

H.w.:- Convert the following numbers to decimal:- (10)

- a)  $(1001.0101)_2$       b)  $(137.21)_8$       c)  $(1E0.2A)_{16}$

### 3. Decimal-to-Binary Conversion:-

There are two ways to convert from a decimal number to a binary number:-  
 (3-1) Sum of weights method  
 (3-2) Repeated division by 2 method.

#### (3-1) Sum of weights method:-

Exq.:- Convert the following decimal numbers to binary:-

- a)  $(12)_{10}$       b)  $(0.625)_{10}$       c)  $(1.25)_{10}$

Solution:-

a)  $(12)_{10} \rightarrow (1100)_2$

	4	3	2	1	0
	2	2	2	2	2
∴	16	8	4	2	1
		1	1	0	0

$(1 \times 8) + (1 \times 4) = (12)_{10}$

b)  $(0.625)_{10} \rightarrow (0.101)_2$

	0	-1	-2	-3
	2	0.5	0.25	0.125
	0	1	0	1

$(1 \times 0.5) + (1 \times 0.125) = (0.625)_{10}$

c)  $(1.25)_{10} \rightarrow (1.01)_2$

	0	-1	-2
	2	0.5	0.25
	1	0	1

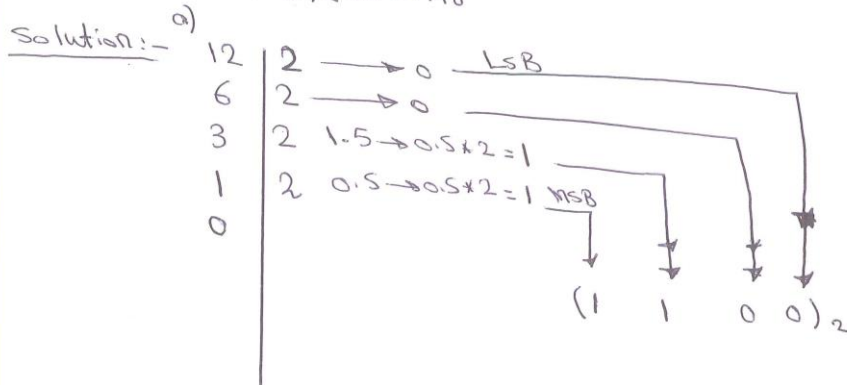
$(1 \times 1) + (1 \times 0.25) = (1.25)_{10}$

3-2:- Repeated division by 2-method:-

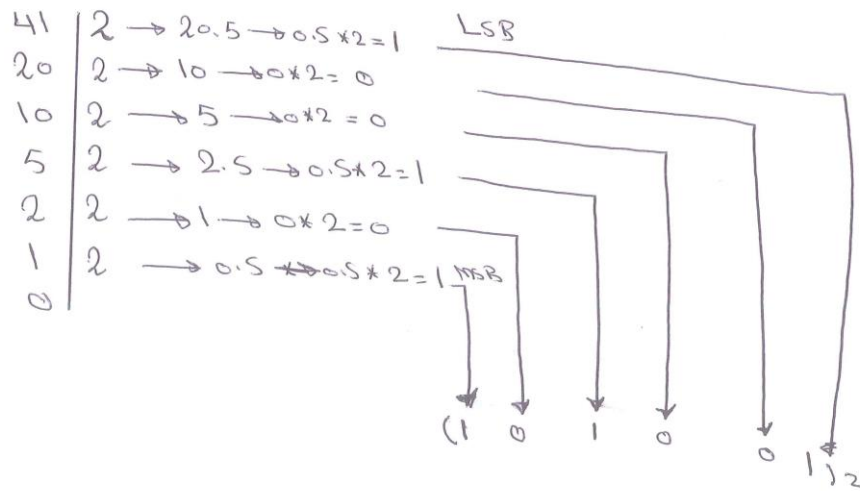
Ex.10:- Convert the following decimal numbers to binary:-

