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Assignment: #1

Q1: What is the weight of 7 in 1799_{10}?

Answer :-

writing in weighted form:

$(1\times10^3)+(7\times10^2)+(9\times10^1)+(9\times10^0)$

$1000+700+90+9$

So, the weight of in 1799_{10} is 100.

Q2, Give the value of each digit in $(5436)_{10}$?

Ans:

write in weighted form:

$(5\times10^3)+(4\times10^2)+(3\times10^1)+(6\times10^0)$

$5000+400+30+6$

so the values of the digits are as follows:

5 = 5000
4 = 400
3 = 30
6 = 6

Q3/ Convert the following:

a/ $11111111_{(2)} = (?)_{10}$

Ans:

Using weighted notation

$(1\times10^7) + (1\times10^6) + (1\times10^5) + (1\times10^4) + (1\times10^3) + (1\times10^2) + (1\times10^1) + (1\times10^0)$

$128 + 64 + 32 + 16 + 8 + 4 + 2 + 1$

255_{10}

b/ $127_{10} = (?)_2$

Sol:

Using repeated divisions by 2.

2	127	0
2	63	1
2	31	1
2	15	1
2	7	1
2	3	1
2	1	1

$(01111111)_2$ // Ans/

c) $45.25_{(10)} = (?)_2$

Sol:

Using repeated division for whole number 45.

2	45	
2	22	1
2	11	0
2	5	1
2	2	1
2	1	0

$45_{10} = (101101)_2$

using repeated multiplication for decimal part.

$0.25 \times 2 = 0.50 \rightarrow 0$

$0.50 \times 2 = 1.00 \rightarrow 1$

$45.25_{(10)} = (101101.01)_2$ Ans!

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d) $10000000.1010_{(2)} = (?)_{10}$

Sol: Using weighted notation.

$(1\times 2^7)+(1\times 2^{-1})+(1\times 2^{-3})$

$128+0.5+0.125$

$= 128.625$ Ans

e) $4D7F_{(16)} = (?)_{10}$

Sol: Using weighted notation:

$(4\times 16^3)+(13\times 16^2)+(7\times 16^1)+(15\times 16^0)$.

$16384+3328+112+15$

$(19839)_{10}$ Ans

f. $128_{(10)} = (?)_{16}$

Using repeated division by 16

$$\begin{array}{r|l} 16 & 128 \\ \hline 16 & 8 \quad 0 \end{array}$$

$128_{(10)} = 80_{(16)}$ Ans.

g. $3A6F_{(16)} = (?)_2$

by hex-binary table.

3	A	6	F
0011	1010	0110	1111

$= 0011101001101111_{(2)}$ ∴ Ans.

h) $1100001111100101_{(2)} = (?)_{16}$

Sol:

Using groups of fours.

$\underset{C}{\underline{1100}}$ $\underset{3}{\underline{0011}}$ $\underset{E}{\underline{1110}}$ $\underset{5}{\underline{0101}}$

$= (C3E5)_{16}$; Ans

i) $6173_{(8)} = (?)_{10}$

Sol:

Using weighted notation:

$(6 \times 8^3) + (1 \times 8^2) + (7 \times 8^1) + (3 \times 8^0)$

$3072 + 64 + 56 + 3$

$61873_{(8)} = 3195_{(10)}$; Ans

J/ $169_{(10)} = (?)_8$

Sol:
Using repeated division.

8	169	
8	21	1
8	2	5

$= (251)_8$; Ans.

K/ $3740_{(8)} = (?)_2$

Sol:
Using oct-binary table:

3	7	4	0
011	111	100	000

$(0111111100000)_2$; Ans.

l) $1010110001011111_{(2)} = (?)_8$

Sol:

Using groups of 3

$\underset{1}{\underline{001}}\ \underset{2}{\underline{010}}\ \underset{6}{\underline{110}}\ \underset{1}{\underline{001}}\ \underset{3}{\underline{011}}\ \underset{7}{\underline{111}}$

$(126137)_8$ Ans.

m) $2A7D_{(16)} = (?)_8$

Sol:

Firstly using hex-binary table

$\overset{2}{\overline{0010}}\ \overset{A}{\overline{1010}}\ \overset{7}{\overline{0111}}\ \overset{D}{\overline{1101}}$

Now using groups of 3.

$\underset{0}{\underline{000}}\ \underset{2}{\underline{010}}\ \underset{7}{\underline{101}}\ \underset{1}{\underline{001}}\ \underset{7}{\underline{111}}\ \underset{5}{\underline{101}}$

$(27175)_8$ Ans

Q. $(7503)_8 = (?)_{16}$

Sol:

Firstly using octal-binary table

7	5	0	3
111	101	000	011

Now, using groups of 4.

