Assignment - 1

1. Write a Binary values table for 0 to 10 decimal values?

Bi	Decimal
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
1001	9
1010	10

2. Decimal to Binary

a. $12 \Rightarrow 1100$

```
2|12
2|6 - 0
2|3 - 0
  1 - 1
```

b. $20 \Rightarrow 10100$

```
2|20
2|10 - 0
2|5 - 0
2|2 - 1
  1 - 0
```

c. $45 \Rightarrow 101101$

```
2|45
2|22 - 1
2|11 - 0
2|5 - 1
2|2 - 1
  1 - 0
```

d. $77 \Rightarrow 1001101$

```
2|77
2|38 - 1
2|19 - 0
2|9 - 1
2|4 - 1
2|2 - 0
  1 - 0
```

e. $103 \Rightarrow 1100111$

4. Binary to Decimal:

a. $1101 = 13$

$2^3 + 2^2 + 2^0$.

b. $1110 = 14$

$2^3 + 2^2 + 2^1 + 2^0$

c. $1110101 = 117$

$2^6 + 2^5 + 2^4 + 2^2 + 2^0$

d. $01010101 = 85$

$2^6 + 2^4 + 2^2 + 2^0$

```
2|102
2|51 - 1
2|25 - 1
2|12 - 1
2|6 - 0
2|3 - 0
  1 - 1
```

e. $10001111 = 143$

$2^7 + 2^3 + 2^2 + 2^1 + 2^0$

```
2|85
2|42 - 1
2|21 - 0
2|10 - 1
2|5 - 0
2|2 - 1
  1 - 0
```

3. What is Octal equivalent of $(9\,910)_8$

Ans:- Not valid Octal number because '9' is not a valid digit in Octal notation.

5. Convert $(1101)_2 \Rightarrow ()_8$

a.

$2^3 + 2^2 + 2^0 = 8 + 4 + 1 = 13$

$(1101)_2 \longrightarrow (15)_8$

$\Rightarrow (13)_{10}$

b. $(1111\ 1111\ 1110)_2 \Rightarrow (\quad)_{10}$ — * Note → For spaces / Not valid

$2^{11}+2^{10}+2^9+2^8+2^7+2^6+2^5+2^4+2^3+2^2+2^1 = (4094)_{10}$

d. $(78)_8 \Rightarrow (\quad)_{10}$

$(7\times 8^1)+(8\times 8^0) = 64$

Invalid number. Because of octal n-0

$(76)_p \Rightarrow (\quad)_{10}$

$(7\times 8^1)+(8\times 1^1) = 62$

e. $(231)_8 \Rightarrow$

$(231)_8 \Rightarrow (153)_{10}$ $8^2\times 2 + 8^1\times 3 + 8^0\times 1$

$(10011001)_2$

```
2|153
2|76 - 1
2|38 - 0
2|19 - 0
2|9 - 4
2|4 - 1
2|2 - 0
 |1 - 0
```

---

f. $(0\times F00)_{16} \Rightarrow (\quad)_p$

$(F00)_{16} \rightarrow (3\times 4d)_{10}$ 1500

$\searrow (7400)_8$ $15\times 16^2 + 0\times 16^1$
                        $+0\ 16^0$

1500

```
8|3840
8|480 - 0
8|60 - 0
 |7 - 4
```
7400

h. $(0\times 2B)_{16} \Rightarrow (\quad)_8$

$2\times 11 =$
$2\times 16^1 + 11\times 16^0 = (43)_{10}$

```
8|43
 |5 - 3
```

$2B \rightarrow (43)_{10}$
$\rightarrow (53)_8$

7. Converting has Base-10

a. $(5610)_{10} \Rightarrow (\quad)$
$(1010111101010)_2$

```
2|5610
2|2805 - 0
2|1402 - 1
2|701 - 0
2|350 - 0
2|175 - 0
2|87 - 1
2|43 - 1
2|21 - 1
2|10 - 1
2|5 - 0
2|2 - 1
 |1 - 0
```