- a)  $(2)_{10}$  c.)  $(0.625)_{10}$  d.)  $(1.25)_{10}$  b)  $(41)_{10}$

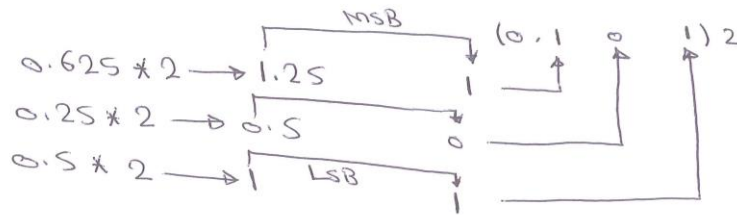
e)  $(123.61)_{10}$



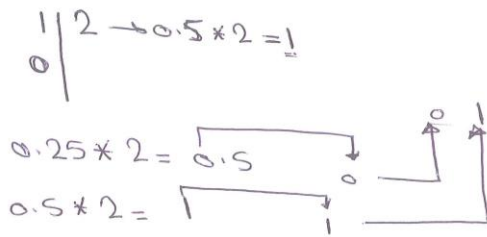
b)  $(41)_{10} \rightarrow (101001)_2$



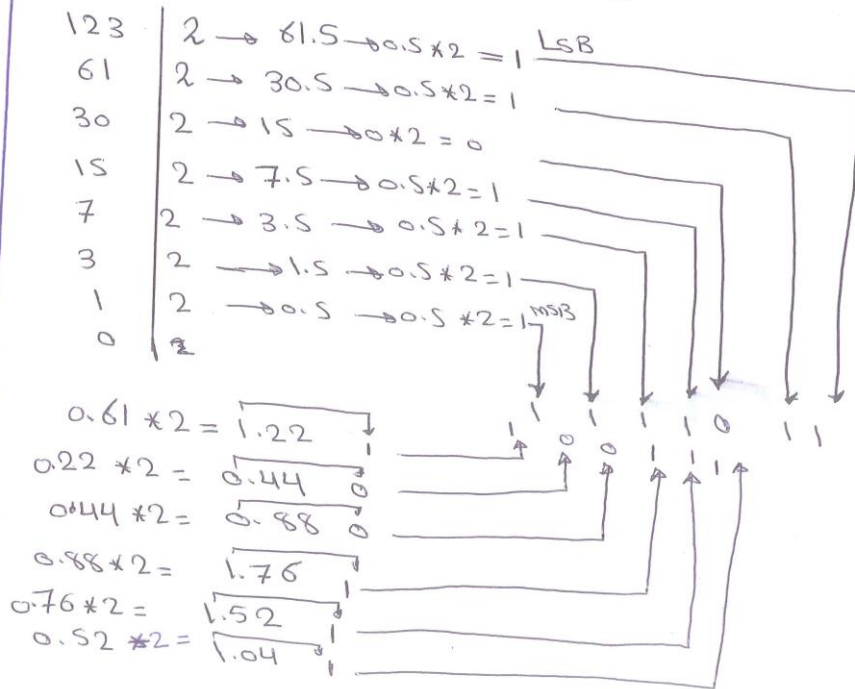
c)  $(0.625)_{10} \rightarrow (0.101)_2$



d)  $(1.25)_{10} \rightarrow (1.01)_2$



e)  $(123.61)_{10} \rightarrow (1111011.100111)_2$



4-Decimal-to-Octal Conversion:-

There are two ways to convert from decimal to octal:-

(4.1) Sum of weights methods

(4.2) Repeated Division by 8.

4.1:- Sum of weights method:-

Ex 11:- Convert the following decimal numbers to octal:-

a) 14

b) 12.25

Solution:-

$$a) (14)_{10} \rightarrow (16)_8$$

$$\begin{array}{r} 1 \\ 8 \end{array} \begin{array}{r} 0 \\ 8 \end{array}$$

$$\begin{array}{r} 8 \\ 1 \end{array}$$

$$\begin{array}{r} 1 \\ 6 \end{array}$$

$$(1 \times 8) + (6 \times 1) = (14)_{10}$$

$$b) (12.25)_{10} \rightarrow (14.2)_8$$

$$\begin{array}{r} 2 \\ 8 \end{array} \begin{array}{r} 1 \\ 8 \end{array} \begin{array}{r} 0 \\ 8 \end{array} \begin{array}{r} -1 \\ 8 \end{array} \begin{array}{r} -2 \\ 8 \end{array}$$

$$\cancel{4} \begin{array}{r} 8 \\ 1 \end{array} \cdot 0.125$$

$$\begin{array}{r} 1 \\ 4 \end{array} \cdot 2$$

$$(1 \times 8) + (4 \times 1) + (2 \times 0.125) = (12.25)_{10}$$

4.2:- Repeated Division by 8:-

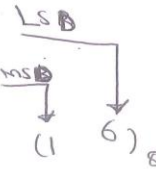
Ex 12:- Convert the following decimal number to octal:-

a) 14

b) 12.25

Solution:-

$$\begin{array}{r} 14 \\ 1 \\ 0 \end{array} \left| \begin{array}{l} 8 \\ 8 \\ 8 \end{array} \right. \begin{array}{l} \rightarrow 1.75 \\ \rightarrow 0.125 \\ \rightarrow 0.125 \times 8 = 1 \end{array} \begin{array}{l} \rightarrow 0.75 \times 8 = 6 \\ \rightarrow 0.125 \times 8 = 1 \end{array}$$



