

## Lecture-1. 4/W.

Q1. Convert decimal to binary, octal and hexa.

$$(i) (162)_{10} \\ \text{binary} = (10100010)_2, \quad \text{octal} = (242)_8, \quad \text{Hexa} = (A2)_{16}$$

$$(ii) (193)_{10} \\ \text{binary} = (11000001)_2, \quad \text{octal} = (301)_8, \quad \text{Hexa} = (C1)_{16}$$

$$(iii) (128)_{10} \\ \text{binary} = (10000000)_2, \quad \text{octal} = (200)_8, \quad \text{Hexa} = (80)_{16}$$

$$(iv) (32)_{10} \\ \text{binary} = (100000)_2, \quad \text{octal} = (40)_8, \quad \text{Hexa} = (20)_{16}$$

$$(v) (47)_{10} \\ \text{binary} = (101111)_2, \quad \text{octal} = (57)_8, \quad \text{Hexa} = (2F)_{16}$$

$$(vi) (93)_{10} \\ \text{binary} = (1011101)_2, \quad \text{octal} = (135)_8, \quad \text{Hexa} = (5D)_{16}$$

Q2. Convert binary to octal, decimal, hexadecimal and decimal:-

$$(i) (01011)_2$$

$$\text{decimal} = (11)_{10}$$

$$\text{octadecimal} = (13)_8 \quad [001011]$$

$$\text{Hexadecimal} = (B)_{16}$$

$$(ii) (11000001)_2$$

$$\text{decimal} = (193)_{10}$$

$$\text{octadecimal} = (301)_8 \quad [11000001]$$

$$\text{Hexadecimal} = (C1)_{16}$$

$$(iii) (1011101)$$

$$\text{Decimal} = (93)_{10}$$

$$\text{octadecimal} = (135)_8$$

$$\text{Hexadecimal} = (5D)_{16}$$

$$\left[ \begin{array}{ccc} 1 & 0 & 1 & 1 & 0 & 1 \end{array} \right]$$

$$(iv) (10001111)_2$$

$$\text{Decimal} = (143)_{10}$$

$$\text{octadecimal} = (217)_8$$

$$\text{Hexadecimal} = (8F)_{16}$$

$$\left[ \begin{array}{ccccccc} 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{array} \right]$$

Q3. Hexadecimal to decimal, octa and binary:-

$$(1) (A023)_{16}$$

binary-

$$(A)_{16} = (1010)_2, (0)_{16} = (0000)_2$$

$$(2)_{16} = (0010)_2, (3)_{16} = (0011)_2$$

grouping,

$$(A023)_{16} \rightarrow (1010\ 0000\ 0010\ 0011)_2$$

$$\text{decimal} = A \times 16^3 + 0 \times 16^2 + 2 \times 16^1 + 3 \times 16^0$$

$$= 10 \times 4096 + 0 + 2 \times 16 + 3 \times 1$$

$$= (40995)_{10}$$

$$\text{octadecimal} = (120043)_8, \left[ \begin{array}{ccccccc} 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 \end{array} \right]$$

$$(ii) (A105)_{16}$$

binary-

$$(A)_{16} = (1010)_2, (1)_{16} = (0001)_2, (0)_{16} = (1101)_2$$

$$(5)_{16} = (0101)_2$$

grouping,

$$(A105)_{16} \rightarrow (1010\ 0001\ 1101\ 0101)_2$$

$$\text{decimal} = A \times 16^3 + 1 \times 16^2 + D \times 16^1 + 5 \times 16^0$$

$$= 10 \times 4096 + 1 \times 256 + 13 \times 16 + 5 \times 1$$

$$= (41429)_{10}$$

$$\text{octadecimal} = (120725)_8$$

$$\left[ \begin{array}{cccccc} 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 0 & 7 & 2 & 5 \end{array} \right]$$

$$(iii) (016BC)_{16}$$

binary,

$$(0)_{16} = (0000)_2, (1)_{16} = (0001)_2, (6)_{16} = (0110)_2$$

$$(B)_{16} = (1011)_2, (C)_{16} = (1100)_2$$

grouping,

$$(016BC)_{16} \Rightarrow (0000\ 0001\ 0110\ 1011\ 1100)_2$$

decimal,

$$= 0 \times 16^4 + 1 \times 16^3 + 6 \times 16^2 + B \times 16^1 + C \times 16^0$$

$$= 0 + 1 \times 4096 + 6 \times 256 + 11 \times 16 + 12 \times 1$$

$$= (5820)_{10}$$

$$\text{octadecimal} = (13274)_8$$

$$\left[ \begin{array}{cccccc} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 3 & 2 & 7 & 4 \end{array} \right]$$

$$(iv) (123AE)_{16}$$

binary-

$$(1)_{16} = (0001)_2, (2)_{16} = (0010)_2, (3)_{16} = (0011)_2$$

$$(A)_{16} = (1010)_2, (E)_{16} = (1110)_2$$

grouping,

$$(123AE)_{16} \Rightarrow (0001\ 0010\ 0011\ 1010\ 1110)_2$$

$$\text{decimal} = 1 \times 16^4 + 2 \times 16^3 + 3 \times 16^2 + A \times 16^1 + E \times 16^0$$

$$= 1 \times 65536 + 2 \times 4096 + 3 \times 256 + 10 \times 16 + 14 \times 1$$

$$= (74670)_{10}$$

$$\text{octadecimal} = (221656)_8$$

$$\left[ \begin{array}{cccccc} 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\ 2 & 2 & 1 & 6 & 5 & 6 \end{array} \right]$$

