

02/06/15

(Lec no)
13, 14

Chapter no 3: Number Systems

• Number Systems.

• Binary	Base (Radix) = 2	Distinct Values = (0, 1)
• Decimal	" " = 10	" " = (0-9)
• Hexa-Decimal	" " = 16	" " = (0-15) (F)
• Octal	" " = 8	" " = (0-7)

Uses of these Number Systems:-

- Binary is used in Digital machines.
- Decimal is used in Daily Life.
- Octal & Hexa-decimal is used for representation of Addresses of Memory Locations.

Number System Conversions:-

- Decimal into Any:-
Divide the given value by base of required system.

Example:-

$$(5)_{10} \rightarrow (101)_2$$

2		5
2		2 - 1
		1 - 0

• Binary into Octal:-

i) $(\overline{110311})_2 \rightarrow (67)_8$

ii) Convert into Decimal then into Octal

• Binary into Hexa-decimal:-

i) $(\overline{110311})_2 \rightarrow (37)_{16}$

ii) Convert into Decimal then into Hexa-decimal.

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Compliment Systems:-

→ 9's is used in machines to calculate subtraction.

we have two systems.

i) r 's \rightarrow Formula = $r^n - N$

ii) $(r-1)$'s \rightarrow " = $r^n - r - N$

where,

r = base, N = Number given

n = Number of digits

Example:-

$9 - 5 = ?$

r 's complement = $10 - 5$

= 5

Add complement with no. + 9

1 is Carry \leftarrow 1 | 4

9's Carry occurs then we will ignore it.

$$\begin{array}{r}
 \text{ii) } 5-9 \\
 \text{1's Complement} = 10' - 9 \\
 = 1 \\
 + 5 \\
 \hline
 6
 \end{array}$$

∴ Carry does not occur
Then again Take Complement.

$$\begin{array}{r}
 \text{Again 1's Complement} = 10' - 6 \\
 = 4 \text{ (Answer)}
 \end{array}$$

Complements for Binary

Example:- $(101)_2 - (011)_2$

Take 1's complement $(100)_2$

Add +1 in it $\downarrow +1$

∴ 2's Complement $(101)_2$

$$\begin{array}{r}
 + 101 \\
 \hline
 \text{Carry} \rightarrow 1 | 010
 \end{array}$$

• Machines Usually used 2's Complement

Example $(101)_2 - (011)_2$

1's complement = $(100)_2$

$$\begin{array}{r}
 + 101 \\
 \hline
 \text{Carry} \rightarrow 1 | 001 \\
 \phantom{\text{Carry}} \rightarrow + 001 \\
 \phantom{\text{Carry}} + 1 \\
 \hline
 (010)_2 \text{ Answer}
 \end{array}$$

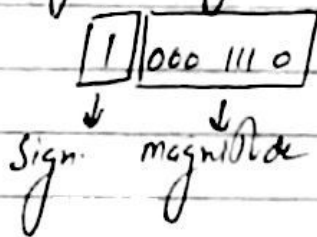
Fixed Point Representation

- Position of Decimal point is fixed.

Example: -14 (00001110)

We have three ways to pack it,

- Signed Magnitude:-



- 1's Complement:-

11110001

- 2's Complement:-

Add +1

11110010

Floating Point Representation

- Position of Decimal point is not fixed.

Example:-

789.789

$$= 0.789789 \times 10^3$$

Mantra Exponent
Base

- It will only save data of Mantra & Exponent.

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