva-Voce Examinations.

5. Evaluation and Marking System.

DOs and DON' Ts in Laboratory:

1. Do not handle any equipment before reading the instructions/Instruction manuals.

2. Read carefully the power ratings of the equipment before it is switched on whether ratings 230 V/50Hz or 115V/60 Hz. For Indian equipments, the power ratings are normally 230V/50Hz. If you have equipment with 115/60 Hz ratings, do not insert power plug, as our normal supply is 230V/50 Hz, which will damage the equipment.

3. Observe type of sockets of equipment power to avoid mechanical damage.

4. Do not forcefully place connectors to avoid the damage.

5. Strictly observe the instructions given by the teacher/Lab Instructor.

Instruction for Laboratory Teachers:

1. Submission related to whatever lab work has been completed should be done during the next lab session.

2. The promptness of submission should be encouraged by way of marking and evaluation patterns that will benefit the sincere students.

Experiment No.1

Aim: Study of various equipments- CRO, Function Generator, Power Supply and Multi-meter

Theory:

1. Draw Front Panel Of CRO, Function Generator, Power Supply and multi-meter.
2. Write the Function of each knob on the Panel.
3. Write applications of each equipment.

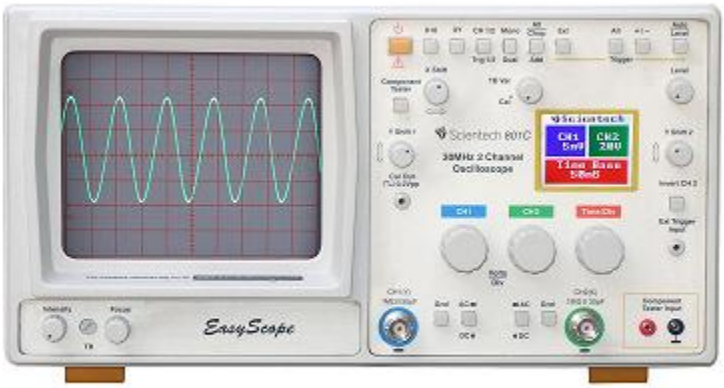


Fig. Front Panel Of CRO

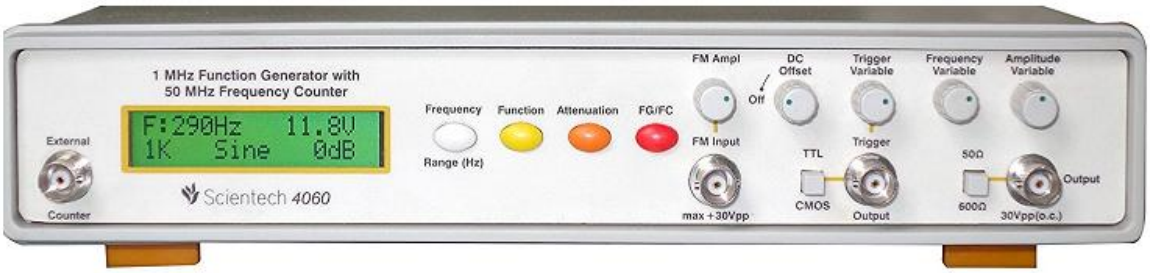


Fig. Front Panel Of Function Generator

Fig. Digital Multimeter

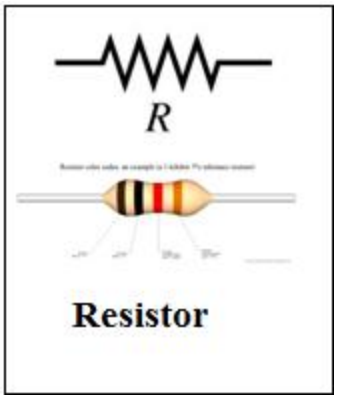
Conclusion: Working of each equipment is studied and function of each knob on the equipment is checked also waveforms of different functions, amplitude and frequency are generated on CRO.

