Logical Design

Lecture 2 :Number Systems

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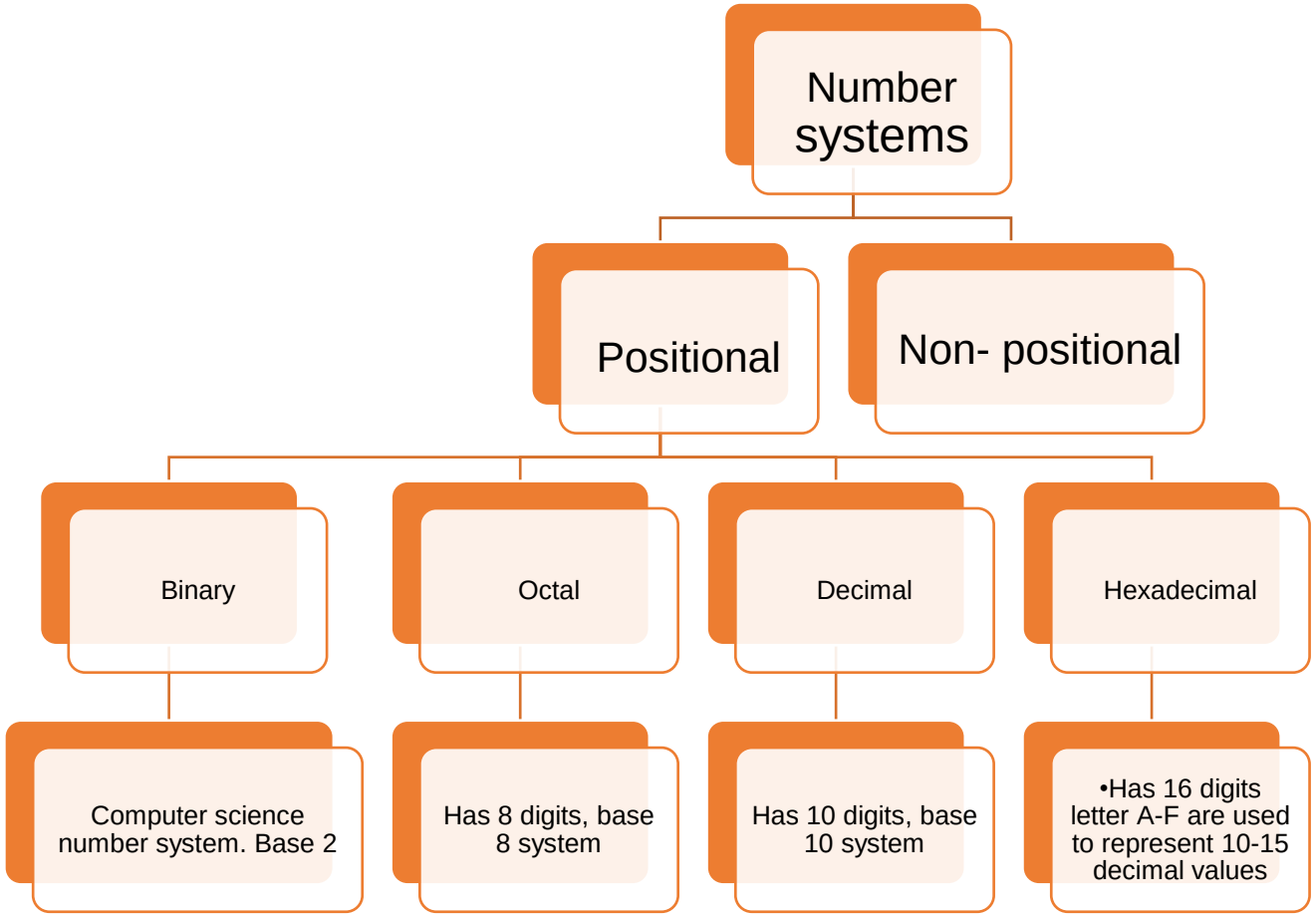
Number Systems



Conversion From Other Bases to Decimal Number System

Binary to Decimal

A number with base 2 is converted into number with base 10. Each binary digit here is multiplied by decreasing power of 2. Let us see one example:

Example: Convert $(11011)_2$ to decimal number.

We need to multiply each binary digit with the decreasing power of 2. That is;

$1\times2^4+1\times2^3+0x2^2+1\times2^1+1\times2^0$

$=16+8+0+2+1 \quad =27$

Therefore, $(11011)_2 = (27)_{10}$

Octal to Decimal Conversion

A number with base 8 is converted into number with base 10. Each digit of octal number here is multiplied by decreasing power of 8.

Example: Convert 121_8 into the equivalent decimal number.

Solution: Given $(121)_8$ is an octal number

Here, we have to multiply each octal digit with the decreasing power of 8, such as;

$1\times8^2+2\times8^1+1\times8^0$

$=64+16+1$

$=81$

Hexadecimal to Decimal Conversion

Each digit of hex number here is multiplied by decreasing power of 16.

Example: Convert 12_{16} into a decimal number.

Solution: Given 12_{16}

Multiply each digit with decreasing power of 16 to obtain an equivalent decimal number.

$1\times16^{1}+2\times16^{0}$

$=16+2$

$=18$

Number System Relationship

HEXADECIMAL	DECIMAL	OCTAL	BINARY
0	0	0	0000
1	1	1	0001
2	2	2	0010
3	3	3	0011
4	4	4	0100
5	5	5	0101
6	6	6	0110
7	7	7	0111
8	8	10	1000
9	9	11	1001
A	10	12	1010
B	11	13	1011
C	12	14	1100
D	13	15	1101
E	14	16	1110
F	15	17	1111