

DESIGN A DECIFRATOR USING THE MULTISIM PROGRAM

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Abstract: *This article is dedicated to the design of digital circuits in the Multisim software, providing information on the design and operation of an encoder, which is considered a combinational logic device, and the process of observing its functionality.*

Keywords: digital, circuit, virtual, program, Multisim, encoder, decoder, hardware, and combination, serial.

In the process of teaching the subject of digital circuit design, theoretical knowledge is reinforced through laboratory and practical sessions. However, in many cases, the expected outcomes of these sessions are not achieved. The main reasons for this include the insufficient number of laboratory setups and the lack of modern tools and equipment. This issue can be addressed by utilizing virtual laboratories during the sessions.

A virtual laboratory is a software-based system that enables users to develop skills for working with various types of devices and systems, as well as thoroughly investigate them from different perspectives [1, 2].

The Multisim software package is one of the tools that provides such capabilities. It includes a variety of modern instruments, enabling the design and experimentation of electronic devices ranging from simple to highly complex. This tool is considered ideal for teaching, as it eliminates any limitations related to components and instruments. Additionally, the Multisim software can serve as a simulator for studying the operating principles of real electronic and measuring instruments, as well as circuits.

Modeling and obtaining results in Multisim stand out for their speed and convenience. Using this software, it is possible to design, model, and analyze analog and digital radio-electronic devices of any complexity. However, to achieve accurate results, users must master the rules and methods of working with the software and develop the skills to apply them for studying and analyzing processes in electronic circuits. The capabilities of this software can also be utilized during practical and laboratory sessions for designing digital logic devices [3,4,5].

It is well known that digital devices are classified into combinational and sequential logic devices. In combinational circuits, the output signal at any given moment corresponds precisely to the combination of logical signals applied to the input at that time. Consequently, this type of circuit does not require memory.

As an example, let us examine the design and operation of an encoder, which is considered a combinational logic device. The Multisim software interface consists of a menu, a toolbar, and a workspace (Figure 1).

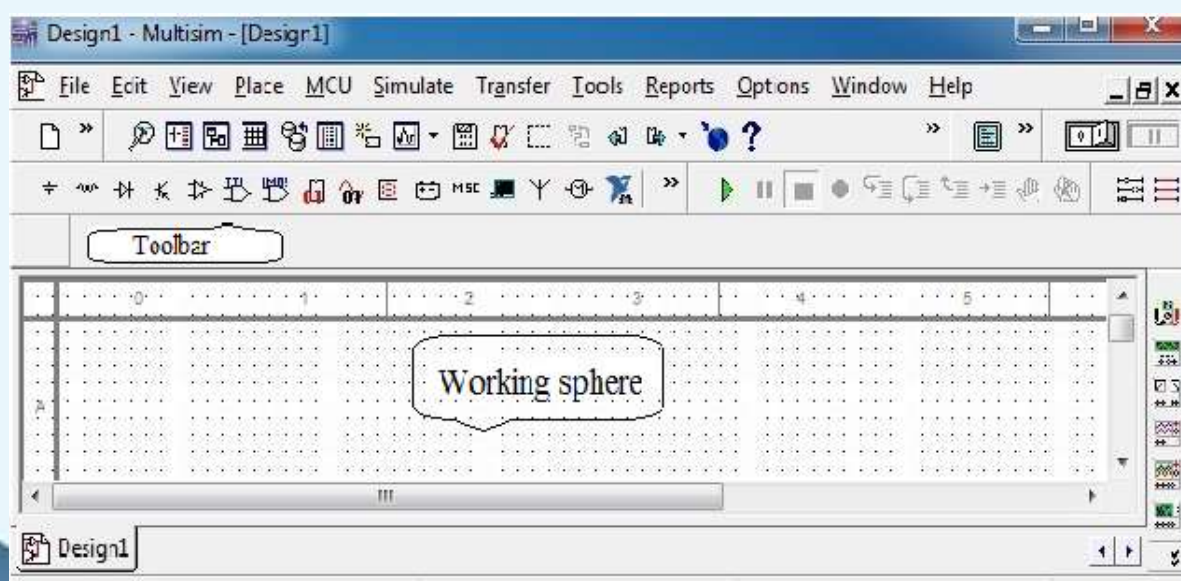


Fig.1. Interface of the Multisim software suite.

In the toolbar, we select the required devices and instruments by clicking on the buttons that represent the elements of radio-electronic circuits. For our case, we will need a DC power source, ground connection, digital and light indicators, switches, and the "AND-NOT" logic gate. By selecting these elements, we will create the model of the decoder.

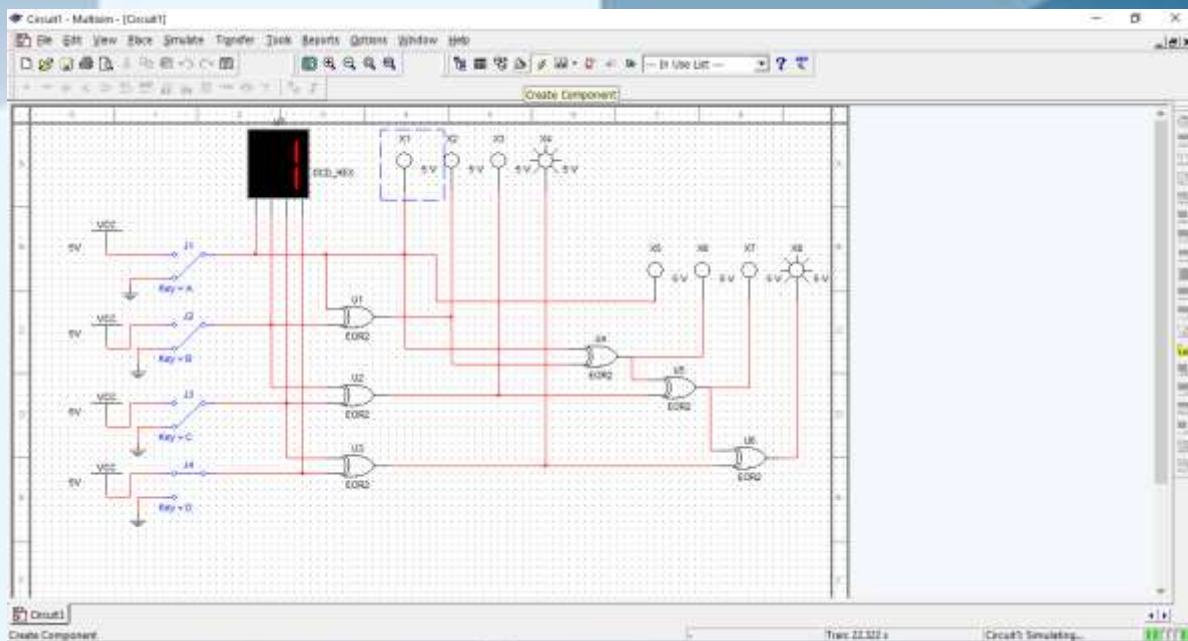


Fig.2. Circuit diagram of the encoder and its operation process.

By sequentially activating the switches, it is possible to observe the representation of different numbers from 0 to 9 in both Grey code and binary numbering systems. Building this circuit provides an understanding of which elements make up the simplest encoder and how it operates [4, 5].

Conclusions

In conclusion, it is worth noting that by using such software, students will have the opportunity to complete the assigned laboratory tasks, as well as to understand and deeply assimilate the material during the process of organizing the sessions.

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