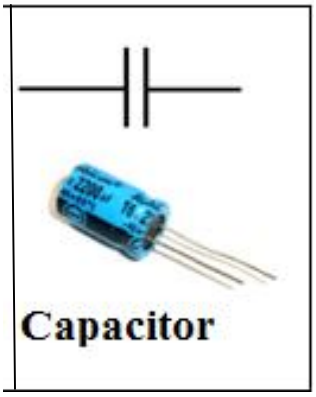
Experiment No.2

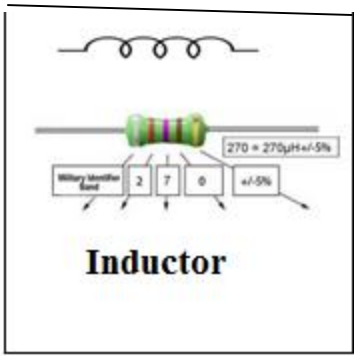
Aim: Study of various components (Active and Passive)- Resisters, capacitors, Inductors, Diode, Transistor ,SCR,DIAC, TRIAC, IGBT, MOSFET,JFET

Symbols :

1) **Passive Components:**



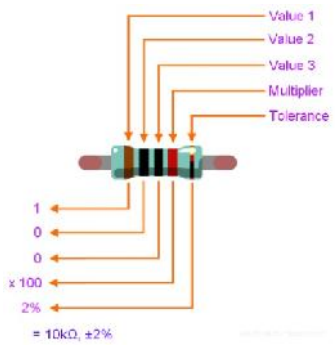




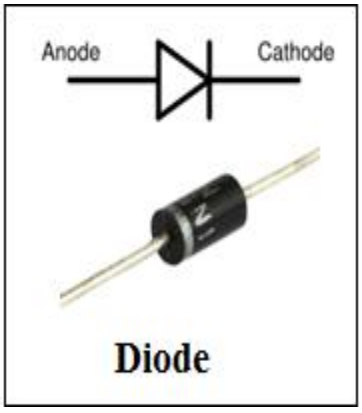
Resistor Color Code Table:

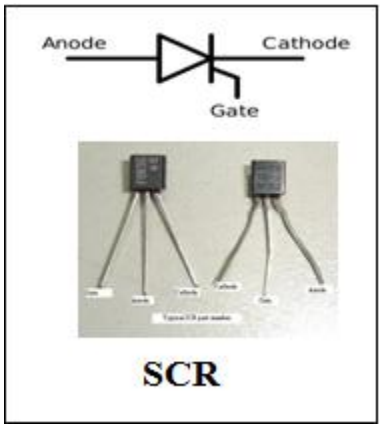
Color	1st Band (First Significant Digit)	2nd Band (First Significant Digit)	3rd Band (First Significant Digit)	4th Band (Multiplier)	5th Band (Tolerance)	6th Band (Temperature Coefficient)
Black	0	0	0	X 10^0		
Brown	1	1	1	X 10^1	± 1 %	100
Red	2	2	2	X 10^2	± 2 %	50
Orange	3	3	3	X 10^3	± 3 %	15
Yellow	4	4	4	X 10^4	± 4 %	25
Green	5	5	5	X 10^5	± 0.5 %	
Blue	6	6	6	X 10^6	± 0.25 %	10
Violet	7	7	7	X 10^7	± 0.1 %	5
Grey	8	8	8	X 10^8	± .05 %	
White	9	9	9	X 10^9	± 1 %	
Gold				X 10^{-1}	± 5 %	
Silver				X 10^{-2}	± 10 %	

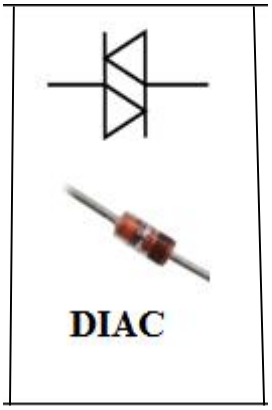
Example:

