Assignment # 1

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

Sol//

Weighted Form.

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

$1000 + 700 + 90 + 9$

The Weight of in 1799_{10} is 100

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

Sol//

Weighte form

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

$5000 + 400 + 30 + 6$

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

(2)

Convert the following:

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

convert into 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} Ans

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

Repeated division by 2.

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

$= (1111111)_2$ Ans

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

sol//

Step 1st

Convert whole number.

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

$45 = 11101$

Step : 2nd.

Convert Fraction:-

$0.25 \times 2 = .5 \rightarrow 0$

$0.5 \times 2 = .0 \rightarrow 1$

$0.25 = (0.10)$

$45.25_{10} = (11101.10)_2$. Ans

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

sol,

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

$$\Rightarrow 128 + 0.5 + 0.125$$

$$\Rightarrow 128.625_{(10)}$$ Ans.

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

sol,

by weighted notation

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

$$\Rightarrow 16,384 + 3328 + 112 + 15$$

$$\Rightarrow (19839)_{10}$$

$$4D7F_{16} = (19839)_{10}$$ Ans.

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

Repeated division by 16

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

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

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

sol//

using Hex-Binary table to convert $3A6F_{16}$ into Binary number.

3	A	6	F
0011	1010	0110	1111

hence.

$3A6F_{(16)} = 0011\,1010\,0110\,1111_{(2)}$. Ans.

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

sol//.

using Groups of Four.

1100	0011	1110	0101
C	3	E	5

hence:

$1100\,0011\,1110\,0101_{(2)} = (C3E5)_{16}$

Ans.

⑥

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

sol:

by weighted notation.

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

$\Rightarrow 3072 + 64 + 56 + 3$

$\Rightarrow 3195_{(10)}$

$6173_{(8)} = 3195_{(10)}$ Ans.

j) $169_{(10)} = (?)_{8}$

sol//

Repeated division by 8.

$$\begin{array}{r|l} 8 & 169 \\ 8 & 21 \rightarrow 1 \\ 8 & 2 \rightarrow 5 \end{array}$$

hence

$169_{(10)} = (251)_8$ Ans.

k) $3740_{(8)} = (?)_2$

sol:

oct-Binary table

3	7	4	0
011	111	100	000

$011111100000_{(2)}$ Ans.

L) 1010110000101111 (2) = (?) 8.

sol/.

using group of 3.

001	010	110	001	011	111
1	2	6	1	3	7

hence
1010110000101111 (2) = (126137) 8

Ans

M) 2A7D (16) = (?) 8.

sol/.

step : 1
using hex-Binary table.

2	A	7	D
0010	1010	0111	1101

step : 2

Now using group of three.

000	010	101	001	111	101
0	2	5	1	7	5

=> 25175 (8) Ans

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

sol: step: 1.

using octal-Binary table.

7	5	0	3
111	101	000	011

Step: 2

Now using groups of four:

1111	0100	0011
F	4	3

=> $F43_{(16)}$ Ans.

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

sol,,

step: 1

Finding 12 in binary.

2	12	
2	6	-> 0
2	3	-> 0
2	1	-> 1

$12_{10} = 1100_{(2)} \Rightarrow 00001100_{(2)}$

step: 2

Now taking 2's complement of obtained number:

$$
\begin{array}{rl}
\underline{00001100} & \\
11110011 & \text{1's complement} \\
\underline{\quad\quad\quad\quad 1} & \text{2's complement} \\
11110100 &
\end{array}
$$

hence

$-12_{(10)} = 11110100_{(2)}$ Ans

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

sol/

convert by using Deci-BCD table

1	5	6
0001	0101	0110

000101010110 BCD

hence

$156_{(10)} = 000101010110$ BCD

Ans

8) $100001110000_{BCD} = (?)_{10}$

sol:

using BCD - Dec table

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

$\Rightarrow 870_{10}$

hence

$100001110000_{BCD} = (870)_{10}$

9) $1001010_2 = (?)$ Gray

sol:

$$1 \rightarrow +0 \rightarrow +0 \rightarrow +1 \rightarrow +0 \rightarrow +1 \rightarrow +0$$

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

$$1 \quad 1 \quad 0 \quad 1 \quad 1 \quad 1 \quad 1$$

hence

$1001010_2 = (1101111)$ Gray

t) 10101111 Gray = ?(2)

sol//.

1 0 1 0 1 1 1 1

1 1 0 0 1 0 1 0

hence:

10101111 Gray = 11001010 (2)

Ans

u) 010000001 = (?) ASCII small.

sol// using ASCII table.

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

64 + 1

65 (10)

65(10) = A ASCII character.

Ans

vi) 01100000 = (?) ASCII capital.

sol//:

using ASCII table:

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

$= 64 + 32$

$\Rightarrow 96_{(10)}$

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

ix) 111000 = (?111000) Even parity.

sol//:

For Even parity

111000 => (1111000) Even parity.

Ans.

x) 101101 = (?101101) odd parity.

sol//:

For odd parity.

