

- Understand the relationship between Boolean logic and digital computer circuits.
- Learn how to design simple logic circuits.
- Understand how digital circuits work together to form complex computer systems.
- In the latter part of the nineteenth century, George Boole incensed philosophers and mathematicians alike when he suggested that logical thought could be represented through mathematical equations.
- Computers, as we know them today, are implementations of Boole's *Laws of Thought*.
 - Claude Shannon was among the first to see this connection.

3.2 BOOLEAN ALGEBRA

3.2.1 Boolean Expression

3.2.2 Boolean Identities

3.2.3 Simplification of Boolean Expressions

3.2.4 Complements

3.2.5 Representing Boolean Functions

3.3 LOGIC GATES

3.3.1 Symbols for Logic Gates

3.3.2 Universal Gates

3.3.3 Multiple Input Gates

3.4 KARNAUGH MAPS

3.4.1 Introduction

3.4.2 Description of Kmaps and Terminology

3.4.3 Kmap Simplification for Two Variables

3.4.4 Kmap Simplification for Three Variables

3.4.5 Kmap Simplification for Four Variables

3.4.6 Don't Care Conditions

3.4.7 Summary

3.5 DIGITAL COMPONENTS

3.5.1 Digital Circuits and Their Relationship to Boolean Algebra

3.5.2 Integrated Circuits

3.5.3 Putting It All Together: From Problem Description to Circuit

3.6 COMBINATIONAL CIRCUITS

3.6.1 Basic Concepts

3.6.2 Examples of Typical Combinational Circuits

3.6.2.1 Half-Adder

3.6.2.2 Full Adder

3.6.2.3 Ripple Carry Adder

3.6.2.4 Decoders

3.6.2.5 Multiplexers

3.6.2.6 Parity Checker

3.6.2.7 4-Bit Shifter

3.6.2.8 2-Bit ALU

3.6.2.9 2-Bit Multiplier

3.7 SEQUENTIAL CIRCUITS

3.7.1 Basic Concepts

3.7.2 Clocks

- 3.7.3 Flip-Flops
 - 3.7.3.1 SR Flip-Flop
 - 3.7.3.2 JK Flip-Flop
 - 3.7.3.3 D Flip-Flop
- 3.7.4 Finite State Machines
- 3.7.5 Examples of Sequential Circuits
 - 3.7.5.1 4-Bit Register
 - 3.7.5.2 4-Bit Synchronous Counter
 - 3.7.5.3 4 X 3 Memory
- 3.7.6 An Application of Sequential Logic: Convolution Coding and Viterbi Detection (omitted)
- 3.8 DESIGNING CIRCUITS