DIGITAL SYSTEMS

NUMBER SYSTEM

Types :-

1) Binary
2) Octal
3) Decimal
4) Hexadecimal

Base or **Radix** :- The value representing the particular no. system.

0 to r-1 → max. no. of digits that can be used in particular no. system.

↓

Base/Radix

Binary → $r = 2$

No. of digits used 0 to $r-1$
0 to 1 i.e 0, 1.

Octal → $r = 8$ (ie. value representing octal no. system is 8)

No. of digits used 0 to 8-1
ie 0 to 7
i.e. 0, 1 7

Decimal → $r = 10$

No. of digits used is 0 to 10-1
i.e. 0 to 9
i.e. 0, 1, 2 9

Hexadecimal No. system → $r = 16$

No. of digits used is 0 to 16-1
i.e. 0 to 15
i.e. 0, 1, ... 15

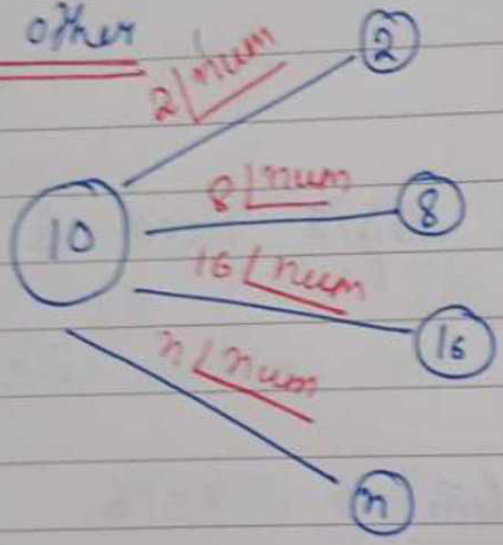
In Hexa
10 decoded as A
11 .. .. B
12 → C, 13 → D
14 → E, 15 → F

211
↓
2B

No. System Conversions :-

1. Decimal to any other
2. Any other to Decimal
3. Octal to Binary Vs.
4. Hexa to Binary Vs.
5. Octal to Hexa Vs.

Decimal to any other



Eg :- 1. 24_{10}

Binary conversion

2 | 24
2 | 12 - 0
2 | 6 - 0
2 | 3 - 0
1 - 1

$\therefore 24_{10} = 11000_2$

Octal conversion

$$8 \mid 24$$
$$3 - 0$$

$24_{10} = 30_8$

Hexa conv.

$$16 \mid 24$$
$$1 - 8$$

$24_{10} = 18_H$

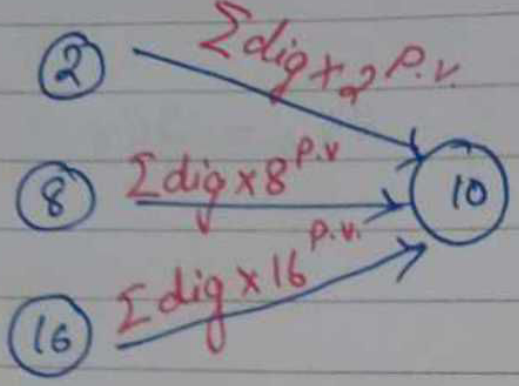
Eg:- 2. 24.25_{10}

$0.25 \times 2 = 0.5 \quad 0$
$0.5 \times 2 = 1.0 \quad 1$
$0.0 \times 2 = 0.0$

"digit after dec. pt. multiplication operation"

$24.25_{10} = 11000.01$

Any other no. system into decimal :-



place value (p.v.) → abc. de

2 1 0 -1 -2

← →

eg :- $(1100)_2$ to decimal

1 1 0 0

p.v. → 3 2 1 0

$0 \times 2^0 + 0 \times 2^1 + 1 \times 2^2 + 1 \times 2^3$

$= 0 + 0 + 4 + 8$

$= 12$

SUNDAY

eg 2:- 1100.01_2 to decimal.

$1 \times 2^{-2} + 0 \times 2^{-1} + 0 \times 2^0 + 0 \times 2^1 + 1 \times 2^2 + 1 \times 2^3$

$= 0.25 + 0 + 0 + 0 + 4 + 8$

$= 12.25_{10}$