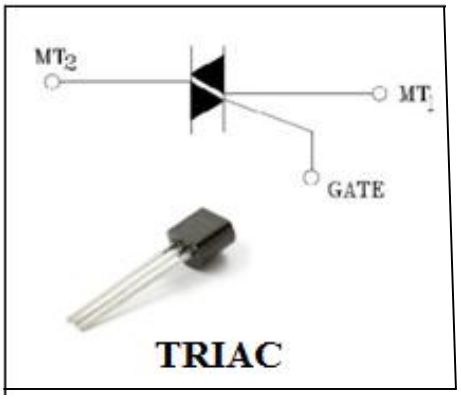


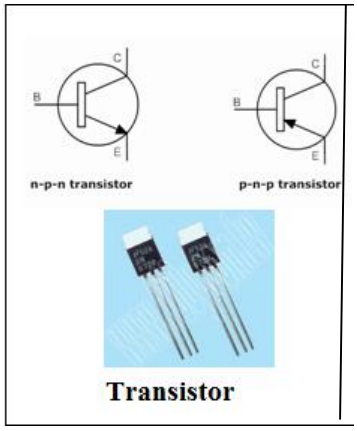
2) Active Components:

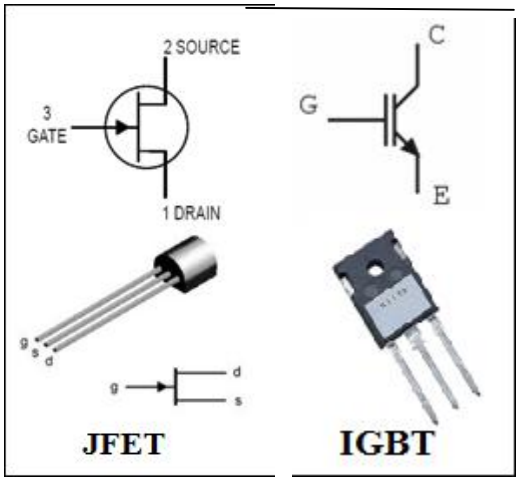


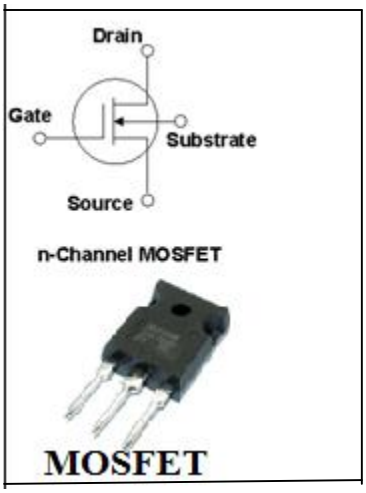












Theory:

1) Define active and passive components
2) Describe construction and working with neat diagrams of each components mentioned above.

Conclusion:

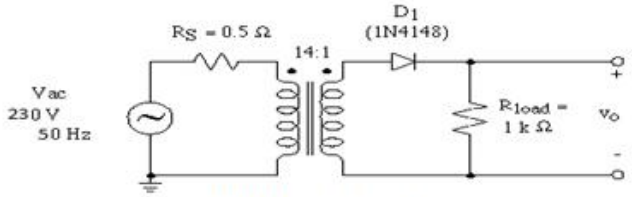
Hence we have studied various active and passive components and can identify various components.

Experiment No.-3

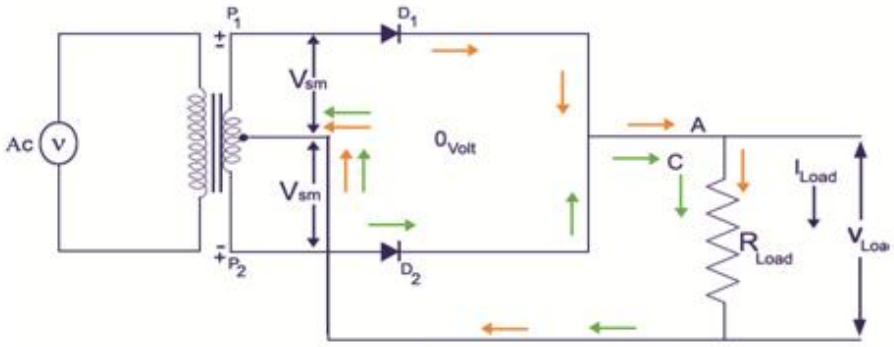
Aim: Study and construct Half wave, Full Wave and Bridge Rectifier without filter and observe the output and input waveforms.

Equipment: Power Supply, diodes, transformers, CRO, Connecting wires, CRO probes.