1111	0100	0011
F	4	3

$(F43)_{16}$ Ans.

Q. $11111111_{(2)} = \pm(?)_{10}$

Sol:

Using 2's compliment

11111111
00000000 1's compliment
\+ 1 2's compliment
00000001

since signed bit is zero

$= 1 \times 2^0 = (+1)_{10}$ Ans

Q) $-12_{(10)} = (?)_2$

Sol:

2	12	
2	6	0
2	3	0
2	1	1

$12 = 1100$

Now, Taking 2's complement

$$
\begin{array}{r}
00001100 \\
\hline
11110011 \\
+ \quad\quad\quad 1 \\
\hline
11110100
\end{array}
$$

1's complement

2's complement

Ans

Q. $156_{(10)} = (?)_{BCD}$

Sol:

Using Deci - BCD table

$$\underline{1} \quad \underline{5} \quad \underline{6}$$
$$0001 \quad 0101 \quad 0110$$

$(000101010110)_{BCD}$ Ans.

Q. $(100001110000)_{BCD} = (?)_{10}$

Sol: Using BCD - Deci table

$$\underset{8}{\underline{1000}} \quad \underset{7}{\underline{0111}} \quad \underset{0}{\underline{0000}}$$

$(870)_{10}$ Ans.

s) $1001010_{(2)} = (?)_{Gray}$

Sol:

$1 \to +0 \to +0 \to +1 \to +0 \to +1 \to +0$

$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$

1 1 0 1 1 1 1

1101111, Ans

t) $10101111_{Gray} = (?)_2$

Sol:

1 0 1 0 1 1 1 1

$\downarrow$ + $\downarrow$ + $\downarrow$ + $\downarrow$ + $\downarrow$ + $\downarrow$ + $\downarrow$ + $\downarrow$

1 1 0 0 1 0 1 0

11001010, Ans

iv) $01000000 = (?)_{ASCII\ small}$

Sol:

Using ASCII table

$(1 \times 2^6) + (1 \times 2^0)$

$64 + 1 = (65)_{10}$

$(65)_{10}$ = A ASCII character.

v) $01100000 = (?)$ ASCII capital

Sol:

Using ASCII table

$(1 \times 2^6) + (1 \times 2^5)$

$64 + 32 = (96)_{10}$

$(96)_{10} = (\text{`})_{ASCII}$.

w, 111000 = (? 111000) Even parity

sol:

(111000) = (1 111000) Even parity

As the number of 1's must be even.

x, 101101 = (? 101101) odd parity

sol:

101101 = (1 101101) odd parity

The number of 1's must be odd.

P-16

Q2: Calculate each of following.

a, $1111\,0011_{(2)} + 0101\,1111_{(2)}$

$$
\begin{array}{r}
1111\,0011 \\
+\ 0101\,1111 \\
\hline
1\,0101\,0010
\end{array}
$$

discarded bit

$(01010010)_2$, Ans

b, $10000000 - 01111111$

Sol:

taking 2's complement

$$
\begin{array}{rl}
01111111 & \\
\hline
10000000 & \text{1's complement} \\
+\ 1 & \text{2's complement} \\
\hline
10000001 &
\end{array}
$$

now,

$$
\begin{array}{r}
10000000 \\
+\ 10000001 \\
\hline
1\,00000001
\end{array}
$$

discarded bit

00000001, Ans

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c. $1100_{(2)} \times 11_{(2)}$

```
     ×11
     1100
    -------
     00
    00
 + 11 1
   11
  ---------
  100100
```

$(100100)_2$ Ans.

d. $1100_{(2)} \div 10_{(2)}$

```
       110
    ------
  10) 1100
      10
     -----
       100
       10
      ----
        00
        00
      ----
```

$(110)_2$ Ans.

e/ $01111111_{(2)} - 00000111_{(2)}$

Sol

taking 2's complement

$$\begin{array}{rl} 00000111 & \\ \hline 11111000 & \text{1's complement} \\ + \quad\quad\quad 1 & \text{2's complement} \\ \hline 11111001 & \end{array}$$

Now,

$$\begin{array}{r} {}^{1}\ {}^{1}\,{}^{1}\,{}^{1}\,{}^{1}\,{}^{1}\,{}^{1}\,{}^{1}\quad \\ 01111111 \\ + \quad 11111001 \\ \hline 1\ 01111000 \end{array}$$

discarded bit

$(01111000)_2$ Ans

7/ $0110\,1010_{(2)} \times 1111\,0001_{(2)}$

Sol:

Using 2's complement

```
 11110001
 00001110   1's complement
+       1   2's complement
 00001111
```

```
        00001111
        01101010
        --------
        00000000
       00001111X
      00000000XX
     00001111XXX
    00000000XXXX
   00001111XXXXX
  00001111XXXXXX
 00000000XXXXXXX
 ---------------
 000011000110110
```

Using 2's complement again

$$
\begin{array}{rl}
 & \underline{1100011\,0110} \\
 & 0011100\,1001 \quad \text{1's complement} \\
+ & 1 \quad \text{2's complement} \\
\hline
 & 0011100\,1010
\end{array}
$$

11100101 0 / Ans.

