Number system

1. What is number system?

**Ans**: Number system are used to represent a information in quantitative form.

1. Types of number system?

**Ans:** 4 types,

* Binary
* Decimal
* Hexa
* Octal

Binary number-system

The symbols of binary system are **0, 1**.

The **Radix**/**Base** of binary system is 2. **EX,** (1010101010)**2**

**Conversion Decimat to Binary 1st method,**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **512** | **256** | **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
|  |  |  |  |  |  |  | **1** | **0** | **1** |

**Conversion Decimat to Binary 2st method,**

**2 100 0**

2 50 **0**

2 25 **1**

2 12 **0**

2 6 **0**

2 3 **1**

2 1 **1**

0

(100)**10** = (1100100)**2**

Fractional decimal to binary

(169.9)10 = (?)**2**

1) First find the decimal of **Whole** part.

**For 0.9,**

0.**9** \* **2** (9 \* 2)

1.**8** \* **2** (8 \* 2)

1.**6** \* **2** (6 \* 2)

1.**2** \* **2** (2 \* 2) **Repeating**

0.**4** \* **2** (4 \* 2)

0.**8** \* **2** (8 \* 2)

1.**6** \* **2** (6 \* 2)

1.**2** \* **2** (2 \* 2) **Repeating**

0.**4** \* **2** (4 \* 2)

0.**8** \* **2** (8 \* 2)

1.**6** \* **2** (6 \* 2)

1.**2** \* **2** (2 \* 2) **Repeating**

0.**4** \* **2** (4 \* 2)

0.**8** \* **2** (8 \* 2)

Whenever we will write the fractional part we will write in **Top-Bottom** approach**.**

(**0.9**)10 = (**.11100**)2

(169.9)10 = (**10101001.11100**)2

Negative decimal to binary

To find **binary** of a negative decimal naumber,

1. Find the normal decimal of the number.
2. Represent in a apropriate bit architecture.
3. And, Finally take **2,s** complement.
4. Done.

EX,

🡪 -32

🡪 32

🡪 00100000 (**8 bit** Architecture)

🡪 11011111 (**2’s** Complement)

🡪 **1**110000**0 LSB**

**MSB** -> 1 == Negative

**MSB** -> 0 == Positive

Binary to Octal (8)

For convert **Binary** to **Octal** we need to create **three three** pair of binary. After create **three three** pair of binary just we need to write the **Decimal** equivalent of all the **three** pairs, And finally out **Binary** to **Octal** will genrated.

EX,

010 010 111 010 111 010 110 🡪 (Binary)2

**2 2 7 2 7 2 6** 🡪(Octal)7

By implement the some logic we can convert, **D 🡪 O, H 🡪 O**

Binary to Hexadecimal (16)

**0 – 0, 1 – 1, 2 – 2, 3 – 3, 4 – 4, 5 – 5, 6 – 6, 7 – 7, 8 – 8, 9 – 9, 10 – A, 11 – B, 12 – C, 13 – D, 14 – E, 15 – F**

Now in binary representation we have to make **four four pair,** For to represent **15** we want only maximum **4 bits.**

0001 0111 1110 1010 1011 1111 0101 1101 0101

**1 7 E A B F 5 D 5**

By implement the some logic we can convert, **D 🡪 H, O 🡪 H**

Fractional binary to decimal

For fraction binary to decimal convertion we need to do that, First of all the whole part will come normally, But after decimal the powers will be nagative after calculating all the power just need to write their sum.

EX,

101**.** 010110

**.**010110

( 0 \* 2-1 ) + ( 1 \* 2-2) + (0 \* 2-3) + (1 \* 2-4) + (1 \* 2-5) + (0 \* 2-6)

0 + 0.25 + 0 + 0.0625 + 0.03125 + 0 = 0.34375

5.34375

Octal to binary convertion

For octal to binary convertion we don’t need to do any thing, Just we need to write the **3 digit** binary representation of all the digits. The same method will be applicable for **Fractional octal** number also.

EX,

(50723)8 = (101000111010011)2

(75623.0571503)8 = (111101110010011.000101111001101000011)2

Fractional binary to hexadecimal

Very simple just need to make **4** pair, Then just need to write the decimal equivalent of all the **4** pair.

110101.1010111101

(00110101.001010111101)2 = (35.2BD)16