Assignment 3

Binary to Decimal :-

$(1011)_2 = 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$

$= 8+0+2+1 = (11)_{10}$

$(0.1011)_2 = 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3} + 1\times2^{-4}$

$= 0.5 + 0 + 0.125 + 0.0625 = (0.6875)_{10}$

Binary addition :-

$$\begin{array}{r} 1010 \\ +1110 \\ \hline 11000 \end{array} \qquad \begin{array}{r} 10 \\ +14 \\ \hline 24 \end{array}$$

Binary multiplication :-

$$\begin{array}{r} 111 \\ \times 101 \\ \hline 111 \\ 000\times \\ 111\times\times \\ \hline 10011 \end{array}$$

Binary to Hexadecimal conversion :-

$\underbrace{1100}_{C}\ \underbrace{1010}_{A}\ \underbrace{0101}_{5}\ \underbrace{0111}_{7} = (CA57)_{16}$

$\underbrace{10}_{2}\ \underbrace{1110}_{E} = (2E)_{16}$

Hexadecimal to Decimal Conversion :-

$(A1C5)_{16} = 10 \times 16^3 + 1 \times 16^2 + 12 \times 16^1 + 5 \times 16^0$

$= 40960 + 256 + 192 + 5 = (41413)_{10}$

Octal to Decimal conversion :-

$(437)_8 = 4 \times 8^2 + 3 \times 8^1 + 7 \times 8^0$

$= (287)_{10}$

Octal to Binary conversion :-

$(753)_8 = (\overbrace{111}^{7}\ \overbrace{101}^{5}\ \overbrace{011}^{3})_2 = (111\,101\,011)_2$

Binary to Octal conversion :-

$(11\,100\,101\,110)_2 = \underbrace{011}_{3}\ \underbrace{100}_{4}\ \underbrace{101}_{5}\ \underbrace{110}_{6} = (3456)_8$

Decimal to Binary Conversion :-

(1) $(13)_{10} = (??)_2$

Repeated division by 2 method,

Quotient	Remainder	
13/2 = 6	1	LSB
6/2 = 3	0	
3/2 = 1	1	
1/2 = 0	1	MSB

$\therefore (13)_{10} = (1101)_2$

* $(158)_{10} = (??)_2$

Quotient	Remainder	
$158/2 = 79$	0	LSB
$79/2 = 39$	1	
$39/2 = 19$	1	
$19/2 = 9$	1	
$9/2 = 4$	1	
$4/2 = 2$	0	
$2/2 = 1$	0	
$1/2 = 0$	1	MSB

$\therefore (158)_{10} = (10011110)_2$

* $(0.375)_{10} = (??)_2$

$0.375 \times 2 = 0.75$	0	
$0.75 \times 2 = 1.50$	1	↓
$0.50 \times 2 = 1.00$	1	

$\therefore (0.375)_{10} = \cancel{(011)_2}\ (0.011)_2$

* $(0.59375)_{10} = (??)_2$

$0.59375 \times 2 = 1.1875$ — 1

$0.1875 \times 2 = 0.375$ — 0 ↓

$0.375 \times 2 = 0.75$ — 0

$0.75 \times 2 = 1.50$ — 1

$0.50 \times 2 = 1.00$ — 1

$\therefore (0.59375)_{10} = (0.10011)_2$

Decimal to Octal conversion :-

* $(335)_{10} = (??)_8$

Quotient

$335/8 = 41.875$ — $0.875 \times 8 = 7$

$41/8 = 5.125$ — $0.125 \times 8 = 1$ ↑

$5/8 = 0.625$ — $0.625 \times 8 = 5$

$\therefore (335)_{10} = (517)_8$

* $(0.8125)_{10} = (??)_8$

$0.8125 \times 8 = 6.5$ — 6 ↓

$0.5 \times 8 = 4$ — 4

$\therefore (0.8125)_{10} = (0.64)_8$

Binary to Octal :-

$\underbrace{001}_{1}\ \underbrace{101}_{5}\ \underbrace{110}_{6} \cdot \underbrace{110}_{6}\ \underbrace{111}_{7}\ \underbrace{01}_{2} = (156.672)_8$

Decimal to Hexadecimal conversion :-

$(2591)_{10} = (??)_{16}$

$\frac{2591}{16} = 161.9375$ $\quad 0.9375 \times 16 = 15 = F$ LSB

$\frac{161}{6} = 10.0625$ $\quad 0.0625 \times 16 = 1$ MSB

$\therefore (2591)_{10} = (1F)_{16}$

Binary to Hexadecimal :-

$\underbrace{0001}_{1}\ \underbrace{1010}_{A}\ \underbrace{0101}_{5}\ \underbrace{1110}_{E} \cdot \underbrace{0111}_{7}\ \underbrace{0100}_{4}\ \underbrace{1100}_{C}$

$\therefore (1101001011110.0111010011)_2 = (1A5E.74C)_{16}$

Convert Decimal number to BCD :-

3 5 = 00110101

↓ ↓

0011 0101

BCD code for decimal '98' :-

9 8 = 1001 1000

↓ ↓

1001 1000

Converting BCD to codes to decimal :-

1001 0100 0111 0000 = 9470

9 4 7 0

BCD addition:-

(a) 0011 + 0100

```
  0011        3
+ 0100      + 4
------      ---
  0111        7
```

(b) 00100011 + 00010101

```
  00100011      23
+ 00010101    + 15
----------    ----
  00111000      38
```

(c) 1001 + 0100

```
  1001        9
+ 0100      + 4
------      ---
  1101       13
```

→ invalid BCD number (>9)

```
  + 0110
--------
  00010011
  1    3
```

(d) 1001 + 1001

```
  1001          9
+ 1001        + 9
------        ----
 10010         18
```

⟶ Invalid cause carry generated

```
+ 0110   Add 6
```

0001 1000
1 8

(e) 00010110 + 00010101

```
  00010110          16
+ 00010101        + 15
----------        ----
                   31
  00101011
```

→ (Invalid BCD > 9)

```
+ 0110
------
  00111000
```

3 1

(f) 01100111 + 01010011

```
  01100111          67
+ 01010011        + 53
----------        ----
                   120
  10111010
```

→ Invalid (>9)

```
+ 1110+0110
-----------
```

0001 0010 0000
1 2 0

(g) 1001 1001
1000 1001

0001 0010 0010 → Invalid because carry generated
+0110 +0110

0001 1000 1000
1 8 8

99
+89
188

Excess-3 code for decimal 5 is,

5
+3
8 → 1000

The excess-3 code for decimal 7 is,

7
+3
10 → 1010

Convert decimal 928 to excess 3 :-

9 2 8
+3 +3 +3

12 5 11
↓ ↓ ↓
1100 0101 1011 Excess-3