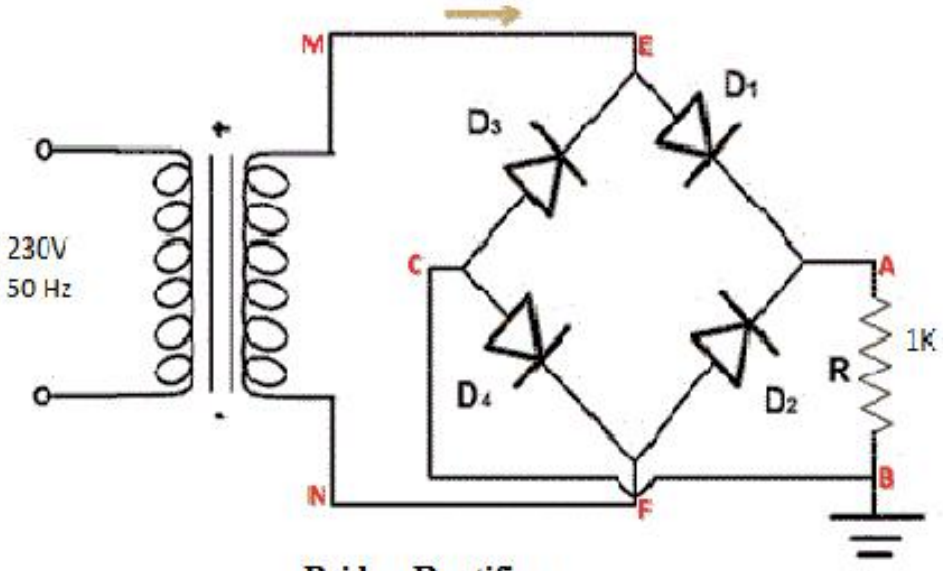
Circuit Diagram:



Half Wave Rectifier



Full Wave Rectifier



Bridge Rectifier

Theory:

1) Describe the circuit operation of Half wave rectifier.
2) Describe the circuit operation of Full wave rectifier.
3) Describe the circuit operation of Bridge wave rectifier.
4) Draw waveform for half wave full wave and bridge rectifier using graph paper.

Procedure:

1) Connect the circuit as shown in figure.
2) Connect the CRO probes to the input and output terminal.
3) Give the input signal.
4) Record the amplitude and frequency of input and output signals.

Observations:

Type of circuit	**Input Signal**		**Output signals**	
	Amplitude(V)	**Frequency(Hz)**	**Amplitude(V)**	**Frequency(Hz)**
Half wave Rectifier				
Full wave Rectifier				
Bridge Rectifier				

Conclusion: Hence we have performed of half wave, full wave and bridge rectifier.

Experiment No.-4

Aim: Study and construct Half wave, Full Wave and Bridge Rectifier with filter and Observe the output and input waveforms.

Equipment: Power Supply, diodes, transformers, CRO, Connecting wires, CRO probes.

Circuit Diagram:

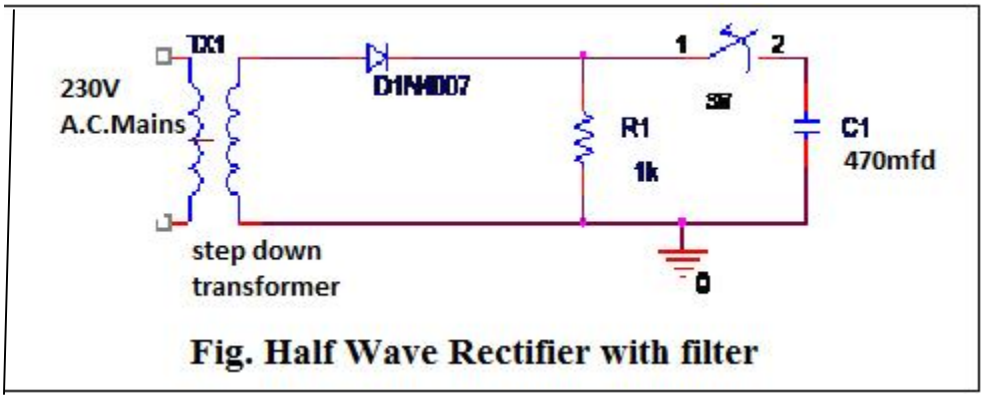


Fig. Half Wave Rectifier with filter

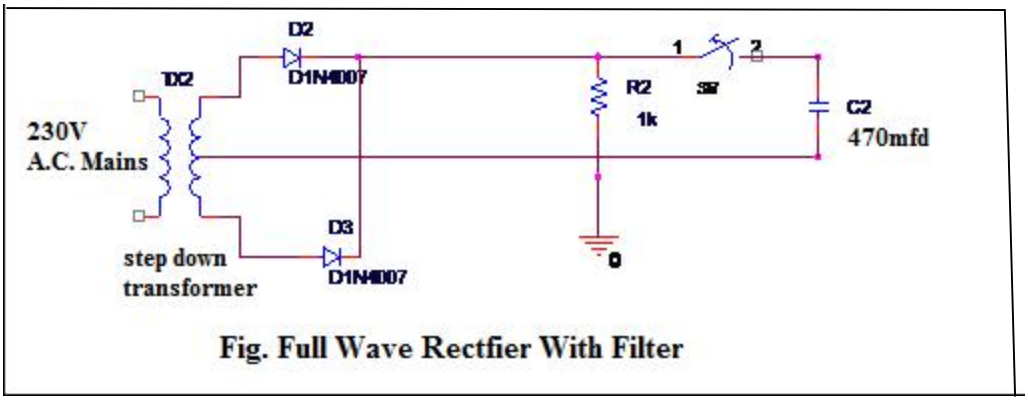


Fig. Full Wave Rectfier With Filter

Procedure:

1) Connect the circuit as shown in figure.
2) Connect the CRO probes to the input and output terminal.
3) Give the input signal.
4) Record the amplitude and frequency of input and output signals.

Observations:

Type of circuit	Input Signal		Output signals	
	Amplitude(V)	**Frequency(Hz)**	**Amplitude(V)**	**Frequency(Hz)**
Half wave Rectifier				
Full wave Rectifier				

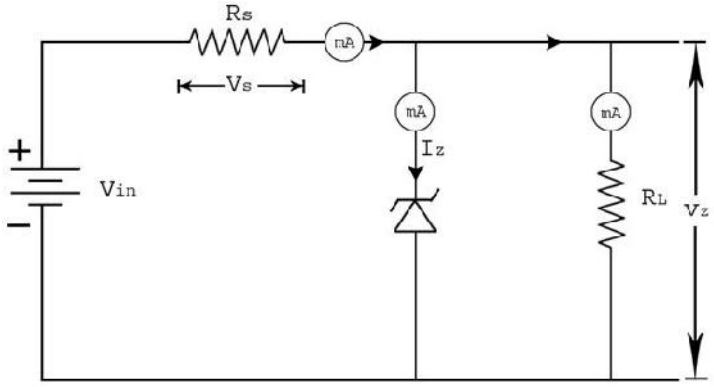
Conclusion: Hence we have performed of half wave, full wave rectifier with filter.

Experiment No.-5

Aim: To perform Zener diode as a voltage regulator.

Equipment: Power Supply, resistor, Zener diode, Connecting wires, bread board

Circuit Diagram:



Theory:

1) Function of zener diode.
2) Circuit operation of zener diode as a voltage regulator.

Procedure:

1) Connect the circuit as shown in figure.
2) Connect the multimeter to load terminal.
3) Vary the input voltage.
4) Record corresponding output voltage.

Observation:

Sr. No.	Input Voltage Vin (V)	Output voltage Vout (V)
1		
2		
3		
4		
5		

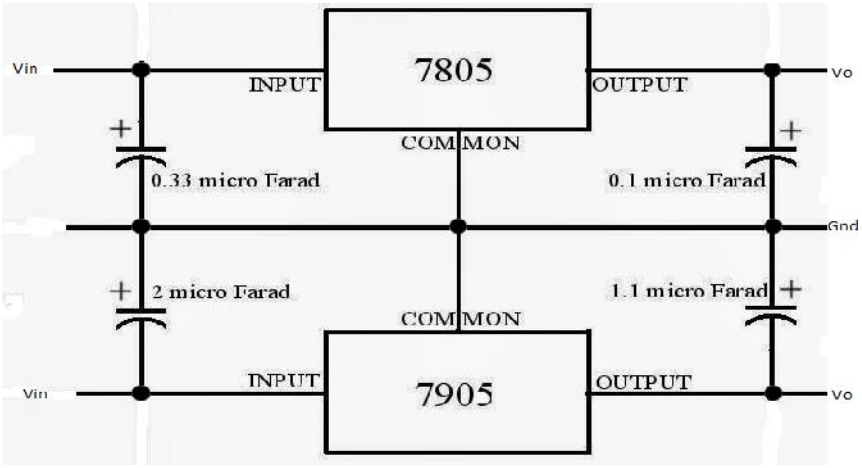
Conclusion: Thus we have studied zener diode as voltage regulator.