101101 = (1101101) odd parity.

As number of ones must be odd.

Q2) Calculate each of following

a) $11110011_2 + 01011111_2$

sol//.

$$\begin{array}{r} 1\,1\,1\,1\,0\,0\,1\,1 \\ +\;0\,1\,0\,1\,1\,1\,1\,1 \\ \hline 1\,0\,1\,0\,1\,0\,0\,1\,0 \end{array}$$

Discarded bit:

$01010010_{(2)}$ Ans

b) $10000000_2 - 01111111_2$.

sol.

by 2's complement

$$\begin{array}{rl} \underline{0\,1\,1\,1\,1\,1\,1\,1} & \\ 1\,0\,0\,0\,0\,0\,0\,0 & \text{1's complement} \\ +\qquad\qquad\quad 1 & \text{2's complement} \\ \hline 1\,0\,0\,0\,0\,0\,0\,1 & \end{array}$$

Now.

$$\begin{array}{r} 1\,0\,0\,0\,0\,0\,0\,0 \\ +\;1\,0\,0\,0\,0\,0\,0\,1 \\ \hline 1\,0\,0\,0\,0\,0\,0\,0\,1 \end{array}$$

Discarded bit.

$00000001_{(2)}$ Ans

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

soln.

$$\begin{array}{r} 11 \\ \times\ 1100 \\ \hline 00 \\ 00 \\ +\ 111 \\ 11 \\ \hline 100100 \end{array}$$

Ans.

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

soln.

$$\begin{array}{r} 110 \\ 10\overline{)1100} \\ 10 \\ \hline 100 \\ 10 \\ \hline 00 \\ 00 \\ \hline \times \end{array}$$

(110_2) Ans

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e) $01111111_2 - 00000111_2$

sol/.

Taking 2's complement form

	0	0	0	0	0	1	1	1	
	1	1	1	1	1	0	0	0	1's comp
+								1	2's comp.
	1	1	1	1	1	0	0	1	

Now:

~~1 1 1 1 1 0 0 0~~

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

Discarded bit.

01111000 (2) Ans.

f) $01101010_2 \times 11110001_{(2)}$.

sol/

Taking 2's complement.

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

Now:

```
           00001111
           01101010
           00000000
          00001111x
         00000000xx
        00001111xxx
       00000000xxxx
      00001111xxxxx
     00001111xxxxxx
    00000000xxxxxxx
    000001100010110
```

Taking 2's complement again

```
 11000110110
 00111001001     1's complement.
+          1     2's complement.
 00111001010
```

1110010100_2.

g) (?)

h) $FC_{16} + AE_{16}$

sol.

$$\begin{array}{r} F\ C \\ +\ A\ E \\ \hline 1\ A\ A \end{array}$$

1AA Ans

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

sol.

using 2's complement

$$\frac{A}{1010} \quad \frac{6}{0110}$$

$$\begin{array}{r} 10100110 \\ 01011001 \\ +\qquad\qquad 1 \\ \hline 01011010 \end{array}$$ 2's complement.

$$\frac{F}{1111} \quad \frac{C}{1100}$$

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

Discarded.

$\frac{0101}{5}$ $\frac{0110}{6}$

56 Ans

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

Soln: using 2's complement

$\frac{3}{0011}$ $\frac{F}{1111}$

00111111
+ 11000000
1 2's comp.
11000001

$\frac{6}{0110}$ $\frac{D}{1101}$

Adding

0110 1101
+ 11000001
100101110

Discarded

$\frac{0010}{2}$ $\frac{1110}{E}$

2E Ans.

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k) 00010110 BCD + 00010101 BCD.

sol//.

$$\begin{array}{r} 0001 \quad 0110 \\ 0001 \quad 0101 \\ \hline 0010 \quad 1010 \end{array}$$

→ invalid due to (>9)

Add 6 to invalid code.

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

Ans

Q5) Apply module → to $1100_2 + 1011_2$.

sol//.

$$\begin{array}{r} 1101 \\ 10011 \\ \hline 0111 \end{array}$$

Ans

Q6) Apply CRC to the Data bits 10110010₂ using generator code 1010(2).

sol//.

$D = 11010011_2$

$G_2 = 1010$

$D' = 110100110000$

using modul's 2 operation.

$\frac{D'}{G} = $ 110100110000
1010
1110
1010
1000
1010
1011
1010
1000
1010
100 ← non-zero

again by adding reminder to Data bits.

110100110100
1010
1110
1010
1000
1010
1011
1010
1010
1010
0

hence

110100110000 is Transmitted CRC.

Q7) Asume that the code produce in Q5 includes an error in most significient bit Apply crc to detect error.

sol//.

Recieved cdt = $D' = 010100110100$

$G = 1010$.

using modula'2 operation.

```
010100110100
1010
 1111
 1010
 1010
 1010
    0110
    1010
    1100
    1010
    1101
    1010
    1000
    1010
      10  -> ≠ 0.
```

hence error has occured.