MEDI-CAPS UNIVERSITY, INDORE		
Department of Electronics & Communication	Lab Session No.	Page No.
Digital Electronics	**Enrol. No.**	Batch No.

Performance Evaluation:

Name			
Performing on		First Submission	Second Submission
Extra	regular		

Grade and Remarks by the Tutor

1.	**Clarity about the objective of the experiment**		
2.	**Clarity about the problem statement**		
3.	**Submitted the work in desired format**		
4.	**Shown capability to solve the problem**		
5.	**Contribution to the team work.**		

Others:

Grade	A	B	C	D	F	Signature

Experiment No. 1

1. **Title: To test logic operations - AND, OR and NOT using Diode and Transistor.**
2. **AIM:**
   a. To understand the meaning and significance of Logic 0 and Logic 1.
   b. To measure the voltage level of Logic 0 and Logic 1.
   c. To understand how diode and transistor work while applying Logic 0 and Logic1.
   d. To understand the physical structure of bread board and learn to embed various components using shorted terminal.
   e. To understand the functioning of AND, OR, NOT, NAND and NOR gate.
3. **OBJECTIVES:** After completing the experiment, the student should be able:
   a. To understand the working of diode and transistor.
   b. To gain knowledge regarding various applications of logic Gates.
   c. To know the Practical implementation of various Logical circuits.
4. **PROBLEM STATEMENT:**
   a. To test and measure the voltage at input and output and verify the truth table for various gates,
   b. To Implement the circuit of NOT, NAND, NOR using transistor only.
5. **Apparatus required:**
   a. Prototyping board (Bread board).
   b. DC power supply 5V battery.

c. Light Emitting Diodes (LED's).
d. Electronic components: Diodes, Transistor, Resistors.
e. Connecting wires.

6. **THEORY:**

Logic Gates: Logic gates are digital circuits which take as different combination of 1 and 0 as inputs and produce output accordingly. Hence, they are called combinational circuit.

If there are two variable A and B applied at the input of the gate and each one of these variable can take two value (1 and 0), then 2^2 combination of input are possible. The output at any instant depends only on current combination of input.

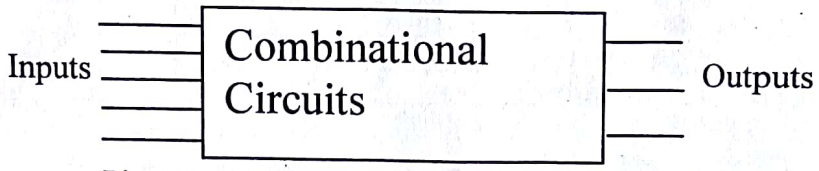


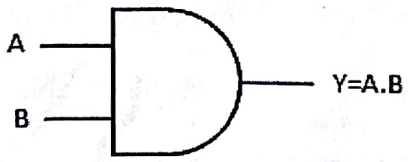
Fig. Block Diagram of Combinational Circuit.

These Logic gates implement certain Boolean functions. A logic gate performs a logical operation on one or more logic inputs and produces a single logic output. The logic operation normally performed is Boolean logic and is most commonly found in digital circuits. Logic gates are primarily implemented electronically using diodes or transistors, but can also be constructed using electromagnetic relays, fluidics, optics, or even mechanical elements.

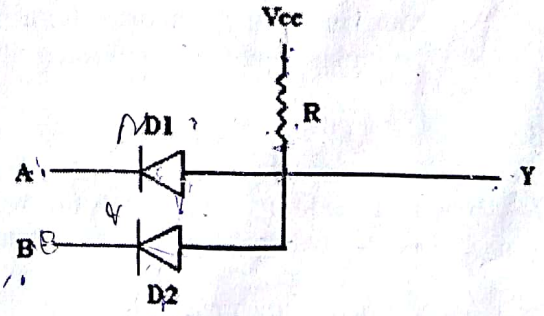
In electronic logic, a logic level is represented by a voltage or current, (which depends on the type of electronic logic in use). Each logic gate requires power so that it can source and sink currents to achieve the correct output voltage. In logic circuit diagrams the power is not shown, but in a full electronic schematic, power connections are required.

Types of Logic Gates: The logic gate implements certain Boolean functions. Depending on the Boolean function implemented by the gate type of gate is defined.

Basic gate: There are three basic gates. Each of these gates does their own basic



Symbolic Representation



Circuit Diagram

function.

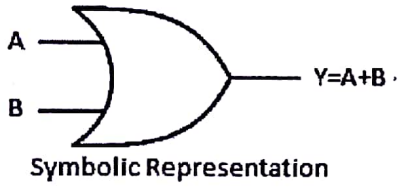
AND GATE: An AND gate has two or more input signal but only one output signal. All inputs must be high to get a high output. The diagram given below indicates the two input AND gate. If 5V is applied at input A and B, none of the diode conduct and the output is 5V.if 0V is applied to either A or B, or both the respective diodes conduct and current flows from source and output is 0V.

