

College: J D Women's College	Subject: Computer Networking
Dept: BCA	Unit/Topic: Digital Electronic Circuits
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Digital Electronics, Circuits & Design

Lecture - 1

Introduction

The development of Electronics was a major revolution in the world. It started with the development of components like Diode & Transistor. With their help, electronics circuits were designed. These circuits were used in developing numerous electronic equipments. The development of modern day computer is the outcome of development in electronics only.

For a long time, the electronic circuits used signals in analog form to carry out their operations. These were useful but had their own limitations. Later on, digital signals were conceptualized and then developed and accordingly digital electronic circuits came into existence. It offered many advantages over analog signals such as better noise suppression which improved the quality of output drastically. Slowly, the analog circuits were reduced by the digital circuits and today we are living in a digital world. We are using digital equipments for many activities in our day to day life.

This chapter is an attempt to make you familiar with some of the basic digital electronic circuits, their design and functions.

Digital Circuits

Digital circuits are electronics circuits that receive and operate on digital signals. As you know, digital signal is a type of electronic signal that has a discrete form having only two

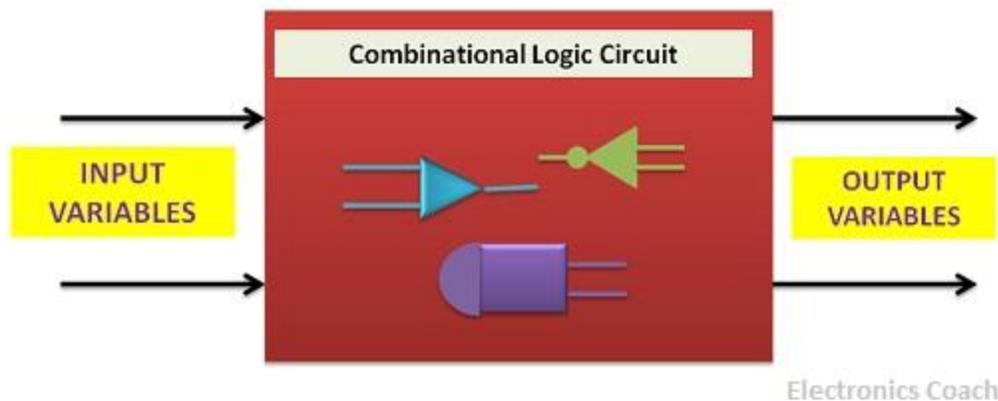
signal levels, low (0) and high (1). The form of this signal is used to code data and instructions. Digital components and circuits are designed in such a way that they operate in a particular way and give a desirable result after receiving the digital signal.

The most basic digital components are Diode and Transistors. They are used to design digital circuits and the most basic of them are called **Logic gates**. So, we can say that the logic gates are the pioneer of digital electronics. Logic gates and other components are further used to design various digital circuits and equipments. The digital circuits can be categorized into two types:

- Combinational Circuit
- Sequential Circuit

Combinational Logic Circuit

The combinational logic circuit comprises of logic gates and thus the output obtained is directly related to the input. There are no feedback elements in case of the Combinational logic circuit. The word **combinational** is derived from the word **combination** which means two or more elements combined together by means of single operation.



A combinational logic circuit consists of logic gates such as NAND, NOR and NOT. These are the building blocks of the digital circuitry. A combinational circuit provides the variety

of operations such as the arithmetic operation of two operands, transmission of data, conversion of code etc.

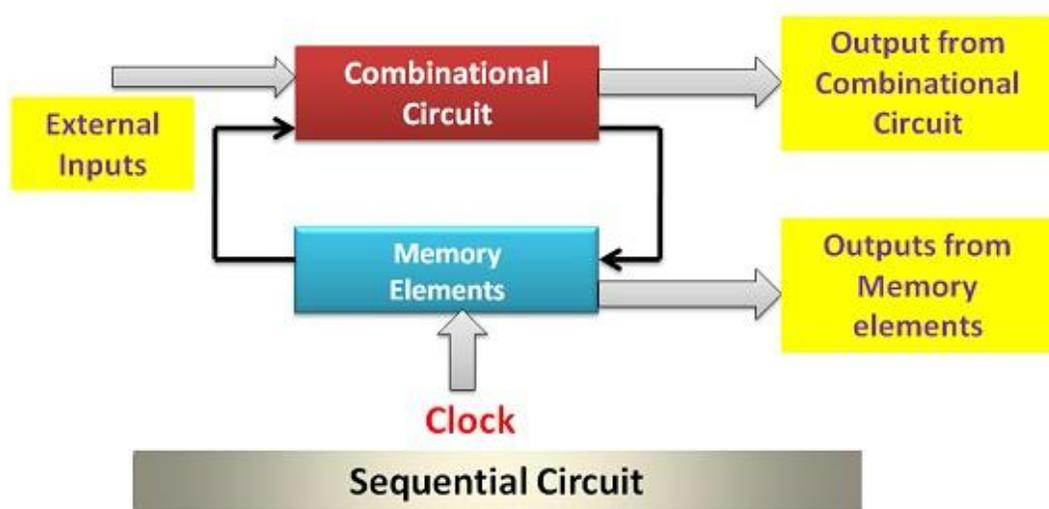
With the help of logic gates, the combinational circuit performs an operation like addition, subtraction or code conversion from binary to BCD, BCD to binary etc. The output of the combinational logic circuit can be described in various ways such as Boolean algebra, truth table, and logic gates.

The combinational circuit can take any number of inputs and the output generated from the circuitry is dependent on the state of the input. Any change in the input will also be reflected in the output terminals.

Various types of combinational circuit exist among which multiplexer and de-multiplexer are the significant ones which are used in various applications. Other combinational circuits are the encoder, decoder, half adder, full adder, Binary to BCD converter etc.

Sequential Logic Circuit

The sequential logic circuit also involves memory elements along with the logic gates. Thus, the output generated by the sequential circuit depends not only on the present state of the input but also on the previous outputs.



The sequential circuit involves usage of feedback loops. With the help of this the state of the previous output is recorded. Thus, the next output is controlled by the state of the previous output. The memory present in the sequential circuit keeps the track of the output and the thus, the output is produced.

The word **sequential** is derived from the word **sequence** which means in a definite order. To understand the operation of the sequential circuit let's take an example of television circuitry. The television is also a type of sequential circuit. The keys available in remote to change the channel or up and down keys to adjust the volume, this entire process is sequential.

