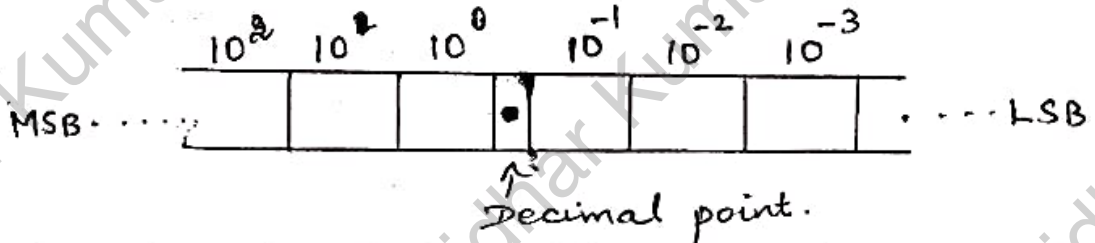
UNIT-1 DIGITAL FUNDAMENTALS.

Review of binary Number system.

→ decimal, binary, octal, hexadecimal.

(i) Decimal number system ( )$_{10}$

In decimal number system, a number can be expressed in units, tens, hundreds, thousands and so on.



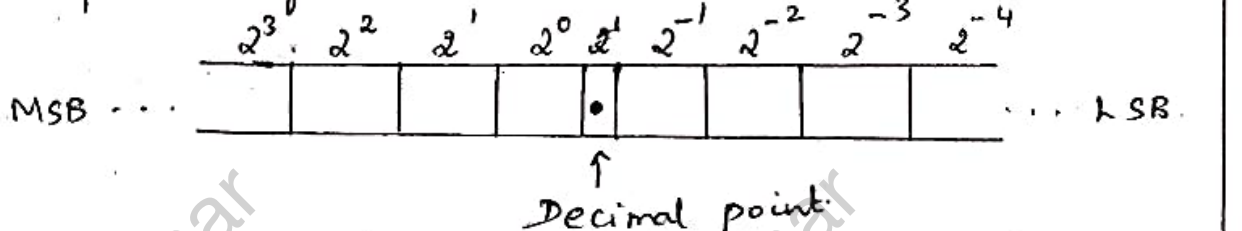
The leftmost digit, which has the greatest weight is called most significant digit. The rightmost digit which has the least weight is called least significant digit. Its weight are expressed as powers of 10. (eg:) $(50.2)_{10}$ ← base or radix

(ii) Binary Number system ( )$_2$

→ It is base-two system.

→ The two binary digits are '1' and '0'.

→ binary system weight is expressed as power of 2.



eg: $(1101.101)_2$ ← base or radix.

(iii) Octal Number system. ( )$_8$

→ uses 8 digits, 0 to 7

→ its base is 8.

(iv) Hexadecimal Number system.

→ base 16., has 16 digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E and F.

→ each hexadecimal digit represents a group of four binary digits called nibbles.

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

NUMBER SYSTEM CONVERSION.

CONVERSION BETWEEN BINARY, OCTAL AND HEXADECIMAL NUMBERS.

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

1) Binary to octal conversion:

2 to 2^3 ← number of digit in integer portion of number (n).

→ group by three digits of binary number then convert each group digit to octal equivalent.

$(111\ 101\ 100)_2$

7 5 4

Ans $(754)_8$.

(ii) <u>octal to binary conversion</u>.

→ Convert each octal digit to three digit binary number.

$(6\ 3\ 4)_8$

6 3 4

110 011 100

Ans: $(110011100)_2$.

$(725.63)_8$ to binary

7 2 5 . 6 3

111 010 101 . 110 011

Ans: $(111010101.110011)_2$.

(iii) <u>Binary to hexadecimal conversion</u>

→ group by four digits of binary number then convert each group digit to hexadecimal equivalent.

$(1101\ 1000\ 1001\ 1011)_2$

D 8 9 B

Ans: $(D89B)_H$

CONVERTING ANY RADIX TO DECIMAL EQUIVALENT.

$$N = A_{n-1}r^{n-1} + A_{n-2}r^{n-2} + \ldots\ldots + A_1r^1 + A_0r^0 + A_{-1}r^{-1} + A_{-2}r^{-2} + \ldots\ldots A_{-m}r^{-m}$$

N = Number in decimal.

A = Digit.

r = Radix or base of a Number system.

n = Number of digits in the integer portion of number.

m = Number of digits in fractional portion of number.

(i) Binary to decimal.

$(11010.11)_2$ to $(?)_{10}$

1 1 0 1 0 . 1 1	1×2^{-2}	= 0.25
	1×2^{-1}	= 0.5
	0×2^{0}	= 0
	1×2^{1}	= 2
	0×2^{2}	= 0
	1×2^{3}	= 8
	1×2^{4}	= 16
		26.75

$(11010.11)_2 = (26.75)_{10}$.

(ii) Hexadecimal to decimal:

$(16.5)_{16}$ to $(?)_{10}$.

1 6 . 5	5×16^{-1}	= 0.3125
	6×16^{0}	= 6
	1×16^{1}	= 16
		22.3125

$(16.5)_{16} = (22.3125)_{10}$