TRUTH TABLE

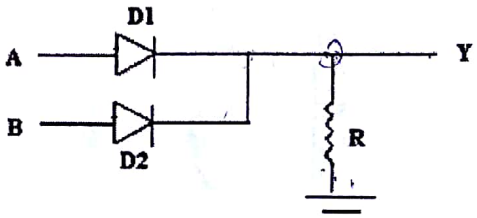
AND GATE		
Inputs		Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

OR GATE: An OR gate has two or more input signal but only one output signal. Any input high gives a high output.

The diagram given below indicates the two input OR gate. If 5V is applied at input A and B, none of the diode conduct and the output is 5V.if 0V is applied to either A or B, or both the respective diodes conduct and current flows from source and outputs 0V.



Symbolic Representation

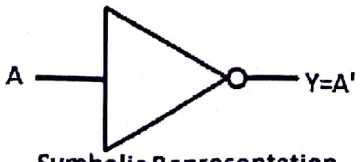


Circuit Diagram

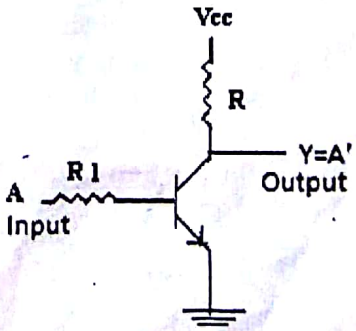
TRUTH TABLE

OR GATE		
Inputs		Output
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

NOT GATE: The NOT gate perform the basic logical function called inversion or



Symbolic Representation



Circuit Diagram

complementation. The purpose of this Gate is to convert one logic level into the

opposite logic level. It has one input and one output. When a logic 1 is applied to an invertor logic 0 appears at its output and vice versa.

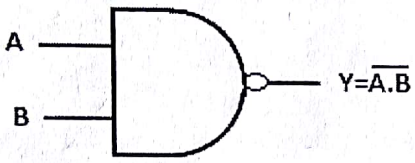
TRUTH TABLE

NOT GATE	
Input	Output
A	Y
0	1
1	0

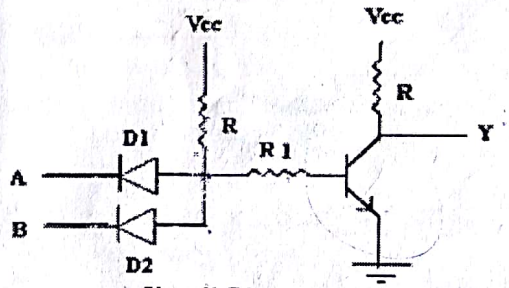
Universal Gates: NAND and Nor gate are called universal gate as they can implement any logical function.

NAND gate: NAND gate implements the NAND (complement of DOT product function) function of Boolean algebra.

Definition: If any input of NAND gate is zero then the output of NAND gate will be 1. If both the inputs of NAND gate are one then the output of NAND gate will be 0.



Symbolic Representation



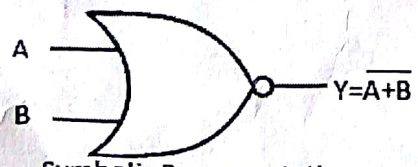
Circuit Diagram

Truth Table

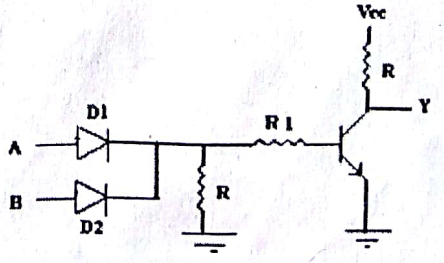
A	B	Y=(A.B)'
0	0	1
0	1	1
1	0	1
1	1	0

NOR gate: NOR gate implements the NOR (Complement of OR function) function of Boolean algebra.

Definition: If any or both input of NOR gate is one then the output of NOR gate will be 0. If both the inputs of NOR gate is zero then the output of NAND gate will be 1.



Symbolic Representation



Circuit Diagram

Truth Table

A	B	Y=(A + B)'
0	0	1
0	1	0
1	0	0
1	1	0

7. **TEST PROCEDURE:**
   a. Make connections as per circuit diagram of fig. 1.1 on bread board. Connect the output pin to the LED.
   b. Switch on the power supply.
   c. Give logic inputs to corresponding input terminal and verify result on LED.
   d. Similarly give logic inputs to other input and check the output.
   e. Follow similar procedure for other circuit diagram

7. **RESULT:** (students have to write the result by their own what result occurs)
8. **SELF ASSESSMENT:**
   a. Sketch circuit diagram, make truth table and assemble an EX-OR Gate from AND, OR, NOT logic Gates.
   b. Why NAND and NOR Gates are called universal gates.
   c. Why is LED being used in this experiment.
   d. How can AND & OR Gate be implemented using transistor.

Prepared by	date	Modified on
Nayan Bhale	21/8/17	