Experiment No.-6

Aim: To construct three terminal voltage Regulator (Dual power supply) using IC 7805, 7905

Equipments: IC 7805, IC 7905, resistors, power supply, bread board etc.

Circuit Diagram :



Theory:

1) Function of IC 7805 and IC 7905.
2) Circuit operation of three terminal voltage regulator using IC mentioned above.

Procedure:

1) Connect the circuit as shown in the figure
2) Connect the multimeter to load terminal.
3) Vary input voltage steps.
4) Record the output.

Observation:

Sr. No.	Input Voltage Vin (V)	Output voltage Vout (V)
1		
2		
3		
4		
5		

Conclusion: Hence we have studied three terminal voltage regulator using IC 7805 and IC 7905

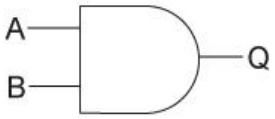
Experiment No. 7

Aim: Study of basic logic gates such as AND, OR, NOT gate.

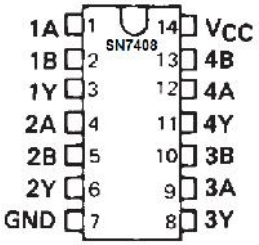
Equipment: AND gate IC 7408, OR gate IC 7432, NOT gate IC 7404, connecting wires, bread board, LED, Power supply

Diagrams:

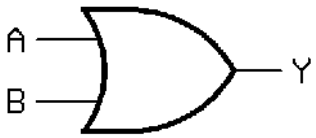
1. **AND gate**



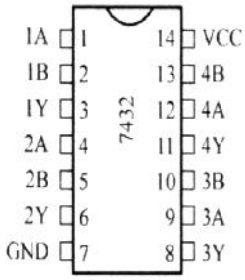
Input	Input	Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



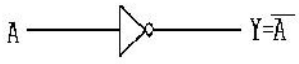
2. **OR Gate**



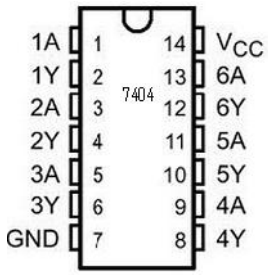
Input	Input	Output
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1



3. **NOT gate**



Input	Output
A	Y
0	1
1	0



Theory:

1) Define logic gate
2) Working of AND gate
3) Working of OR gate
4) Working of NOT gate

Procedure:

1) Connect the circuit as shown in fig.
2) Verify truth table for each gate.

Conclusion: Truth tables of all logics gates are studies and verified.

Experiment No.-8

Aim: To Perform Market Survey and prepare a report on basis of survey for a product Touch Screen Mobiles

Description:

1. For Market survey on **"Touch Screen Mobiles"** prepare a report on the survey of following parameters:
    - Manufacturing companies
    - 3G/4G Connectivity
    - Uplink/ Downlink speed of internet
    - Frequency band used
    - Memory
    - Processors
    - Operating System

Experiment No.-9

Aim: To Perform Market Survey and prepare a report on basis of survey for a product Digital Cameras.

Description:

1. For Market Survey on "**Digital Cameras**" prepare a report on the survey of following parameters :
    - Manufacturing companies
    - Type
    - Sensing Element
    - Pixels
    - Digital zoom
    - Battery Type (SLR/DSLR/Point and Shoot cameras,CCTV)

Experiment No.-10

Aim: Study of NAND Gate as an universal gate.

