COMPUTER SYSTEM AND ORGANISATION  
(MODULE 3/6)  
  
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* Number System
* TYPES OF NUMBER SYSTEM
* Decimal number system

**Decimal Number System** consists of 10 digits which are 0,1,2,3,4,5,6,7,8,9.

As base of this system is 10 , it is to be shown as (Decimal Number)10

Ex. (435)10.

This is based on positional value where the weightage of a digit is as per its position. For ex- In the analysis of number 435 ,the value of 5 is 5(=5 X100) as it is in unit’s place, value of 3 is 30(=3 X 101 as it is in tenth place and value of 4 is 400(=4 X 102 ) as it is in hundredth place in Decimal Number representation.

We can write the following numbers as:

526 = 5 X 102 + 2 X 101 + 6 X 100

25.32 = 2 X 101 + 5 X 100 + 3 X 10-1 + 2 X 10-2

**The left most digit is called MSD (Most Significant Digit ).**

**The right most digit is called LSD (Least Significant Digit ).**

Numbers can be represented in any of the number system categories like binary, decimal, hex, etc.

Any number which is represented in any one of the number system types can be easily converted to another. Let us learn how to convert a decimal number into binary, octal and hexadecimal and vice versa using various examples.

* **Decimal to Binary**

**Method to convert a Decimal number into its Binary equivalent:**

1. Divide the decimal number by 2.

2. Take the remainder and record it on the side.

3. Divide the quotient by 2.

4. Repeat the same until the decimal number cannot be further divided.

5. Write the remainders in reverse order to get the resultant binary number.

* **Decimal fraction to Binary**

**1.Convert the Decimal fractional number (0.47)10 to Binary.**

0.47 \* 2 = 0.94 Integral part: 0

0.94 \* 2 = 1.88 Integral part: 1

0.88 \* 2 = 1.76 Integral part: 1

0.76 X 2 = ……

**Reading the integers from top to bottom Answer:** **(0.011)2**

**2. Convert the Decimal fractional number (0.75)10 to Binary.**

0.75 X 2 = 1.50 Integral part: 1

**0.50 X 2 = 1.00** Integral part: 1

**Reading the integers from top to bottom Answer:** **(0.11)2**

* EXAMPLE

**Convert (105.15)10 to binary**

Let us convert 105 first.

…. **128 64 32 16 8 4 2 1**

…. **27  26 25 24 23  22  21 20**

**1 1 0 1 0 0 1**

**So (105)10 = (1101001)2**

Let us convert (0.15) 10

Multiply 0.15 by 2 **[0]**.30

Multiply 0.30 by 2 **[0]**.60

Multiply 0.60 by 2 **[1]**.20

Multiply 0.20 by 2 **[0]**.40

Multiply 0.40 by 2 **[0]**.80

Multiply 0.80 by 2 **[1]**.60

Reading the integers from top to bottom **(0.15)10 = (0.001001)2**

Final result (105.15) 10

=  **(1101001.001001)2**

* Decimal to Octal Conversion
* **Decimal to Octal Conversion**
* **Decimal to Hexadecimal**

**Method to convert a Decimal number into its Hexadecimal equivalent**

1. Divide the decimal number by 16.

2. Take the remainder and record it on the side.

3. Divide the quotient by 16.

4. Repeat the same until the decimal number cannot be further divided.

5. Write the remainders in reverse order to get the resultant octal number.

**Decimal fraction to Hexadecimal:**

Multiply the given fraction by 16. Keep the integer in the product as it is and multiply the new fraction in the product by 16. Continue the process and read the integers in the products from top to bottom.

* **Solved Problems**
* New Base System to Decimal Number System

**A decimal number can be expressed as :**

*(14.5 )10**= 1 x 101 + 4 x 100 + 5 x 10-1*

**A binary number in Decimal form :**

*(1011.1)2* *= 1 x 23 + 0 x 22 + 1 x 21 + 1 x 20 + 1 x 2-1*

**An octal number in Decimal form:**

*(335.17)8=3 x 82 + 3 x 81 + 5 x 80 + 1 x 8-1 + 7 x 8-2*

**A hexadecimal number in Decimal :**

*(1BC.2)16**= 1 x 162 + C x 161 + F x 160 + 2 x 16-1*

* Conversion of Binary to Decimal

1. **Convert 101012 to Decimal.**

101012 =((1 x 24) + (0 x 23) + (1 x 22) + (0 x 21) + (1 x 20))10

=(16 + 0 + 4 + 0 + 1)10

=2110

2. **Convert (11011.101)2 to Decimal.**

24 23 22 21 20 . 2-1 2-2 2-3

1 1 0 1 1 . 1 0 1

11011.1012= (1 x 24)+ (1 x 23)+ (0 x 22)+ (1 x 21)+ (1 x 20)+ (1 x 2-1)+ (0 x 2-2)+ (1 x 2-3)

= 16+8+0+2+1+0.5+0+0.125

= (27.625)10

* Octal &Hexadecimal to Decimal conversion
* SUMMARY
* Types of Number System
* Decimal to Binary, Octal and Hexadecimal conversion for both integer and fraction
* Binary ,Octal , Hexadecimal to Decimal conversion for both integer and fraction
* Numerous examples for all types of conversions