



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the name of Allah, the Most Merciful, the Most Kind

Date: 15-09-2021

BCS 103

Digital Logic & Computer Architecture

Lecture 5 and 6

IN THE LAST LECTURE

- 1's Complement
- 2's Complement
- Binary Addition
- Binary Subtraction
- Binary Multiplication
- Conversion (Detail will be discussed later on)

CONTENTS

Today we will discuss regarding

Binary Codes

Binary Codes

In the coding, when numbers, letters or words are represented by a specific group of symbols, it is said that the number, letter or word is being encoded. The group of symbols is called as a code.

The digital data is represented, stored and transmitted as group of binary bits. This group is also called as binary code. The binary code is represented by the number as well as alphanumeric letter.

Advantages of Binary Code

Following is the list of advantages that binary code offers.

- Binary codes are suitable for the computer applications.
- Binary codes are suitable for the digital communications.
- Binary codes make the analysis and designing of digital circuits if we use the binary codes.
- Since only 0 & 1 are being used, implementation becomes easy.

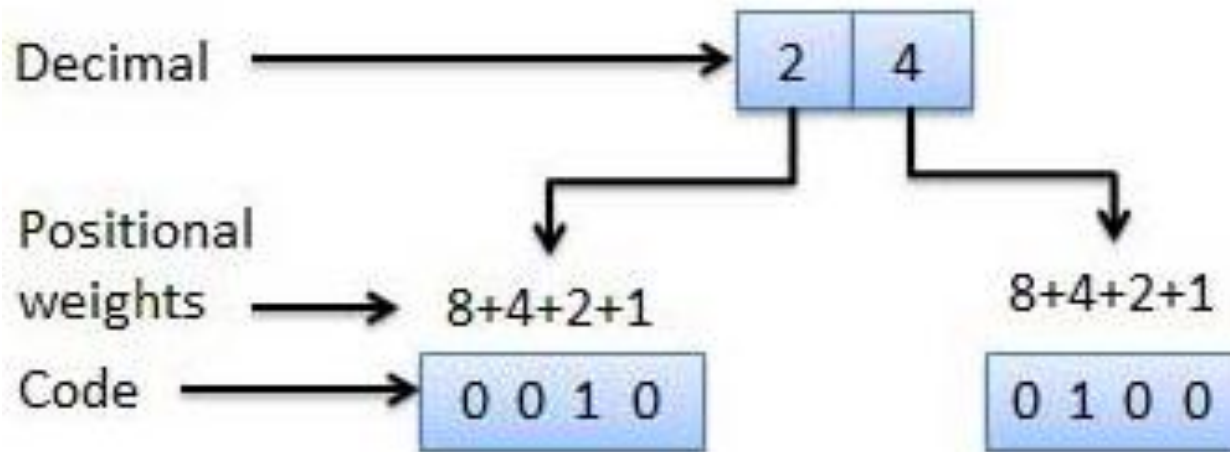
Classification of binary codes

The codes are broadly categorized into following four categories.

- **Weighted Codes**
 - BCD (8421)
 - 6311
 - 2421
 - 642-3
 - 84-2-1
- **Non-Weighted Codes**
 - Excess-3 Codes
 - Gray Codes
- **Alphanumeric Codes**
 - ASCII
 - EBCDIC
- **Error Detecting Codes (Parity)**

Weighted Codes

Weighted binary codes are those binary codes which obey the positional weight principle. Each position of the number represents a specific weight. Several systems of the codes are used to express the decimal digits 0 through 9. In these codes each decimal digit is represented by a group of four bits.



BCD Codes

In this code each decimal digit is represented by a 4-bit binary number. BCD is a way to express each of the decimal digits with a binary code. In the BCD, with four bits we can represent sixteen numbers (0000 to 1111). But in BCD code only first ten of these are used (0000 to 1001). The remaining six code combinations i.e. 1010 to 1111 are invalid in BCD.

Decimal	0	1	2	3	4	5	6	7	8	9
BCD	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001

Advantages of BCD Codes

- It is very similar to decimal system.
- We need to remember binary equivalent of decimal numbers 0 to 9 only

Disadvantages of BCD Codes

- The addition and subtraction of BCD have different rules.
- The BCD arithmetic is little more complicated.
- BCD needs more number of bits than binary to represent the decimal number. So BCD is less efficient than binary

Binary to BCD Conversion

- Step 1 -- Convert the binary number to decimal.
- Step 2 -- Convert decimal number to BCD.

Example 1 – convert $(11101)_2$ to BCD.

Step 1 – Convert to Decimal

Binary Number – $(11101)_2 = (29)_{10}$

Step 2 – Convert Decimal to BCD

2	9	
0010	1001	
$(00101001)_{\text{BCD}}$		Answer

Binary to BCD Conversion

- Step 1 -- Convert the binary number to decimal.
- Step 2 -- Convert decimal number to BCD.

Example 2 – convert $(111010)_2$ to BCD.

Step 1 – Convert to Decimal

Binary Number – $(111010)_2 = (58)_{10}$

Step 2 – Convert Decimal to BCD

5	8	
0101	1000	
$(01011000)_{\text{BCD}}$		Answer

Weighted Codes

- BCD (8421)
- 6311
- 2421
- 642-3
- 84-2-1

Thanks