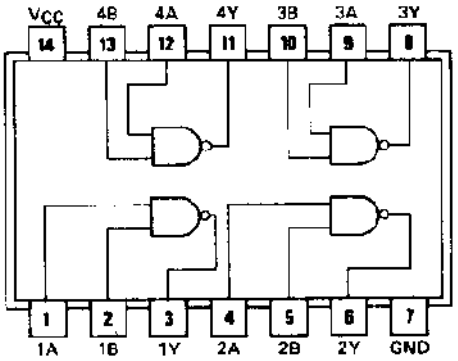
Equipment: IC 7400, Bread Board, Conducting wires

Theory:

1. Why NAND gate is called as universal gate?
2. Construct Basic gates using NAND gate

Diagrams:

1. **Pin diagram and truth table of NAND gate:**



Input	Input	Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

2. **Basic gates using NAND gate:**

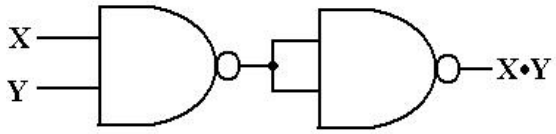


Fig. AND using NAND

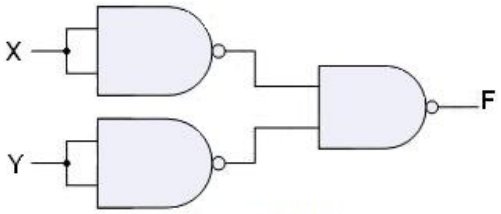


Fig. OR using NAND

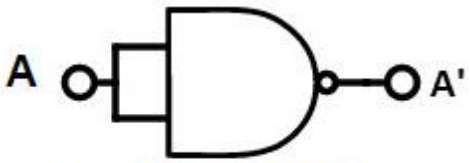


Fig. NOT using NAND

Conclusion: Truth tables of AND, OR and NOT gate using NAND gate is verified and hence NAND gate as universal gate is studied.

3. Quiz on the Subject

1. Find the range of values of the resistor with following four band colour code designation

i) Yellow white orange red
ii) Brown red orange silver
iii) Red black gold gold
iv) Violet green silver gold

2. Find both, resistance value and tolerance value, for the resistors with 4-band color codes:

(i) Red Black Green Silver (ii) Green Red Brown
(iii) Red Black Gold Gold (iv) Violet Green Silver Gold

3. Specify color codes for resistor values:

(i) 4.3kΩ±5% (ii) 6.8MΩ±20% (iii) 7500Ω±20% (iv) 100Ω±10%

4. Draw symbols of:

i) PN junction diode,
ii) NPN transistor,
iii) PNP transistor,
iv) Resistor,
v) Capacitor,
vi) Inductor,
vii) Variable capacitor,
viii) Variable resistor.

5. Answer the following

a. List the basic logic gates with their symbols and truth tables.
b. List the Universal logic gates with their symbols and truth tables.
c. Add (111001) + (101010)
d. Write 2's compliment of 1000110.
e. Subtract (100110)-(011101).

6. Draw a symbol of

i) PN junction diode
ii) npn transistor
iii) pnp transistor
iv) n channel JFET
v) p channel JFET
vi) Resistor
vii) capacitor
Viii) Inductor
ix) Variable capacitor
x) variable resistor

7. List different types of capacitors and explain any two in detail with neat diagram.

8. Compare the following.
   a) Hexadecimal and decimal number system
   b) Binary and Decimal number system.

9. Compare BJT and JFET.

10. Perform following operations using 2's compliments. a) (48)-(24) b) (22)-(47)

4. Conduction of VIVA-VOCE Examinations: -

Teacher should conduct oral exams of the students with full preparation. Normally the objective questions with guess are to be avoided. To make it meaningful, the questions should be such that depth of the student in the subject is tested. Oral Exams are to be conducted in co-cordial situation. Teachers taking oral exams should not have ill thoughts about each other & courtesies should be offered to each other in case of opinion, which should be critically suppressed in front of the students.

5. Evaluation and marking system: -

Basic honesty in the evaluation and marking system is essential and in the process impartial nature of the evaluator is required in the exam system. It is a primary responsibility of the teacher to see that right students who really put their effort &intelligence are correctly awarded.

The marking pattern should be justifiable to the students without any ambiguity and teacher should see that students are faced with just circumstance.