Q4. Octal to binary, hexa and decimal:

(i)  $(1271)_8$

binary-  $(1)_8 = (001)_2$ ,  $(2)_8 = (010)_2$ ,  $(7)_8 = (111)_2$

$(1)_8 = 001$

grouping,

$(1271)_8 \rightarrow (001010111001)_2$

decimal -

$$\begin{aligned} & 1 \times 8^3 + 2 \times 8^2 + 7 \times 8^1 + 1 \times 8^0 \\ & = 1 \times 512 + 2 \times 64 + 7 \times 8 + 1 \times 1 \\ & = 697 \end{aligned}$$

hexa -  $(2B9)_{16}$

$$\left[ \begin{array}{ccc} 001010111001 \\ \hline 2 \quad \quad B \quad \quad 9 \end{array} \right]$$

(ii)  $(1392)_8 \rightarrow \text{not defined}$

(iii)  $(126)_8$

binary,

$(1)_8 = (001)_2$ ,  $(2)_8 = (010)_2$ ,  $(6)_8 = (110)_2$

grouping,

$(126)_8 = (001010110)_2$

decimal,

$$\begin{aligned} & = 1 \times 8^2 + 2 \times 8^1 + 6 \times 8^0 \\ & = 86 \end{aligned}$$

hexa,

$= (56)_{16}$

$$\left[ \begin{array}{ccc} 001010110 \\ \hline 5 \quad \quad 6 \end{array} \right]$$

(iv)  $(1674)_8$

binary,

$(1)_8 = (001)_2$ ,  $(6)_8 = (110)_2$ ,  $(7)_8 = (111)_2$ ,  $(4)_8 = (100)_2$

grouping,

$(1674)_8 = (001110111100)_2$

decimal

$$= 1 \times 8^3 + 6 \times 8^2 + 7 \times 8^1 + 4 \times 8^0$$

$$= 512 + 384 + 56 + 4 = 956$$

hexa,

$$= (3BC)_{16}$$

$$\left[ \begin{array}{ccc} 0011 & 1011 & 1000 \\ 3 & B & C \end{array} \right]$$

Q57 8 bit signed integers convert to decimal :-

(i)  $(10110111)_2$

$$\Rightarrow \begin{array}{r} 10110111 \\ 01001001 \end{array} \Rightarrow -73 \text{ (-ve)}$$

(ii)  $(0111011)_2$

$$\Rightarrow (0111011) = 59 \text{ (+ve)}$$

(iii)  $(11011010)_2$

$$\Rightarrow \begin{array}{r} 11011010 \\ 00100110 \end{array} \Rightarrow -38 \text{ (-ve)}$$

(iv)  $(10111111)_2$

$$\Rightarrow \begin{array}{r} 10111111 \\ 01000001 \end{array} = -65 \text{ (-ve)}$$

Q67

(i) -10

2 bits

$$01 \boxed{10} \rightarrow 2$$

$$\underline{-10}$$

4 bits

$$1010 \rightarrow 10$$

-10 will be,

$$0101$$

$$+ \begin{array}{r} 1 \\ 0110 \end{array}$$

In 4 bits -10 will be 0110

(ii) 190 in 7 bits

$$\begin{array}{r|l}
 2 & 190 & 0 \\
 \hline
 2 & 95 & 1 \\
 \hline
 2 & 47 & 1 \\
 \hline
 2 & 23 & 1 \\
 \hline
 2 & 11 & 1 \\
 \hline
 2 & 5 & 1 \\
 \hline
 2 & 2 & 0 \\
 \hline
 & 1 & 
 \end{array}$$

In 7 bits 190 will be 0111110

(iii) -193 in 7 bits

$$\begin{array}{r|l}
 2 & 193 & 1 \\
 \hline
 2 & 96 & 0 \\
 \hline
 2 & 48 & 0 \\
 \hline
 2 & 24 & 0 \\
 \hline
 2 & 12 & 0 \\
 \hline
 2 & 6 & 0 \\
 \hline
 2 & 3 & 1 \\
 \hline
 & 1 & 
 \end{array}$$

11000001  $\rightarrow$  193

2's complement

00111110

Add +1 to units place.

111111

-193 in 7 bits 0111111

(iv) -45 in 6 bits.

$$\begin{array}{r|l}
 2 & 45 & 1 \\
 \hline
 2 & 22 & 0 \\
 \hline
 2 & 11 & 1 \\
 \hline
 2 & 5 & 1 \\
 \hline
 2 & 2 & 0 \\
 \hline
 & 1 & 
 \end{array}$$

101101  $\rightarrow$  45

2's complement

010010

+1

010011  $\rightarrow$  -45

(v) -32 in 6 bits.

32  $\rightarrow$  100000

-32  $\rightarrow$  011111  $\rightarrow$  2's complement

Add +1 to units place.

011111

+1

100000

-32 in 6 bits is 100000

(vi) 128 in 8 bits.

128  $\rightarrow$  10000000

128 in 8 bits is 10000000

(vii) -1 in 7 bits

1 in  $\rightarrow$  0000001

-1 in 7 bits  $\rightarrow$  2's complement

$$\begin{array}{r}
 1111110 \\
 + \\
 \hline
 1111111
 \end{array}$$