DLD LAB REPORT- 01

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- **Lab Title**:

“Introduction to lab equipment and verification of logic gates”

- **Equipment Used:**

1. Trainers
2. IC’s

- **Digital logic design:**

Digital logic design is a system in electrical and computer engineering that uses simple number values to produce input and output operations. Digital logic design is the basis of electronic systems, such as computers and cell phones. Digital logic is rooted in binary code, which renders information through zeroes and ones, giving each number in the binary code an opposite value. This system facilitates the design of electronic circuits that convey information, including logic gates with functions that include AND, OR, and NOT commands. The value system translates input signals into specific outputs. These functions facilitate computing, robotics, and other electronic applications.

- **Working of digital logic design:**

Digital logic is mainly used for data (must be digital information) representation, manipulation and processing of using discrete signals or binary digits (bits). It can perform logical operations, data retrieval or storing and data transformation by analyzing logical circuit design.

Digital Logic Design is used to develop hardware, such as circuit boards and microchip processors. This hardware processes user input, system protocol and other data in computers, navigational systems, cell phones or other high-tech systems.

A typical logic design comprises various logic gates that constitute the digital device. The logic gates are printed onto the integrated circuits which make up the overall electronic circuit of a particular digital device.

As a digital design engineer, you may assist in developing cell phones, computers, and related personal electronic devices.

- **Logic gates:**

A logic gate is a device that acts as a building block for digital circuits. They perform basic logical functions that are fundamental to digital circuits. Most electronic devices we use today will have some form of logic gates in them. For example, logic gates can be used in technologies such as smartphones, tablets etc.

In a circuit, logic gates will make decisions based on a combination of digital signals coming from its inputs. Most logic gates have two inputs and one output. Logic gates are based on Boolean algebra. At any given moment, every terminal is in one of the two binary conditions, *false* or *true*. False represents 0, and true represents 1. Depending on the type of logic gate being used and the combination of inputs, the binary output will differ. A logic gate can be thought of like a light switch, wherein one position the output is off -- 0, and in another, it is on -- 1. Logic gates are commonly used in integrated circuits (IC).

Different types of logic gates are:

- AND
- OR
- NOT
- XOR

➢ Integrated circuits (IC):

Integrated circuit (IC), also called microelectronic circuit, microchip, or chip, an assembly of electronic components, fabricated as a single unit, in which miniaturized active devices (e.g., transistors and diodes) and passive devices (e.g., capacitors and resistors) and their interconnections are built up on a thin substrate of semiconductor material (typically silicon). The resulting circuit is thus a small monolithic "chip," which may be as small as a few square centimeters or only a few square millimeters. The individual circuit components are generally microscopic in size.

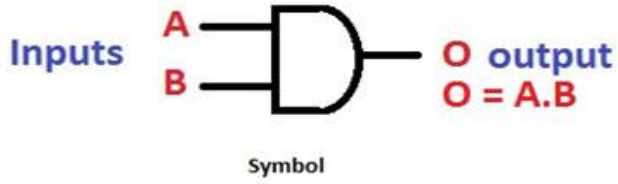
Different logic gates on IC are:

- AND (74LS08)
- OR (74LS32)
- NOT (74LS04)
- XOR (74LS86)

➢ Logic gates and their truth tables:

Here A and B represent two inputs that are entering the circuit, whereas Y represents the output. A truth table shows all the possible input combinations and the definite result of each of them.

1. **AND Gate:**

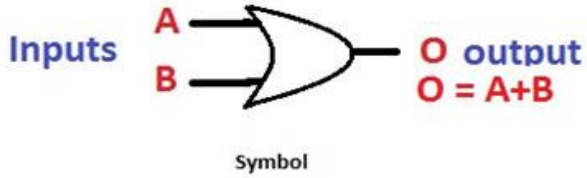


Symbol

Inputs		Output
A	B	O
0	0	0
0	1	0
1	0	0
1	1	1

Truth table

2. **OR Gate:**

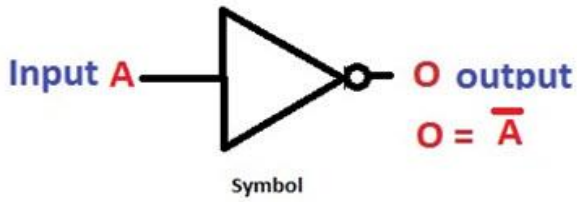


Symbol

Inputs		Output
A	B	O
0	0	0
0	1	1
1	0	1
1	1	1

Truth table

3. **NOT Gate:**

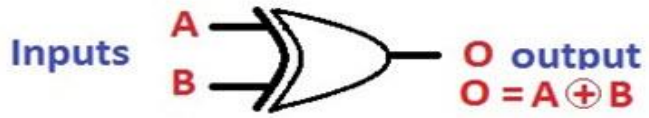


Symbol

Inputs	Output
A	O
0	1
1	0

Truth table

4. XOR Gate:



Symbol

Inputs		Output
A	B	O
0	0	0
0	1	1
1	0	1
1	1	0

Truth table

- **Conclusion:**

As mentioned before, electrical and computer engineering is often based on digital logic design. They use the specific characteristic of these logic functions to build complex circuits for electronic components. The result of the logic design and implementation process are circuit boards and chips (i.e., microchip processors) housing the logic gates and functions. Each component has a unique set of characteristics defined by the logic, such as power, input, protocol, and logic function.

Digital circuits are typically preferred over analog circuits because there is no signal degradation due to noise that is usually produced in the latter. The discrete binary values can be picked up in the transmission through the noise and reconstructed without any flaws. Digital devices that use digital logic design are implemented across a variety of fields and applications. You will find them being used in medical and aviation equipment, in military navigation systems, as well as in everyday consumer products such as your humble smartphone.

************THE END************