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Roll No : "P20-0108"

Section : "2D"

Course : "Digital Logic Design"

Assignment : "01-A"

Question # 1
 "Complete the table"

1

Decimal	Signed Magnitude Form	1's Complement	2's Complement
7	0111	0111	0111
6	0110	0110	0110
5	0101	0101	0101
4	0100	0100	0100
3	0011	0011	0011
2	0010	0010	0010
1	0001	0001	0001
0	0000	0000	0000

-0	1000	1111	NA -
-1	1001	1110	1111
-2	1010	1101	1110
-3	1011	1100	1101
-4	1100	1011	1100
-5	1101	1010	1011
-6	1110	1001	1010
-7	1111	1000	1001
-8	NA 1000	NA or -	1000 1000.

Question # 2

Convert "110111101.1011" binary Number to decimal Number By using "Sum of weight"

① 110111101.1011

Soln:

$$\begin{array}{cccccccccccc}
 \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\
 2^8 & 2^7 & 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 & 2^{-1} & 2^{-2} & 2^{-3} & 2^{-4} \\
 \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow & \swarrow \\
 256 & 128 & 32 & 16 & 8 & 4 & 1 & 0.5 & 0.125 & 0.0625 & & &
 \end{array}$$

$$\Rightarrow \boxed{445.6875} \rightarrow \text{Answer.}$$

Question # 3

Convert 86235.876 decimal Number to Binary

By Sum of weight Method:-

1024 512 256 128 64 32 16 8 4 2 1

65536 32768 16384 8192 4096 2048

$$\Rightarrow 65536 + 20699$$

$$\Rightarrow 65536 + 16384 + 4315$$

$$\Rightarrow 65536 + 16384 + 4096 + 219$$

$$\Rightarrow 65536 + 16384 + 4096 + 128 + 91$$

P.T.O

$$\begin{aligned} \Rightarrow & 65536 + 16384 + 4096 + 128 + 64 + 2 \\ \Rightarrow & 65536 + 16384 + 4096 + 128 + 64 + 16 + 11 \\ \Rightarrow & 65536 + 16384 + 4096 + 128 + 64 + 16 + 8 + 3 \\ \Rightarrow & 65536 + 16384 + 4096 + 128 + 64 + 16 + 8 + 2 + 1 \end{aligned}$$

~~$\Rightarrow 101010000110110$~~

$\Rightarrow \boxed{101010000110110} \rightarrow$ Answer of decimal part by Sum of weight method

Now, fraction part (0.876)

