CHAPTER 11

11.1- Boolean Algebra Đại số Boolean

**Mathematical discipline (môn) used to design and analyze the behavior of the digital circuitry in digital computers and other digital systemsNamed after George BooleEnglish mathematicianProposed basic principles of the algebra in 1854Claude Shannon suggested Boolean algebra could be used to solve problems in relay-switching circuit designIs a convenient tool:AnalysisIt is an economical way of describing the function of digital circuitryDesignGiven a desired function, Boolean algebra can be applied to develop a simplified implementation of that function**

**Boolean Algebra** Investigated Set: B = { False, True } = { F, T} = {0,1} Basic Operator: AND (.), OR (+), NOTOther operators: NAND (Not And), NOR (Not Or), XOR (Exclusive OR)

Representation:

A math equation with black text

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**Boolean Variables and OperationsMakes use of variables and operationsAre logicalA variable may take on the value 1 (TRUE) or 0 (FALSE)Basic logical operations are AND, OR, and NOTANDYields true (binary value 1) if and only if both of its operands are trueIn the absence of parentheses the AND operation takes precedence over the OR operationWhen no ambiguity will occur the AND operation is represented by simple concatenation instead of the dot operatorORYields true if either or both of its operands are trueNOTInverts the value of its operand**

**Table 11.1- Boolean Operators**A table with numbers and symbols

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**Table 11.2: Basic Identities of Boolean Algebra**A table with a number of equations

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**11.2- Basic Logic GatesCổng logic (Logic Gate) là một công tắc điện tử cơ bản trong mạch số, thực hiện các phép toán logic Boolean (AND, OR, NOT...) để xử lý tín hiệu nhị phân (0 và 1). Nó được tạo từ các linh kiện như transistor và là nền tảng của mọi thiết bị kỹ thuật số.**

**Uses of NAND Gates**A diagram of a circuit

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**Uses of NOR Gates**A diagram of a diagram of a circuit

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**11.3- Combinational CircuitMột mạch tổ hợp (Combinational Circuit) là một tập hợp các cổng logic được kết nối với nhau, trong đó đầu ra tại bất kỳ thời điểm nào chỉ phụ thuộc vào đầu vào tại thời điểm đó, không có bộ nhớ hay trạng thái trước đó.**

**The appearance of the input is followed almost immediately by the appearance of the output, with only gate delaysConsists of n binary inputs and m binary outputsCan be defined in three ways:Truth tableFor each of the 2^n possible combinations of input signals, the binary value of each of the m output signals is listedGraphical symbolsThe interconnected layout of gates is depictedBoolean equationsEach output signal is expressed as a Boolean function of its input signals**

**Example: Using 3 ways for a   
Boolean Function of Three VariablesSum of product (SOP)**

A table with numbers and letters

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AI-generated content may be incorrect.A diagram of a circuit

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**Product of Sum (POS)**

**Algebraic Simplication   
Minimize a Boolean FunctionA Boolean function will be implemented as a combinational network  More complex function will cause a more complex network How to minimize a Bollean function?Methods: Karnaugh Map Quine-McCluskey Method**

**Algebraic Simplification**

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A table with numbers and letters

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A black and white math pattern

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**Karnaugh Map**A diagram of a mathematical equation

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**A convenient way of representing a Boolean function of a small number (up to four) of variablesExample**A group of squares with numbers

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