Q/ $10001000_{(2)} \div 00100010_{(2)}$

Sol:

Taking 2's complement

$$
\begin{array}{rl}
 & \underline{00100010} \\
 & 11011101 \quad \text{1's complement} \\
 & 1 \quad \text{2's complement} \\
\hline
 & 11011110
\end{array}
$$

quotient = 00000000

subtracting diviser from divident with 2's complement

$$
\begin{array}{r}
+\ 10001000 \\
11011110 \\
\hline
1\ 01100110
\end{array}
$$

discarded byte

Adding 1 to quotient = 00000001

subtracting diviser from first partial remainder

$$
\begin{array}{r}
+\ 01100110 \\
11011110 \\
\hline
1\ 01000100
\end{array}
$$

discarded byte

Adding 1 to quotient = 00000010

Again,

$$\begin{array}{r} 01000100 \\ +\ 1101110 \\ \hline 1\ 00100010 \end{array}$$

discarded byte

Adding 1 to quotient = 00000011

Again,

$$\begin{array}{r} 00100010 \\ +\ 1101110 \\ \hline 1\ 00000000 \end{array}$$

discarded byte

Add 1 to quotient = 00000100

00000100 Ans.

P-33

h) $FC_{(10)} + AE_{(16)}$.

Sol:

$$\begin{array}{r} FC \\ + \; AE \\ \hline 1AA \end{array}$$

$1AA$, Ans

i) $F1_{(10)} - A6_{(16)}$

Sol:
Using 2's complement.

A	6
1010	0110

$$\begin{array}{rl} 1010\,0110 & \\ \hline 0101\,1001 & \text{1's complement} \\ + \qquad\quad 1 & \text{2's complement} \\ \hline 0101\,1010 & \end{array}$$

$\underline{F}$ $\underline{1}$

1111 1100

now,

$$
\begin{array}{r}
11111100 \\
+\ 01011010 \\
\hline
\leftarrow 1\ 01010110
\end{array}
$$

discarded byte

$\underline{0101}$ $\underline{0110}$

5 6

56 $\underline{\text{Ans}}$

P25

j) $6D_{16} - 3F_{16}$

Using 2's complement

3	F
0011	1111

~~[illegible]~~

00111111

11000000 1's complement

1 2's complement

11000001

6	D
0110	1101

Adding:

$$\begin{array}{r} 01101101 \\ +\ 11000001 \\ \hline 1\ 00101110 \end{array}$$

discarded byte

$$\underline{0010} \quad \underline{1110}$$
$$2 \quad\quad E$$

2E. Ans.

K. 00010110 BCD + 00010101 BCD

$$\begin{array}{r} 0001\ 0110 \\ +\ 0001\ 0101 \\ \hline 0010\ 1010 \end{array}$$ → invalid due to (>9).

Add 6 to invalid code.

$$\begin{array}{r} 0010\ 1010 \\ +\ 0110 \\ \hline 0010\ 0001 \end{array}$$

00100001. Ans

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Q5/

Sol:

$$\begin{array}{r} 1101 \\ 1011 \\ \hline 0111 \end{array}$$

0111 Ans

Q6/

Sol:

$D = 11010011_2$

$G = 1010$

$D' = 110100110000$

Using modular 2 operation

$\frac{D'}{G}$ = 110100110000

```
110100110000
1010
----
1110
1010
----
1000
1010
----
 1011
 1010
 ----
   1000
   1010
   ----
   100   -> non-zero.
```

Again by adding remainder to Data bit

```
110100110100
1010
----
1110
1010
----
1000
1010
----
 1011
 1010
 ----
  1010
  1010
  ----
   0
```

hence, 110100110100 is transmitted in CRC.

Q7:

Sol:

Recieved data = D' = 010 100110100

G = 1010

Using modulo-2 operation

```
010100110100
1010
----
1111
1010
----
1010
1010
------
   0110
   1010
   ----
   1100
   1010
   ----
   1101
   1010
   ----
   1110
   1010
   ----
    1000
    1010
    ----
      10
```

10 , which is not equal to zero.

So, error has occured.