$\therefore 0.876$

$$\Rightarrow 0.5 + 0.376$$

$$\Rightarrow 0.5 + 0.25 + 0.126$$

$$\Rightarrow 0.5 + 0.25 + 0.125 + 0.001$$

$2^{-1} \quad 2^{-2} \quad 2^{-3}$

$$\Rightarrow 0.5 + 0.25 + 0.125 = \boxed{0.876} \rightarrow$$

$\Rightarrow \boxed{101010000110110.111000} \rightarrow$ Answer

Question # 3

BT repeated Division Method / multiplication

$$\Rightarrow 86235$$

$$\hookrightarrow 10101000011011011$$

Now fraction part (0.876) BT
Multiplication Method

\Rightarrow After simplification we get

$$\Rightarrow \boxed{11100000010001100011011} \text{ is Answer.}$$

$$86235.876 =$$

$$\hookrightarrow 10101000011011011.11100000010001100011011$$

$$0.876$$

$\times 2$

$$1.752$$

$$0.752$$

$\times 2$

$$1.504$$

$$0.504$$

$\times 2$

$$1.008$$

$$0.008$$

$\times 2$

$$0.016$$

$\times 2$

$$0.032$$

$\times 2$

$$0.064$$

$\times 2$

$$0.128$$

$$0.128$$

$\times 2$

$$0.256$$

$\times 2$

$$0.512$$

$\times 2$

$$1.024$$

$$0.024$$

$\times 2$

$$0.048$$

$\times 2$

$$0.096$$

$\times 2$

$$0.192$$

$\times 2$

$$0.384$$

$\times 2$

$$0.768$$

$$0.752 - 1$$

$$0.504 - 1$$

$$0.008 - 1$$

$$0.016 \rightarrow 0$$

$$0.032 - 0$$

$$0.128 - 0$$

$$0.256 - 0$$

$$0.512 - 0$$

$$0.024 - 1$$

$$0.048 - 0$$

$$0.096 - 0$$

$$0.192 - 0$$

$$0.384 - 0$$

$$0.768 - 0$$

$$0.536 - 1$$

$$0.072 - 1$$

$$0.144 - 0$$

$$0.288 - 0$$

$$0.576 - 0$$

$$2 \overline{) 86235}$$

$$2 \overline{) 43117} - 1$$

$$2 \overline{) 21558} - 1$$

$$2 \overline{) 10779} - 0$$

$$2 \overline{) 5389} - 1$$

$$2 \overline{) 2694} - 1$$

$$2 \overline{) 1347} - 0$$

$$2 \overline{) 673} - 1$$

$$2 \overline{) 336} - 1$$

$$2 \overline{) 168} - 0$$

$$2 \overline{) 84} - 0$$

$$2 \overline{) 42} - 0$$

$$2 \overline{) 21} - 0$$

$$2 \overline{) 10} - 1$$

$$2 \overline{) 5} - 0$$

$$2 \overline{) 2} - 1$$

$$1 - 0$$

Question #4

Convert the Decimal Number -412.390625 to single precision.

$$\Rightarrow -412.390625$$

$$\therefore 412 = 11001100$$

$$\therefore 0.390625 = 011001$$

$$\therefore 412.390625$$

$$\Rightarrow 11001100.011001$$

$$\Rightarrow 1 \cdot \underbrace{10011100011001}_{\text{mantissa}} \times 10^8 \rightarrow \text{exp}$$

$$\therefore \Rightarrow 8 + 127 = 135 \rightarrow \text{exponent (Bias)}$$

$$\therefore 135 = 10000111$$

$$\begin{array}{r} 2 \overline{) 135} \\ 2 \overline{) 67 - 1} \\ 2 \overline{) 33 - 1} \\ 2 \overline{) 16 - 1} \\ 2 \overline{) 8 - 0} \\ 2 \overline{) 4 - 0} \\ 2 \overline{) 2 - 0} \\ 1 - 0 \end{array}$$

$$\begin{array}{r} 2 \overline{) 412} \\ 2 \overline{) 206 - 0} \\ 2 \overline{) 103 - 0} \\ 2 \overline{) 51 - 1} \\ 2 \overline{) 25 - 1} \\ 2 \overline{) 12 - 1} \\ 2 \overline{) 6 - 0} \\ 2 \overline{) 3 - 0} \\ 1 - 1 \end{array}$$

$$\begin{array}{r} 0.390625 \\ \times 2 \\ \hline 0.78125 \\ \times 2 \\ \hline 1.5625 \\ 0.5625 \\ \times 2 \\ \hline 1.125 \\ 0.125 \\ \times 2 \\ \hline 0.25 \\ \times 2 \\ \hline 0.5 \\ \times 2 \\ \hline 1.00 \end{array}$$

Sign	Exponent	Mantissa
1	10000111	1001110001100100000000

Answer

Question # 5

Determine Binary value of floating point number:

c) 1101101100010116611010110111

So, n.

Soln.	exponent	mantissa

37. Experiment

1	10110110	11000101100111010110111
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$$\therefore (-1)^{\text{Sign}} (1.\text{mantissa}) (2^{\text{exp}-127})$$

$$\therefore 10110110 = 182$$

$$= (-1)^1 (1.11000101100111010110111)_{2}^{182-187}$$

$$= (-1)^1 (1.11000101100111010110111) 2^{53}$$

-1) (~~1~~ || 000 | 0 || 00 || 0 | 0 || 0 || 000000000000000000000000000000)

$\Rightarrow -111000101100111010110111000000000000000000000000000000000000$

$$\Rightarrow -838860906632815$$