MCA Part 1

Paper 2: Computer Organisation

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Lecture-02

Binary Arithmetic

1’s complement and 2’s complement

Complements are used in the digital computers in order to simplify the subtraction operation and for the logical manipulations. For each radix-r system (radix r represents base of number system) there are two types of complements.

|  |  |  |
| --- | --- | --- |
| **S.N.** | **Complement** | **Description** |
| 1 | Radix Complement | The radix complement is referred to as the r's complement |
| 2 | Diminished Radix Complement | The diminished radix complement is referred to as the (r-1)'s complement |

As the binary system has base r = 2. So the two types of complements for the binary system are 2's complement and 1's complement.

1's complement

The 1's complement of a number is found by changing all 1's to 0's and all 0's to 1's. This is called as taking complement or 1's complement. Example of 1's Complement is as follows.



2's complement

The 2's complement of binary number is obtained by adding 1 to the Least Significant Bit (LSB) of 1's complement of the number.

2's complement = 1's complement + 1

Example of 2's Complement is as follows.



Binary arithmetic is essential part of all the digital computers and many other digital system.

Binary Addition

It is a key for binary subtraction, multiplication, division. There are four rules of binary addition.



In fourth case, a binary addition is creating a sum of (1 + 1 = 10) i.e. 0 is written in the given column and a carry of 1 over to the next column.

Example − Addition



Binary Subtraction

**Subtraction and Borrow**, these two words will be used very frequently for the binary subtraction. There are four rules of binary subtraction.



Example − Subtraction



Binary Multiplication

Binary multiplication is similar to decimal multiplication. It is simpler than decimal multiplication because only 0s and 1s are involved. There are four rules of binary multiplication.



Example − Multiplication



Binary Division

Binary division is similar to decimal division. It is called as the long division procedure.

Example − Division

