MATH-405

Notes on Required Readings

Chapter Notes

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CHAPTER 1
Digital Systems and Binary Numbers

1. Understand the binary number system.
2. Know how to convert between binary, octal, decimal, and hexadecimal numbers.
3. Know how to take the complement and reduced radix complement of a number.
4. Know how to form the code of a number.
5. Know how to form the parity bit of a word.

- The **binary system** has just two **digits (bits)**, 0 and 1. Discrete elements of information can be represented with group of these bits called **binary codes**
- You can indicate the base when clarification is needed, e.g. $0111_2 = 7_{10}$
- *Modern digital design methodology* uses **hardware description languages (HDLs)** to describe and simulate digital circuits in a textual form
- **Digital (logic) circuits** process *binary data* by using ***binary logic elements (logic gates)***
  - Quantities are stored in binary storage elements **(flip-flops)**

1.2 Binary Numbers

1.3 Number-Base Conversions

1.4 Octal and Hexadecimal Numbers

1.5 Complements of Numbers

1.6 Signed Binary Numbers

1.7 Binary Codes

1.8 Binary Storage and Registers

1.9 Binary Logic

CHAPTER 2
Boolean Algebra and Logic Gates

1. Gain a basic understanding of postulates used to form algebraic structures.
2. Understand the Huntington Postulates.
3. Understand the basic theorems and postulates of Boolean algebra.
4. Know how to develop a logic diagram from a Boolean function; know how to derive a Boolean function from a logic diagram.
5. Know how to apply DeMorgan's theorems.
6. Know how to express a Boolean function as a truth table; know how to derive a Boolean function from a truth table.
7. Know how to express a Boolean function as a sum of minterms and as a product of maxterms.
8. Be able to convert from a sum of minterms to a product of maxterms, and vice versa.
9. Be able to form a two-level gate structure from a Boolean function in sum of products form; know how to form a two-level gate structure from a Boolean function in product of sums form.
10. Be able to implement a Boolean function with NAND and inverter gates; know how to implement a Boolean function with NOR and inverter gates.

2.1 Introduction

- Placeholder $x = \frac{1}{2}$