ELECTRONIC
DIGITAL
SYSTEM
FUNDAMENTALS

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Electronic
Digital System Fundamentals

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Preface

Electronic Digital Systems Fundamentals is an introductory text that provides coverage of the various topics in the field of digital electronics. The key concepts presented in this book are discussed using a simplified approach that greatly enhances learning. The use of mathematics is kept to the very minimum and is discussed clearly through applications and illustrations.

Each chapter is organized in a step-by-step progression of concepts and theory. The chapters begin with an introduction, discuss important concepts with the help of numerous illustrations, as well as examples, and conclude with summaries.

The overall learning objectives of this book include:

- Describe the characteristics of a digital electronic system.
- Explain the operation of digital electronic gate circuits.
- Demonstrate how gate functions are achieved.
- Use binary, octal, and hexadecimal counting systems.
- Use Boolean algebra to define different logic operations.
- Change a logic diagram into a Boolean expression and a Boolean expression into a logic diagram.
- Explain how discrete components are utilized in the construction of digital integrated circuits.
- Discuss how counting, decoding, multiplexing, demultiplexing, and clocks function with logic devices.
- Change a truth table into a logic expression and a logic expression into a truth table.
- Identify some of the common functions of digital memory.
- Explain how arithmetic operations are achieved with digital circuitry.

Appendices are also included that contain information regarding circuit symbols, data sheets and electrical safety.

The authors hope that you will find Electronic Digital System Fundamentals easy to understand and that you are successful in your pursuit of knowledge in this exciting technical area.

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Chapter 1

Introduction to Digital Systems

Chapter 1 provides an overview of electronic digital systems. The concepts discussed in this chapter are important for developing an understanding of electronic digital systems. Digital electronics is undoubtedly the fastest growing area in the field of electronics today. Personal computers, cameras, cell phones, calculators, watches, clocks, video games, test instruments and home appliances are only a few of the applications of digital systems. Digital systems play an essential role in our daily lives and new applications are emerging at a rapid pace.

DIGITAL AND ANALOG ELECTRONICS SYSTEMS

Electronics is further divided into two main categories: analog and digital. Analog electronics deals with the analog systems, in which signals are free to take any possible numerical value. Digital electronics deals with digital or discrete systems, which has signals that take on only a limited range of values. Practical systems are often hybrids having both analog and discrete components.

Analog as in the term 'analogous', is used to represent the variation of an electrical quantity when a corresponding physical phenomenon varies. For example, when the flow of fluid through a pipe increases, an analog meter monitoring the flow may generate a larger voltage (or other electric quantity), which can then be displayed on a scale calibrated to indicate flow rate. Most quantities in nature are inherently analog—temperature, pressure, flow, light intensity change, loudness of sound, current flow in a circuit, or voltage variations.

Digital signals are characterized by discrete variations or jumps in their values. They are useful in producing information about a system. For example, in the case of a sensor monitoring the flow rate in a water canal, it might be sufficient to know whether the flow has reached a critical level, rather than monitoring every possible value of the flow. All values below