$$b) (12.25)_{10} \Rightarrow (14.2)_8$$

$$\begin{array}{r|l} 12 & 8 \rightarrow 1.5 \\ 1 & 8 \rightarrow 0.125 \\ 0 & \end{array} \quad \begin{array}{l} 0.5 \times 8 \rightarrow 4 \\ 0.125 \times 8 \rightarrow 1 \end{array} \quad \begin{array}{l} \text{LSD} \\ \text{MSD} \\ \downarrow \\ 4 \\ 1 \end{array}$$

$$0.25 \times 8 = 2$$

### 5- Decimal to Hexadecimal Conversion:-

There are two ways to convert from decimal to hexadecimal:

(5-1) Sum of weights method.

(5-2) Repeated Division by 16.

#### (5-1) Sum of weights method:-

Ex 13:- Convert the following decimal numbers to hexadecimal:

a)  $(650)_{10}$

b)  $(213.0625)_{10}$

Solution:-

a)  $(650)_{10} \rightarrow (28A)_{16}$

$$\begin{array}{r} 2 \quad 1 \quad 0 \\ 16 \quad 16 \quad 16 \\ 256 \quad 16 \quad 1 \\ (2 \quad 8 \quad A)_{16} \\ (2 \times 256) + (8 \times 16) + (A \times 1) \\ (2 \times 256) + (8 \times 16) + (10 \times 1) = (650)_{10} \end{array}$$

b)  $(213.0625)_{10} \rightarrow (D5.1)_{16}$

$$\begin{array}{r} 1 \quad 0 \quad -1 \\ 16 \quad 16 \quad 16 \\ 16 \quad 1 \quad 0.0625 \\ (D \quad 5 \quad 1)_{16} \\ (16 \times D) + (5 \times 1) + (1 \times 0.0625) \\ (16 \times 13) + (5 \times 1) + (1 \times 0.0625) = (213.0625)_{10} \end{array}$$

(5-2) Repeated Division by 16:-

(15)

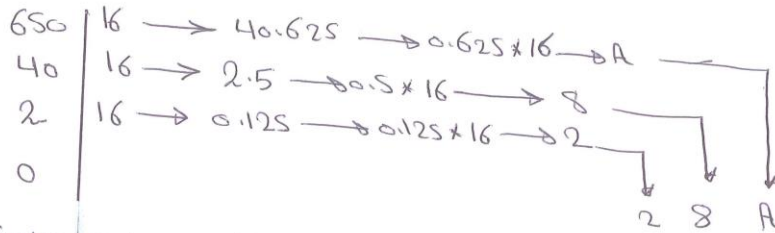
(Ex.14) Convert the following decimal numbers to hexadecimal:-

a)  $(650)_{10}$

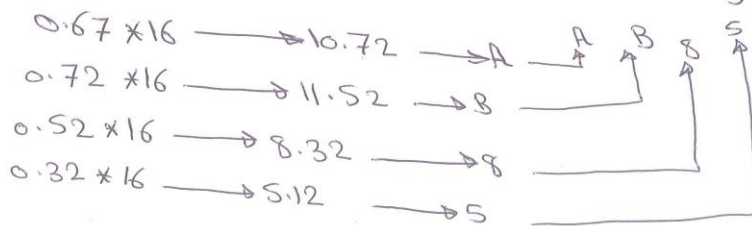
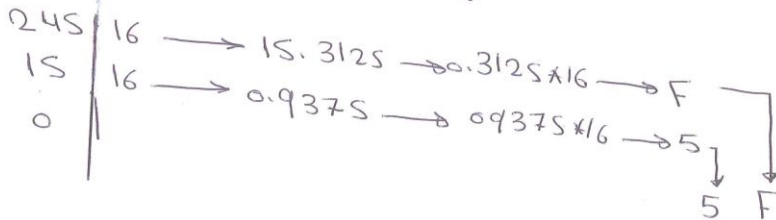
b)  $(245.67)_{10}$

Solution:-

a)  $(650)_{10} \rightarrow (28A)_{16}$



b)  $(245.67)_{10} \rightarrow (F5.AB85)_{16}$



H.w:- Convert each of the following decimal numbers to binary, octal and hexadecimal numbers by using

Ⓐ sum of weight method and Ⓑ Repeated of division

- Ⓐ 27      Ⓑ 915      Ⓒ 0.375
- Ⓓ 0.65    Ⓔ 174.25    Ⓕ 250.8