e, c):-

$(5610)_{10} = (12751)_8$

$= 15' 14\ 10$

$(15EA)_{16}$

f. $(22110)_{10} \Rightarrow (\quad)$

$\Rightarrow (101011001011110)_2$

$\Rightarrow (53136)_8$

$\Rightarrow 56\ 514$

$(565E)_{16}$

$\overset{\times}{|}\ 5610$

$8\ |\ 710 - 2$

$8\ |\ 87 - 5$

$8\ |\ 10 - 1$

$\quad 1 - 2$

$16\ |\ 5610$

$16\ |\ 350 - 10$

$16\ |\ 21 - 14$

$\quad 1 - 5$

$Y\ |\ 2210$

$8\ |\ 2763 - 6$

$8\ |\ 345 - 8$

$8\ |\ 60 - 1$

$\quad 5 - 3$

$16\ |\ 2210$

$16\ |\ 1381 - 14$

$16\ |\ 86 - 9$

$\quad 5 - 6$

$2\ |\ 3\ 5$

$2\ |\ 17 - 1$

$2\ |\ 8 - 1$

$2\ |\ 4 - 0$

$2\ |\ 2 - 0$

$\quad 1 - 0$

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Continuation Assignment

8.

a) 9+12

   01001 + 01100

          01001

          01100

        10101

b) 40 +31

   0101000

   0111111

  01000111 = 71

d) 11110101 = 245

   01111100 = 124

  0101110001 = 369

c) 1110 = 14

  0101 = 5

  010011 = 19

e) 11000011

  01011110

  010010001 = 284

HQ

9. Binary Subtraction

a) 8-3,
```
  1000
  0011
  0101 = 5
```

b) 17-11
```
  010001
- 001011
  01110 = 6
```

c) 25-7
```
  011001
  000111
  010010
```

d) 86-31
```
  01010110
  00011111
  01101111
```

e) 209-71
```
  11010001
  01000111
  010001010 = 138
```

b)
```
  0111 = 7×2
× 0010
  01110
```

c) 01100111
```
  00000101
```
```
× × ×      100000000 11
× × ×
```

10. Multiplication Binary

a) 12×3
```
   01100
 ×    11
   1100
  1100
 100100
```

Binary Subtraction (right page)

```
1.0101010    170
  0101      5
(010101 0
0.0 0 0000×
1.0101 0×0××
0110101 0010 = 850
```

11. Binary Division

a) 15/2 = 0111
```
   0111  | 10 => 0111
   10    111
   11
   10
   11
   10
    1
```

b) 45/5 = 9 = 1001
```
0101 | 010 1101 | 101
       101    1001
       0 101
      -101
        0
```

c) 121/14 = 8 = 1000
```
1110 | 1111001 | 1110
       1110      1000
       1001
       1001
```

d)
```
.101 | 110 10 100 | 101
       101          10101
       1000
       101
        110
        101
         10
= 1.01010
```

e) 10101010 | 111
```
        111     11000
        111
        111
        .0010
```

Similarly :- for base 3, Octal, Hexadecimal

$34.34_{10} = 1021 \cdot 120012120_3$

$34 = (42)_8$

$0.34 \times 8 = 2 + 0.72$

$0.72 \times 8 = 5 + 0.76$

$0.76 \times 8 = 6 + 0.08$

$0.08 \times 8 = 0.064$

$0.064 \times 8 = 0.120$ Ans :-

$0.12 \times 8 = 0.960$ 42.2560607374

$0.96 \times 8 = 7 + 0.68$

$0.68 \times 8 = 5 + 0.044$

$0.044 \times 8 = 3 + 0.52$

$0.52 \times 8 = 4 + 0.16$

$34 = (22)_{16}$

$0.34 \times 16 = 5 \times 0.44$

$0.44 \times 16 = 7 + 0.040$

$0.040 \times 16 = 10(A) + 0.240$

$0.240 \times 16 = 3 + 0.54$

$0.54 \times 16 = 13(D) + 0.44$

$0.440 \times 16 = 17 + 0.040$

$0.040 \times 16 = 0 + 0.64$

Ans 22.570A3D70

ii) 125.125

Binary of 125 = 1111101

$0.125 \times 2 = 0.(0).25$

$0.25 \times 2 = 0 + 0.5$

$0.5 \times 1 = (0) 1.0$ Ans = 1111101.001

$(125)_3 = 11122$

$0.125 \times 3 = 0 + 0.325$

$0.375 \times 3 = 1 + 0.125$

$0.125 \times 3 = 0 + 0.375$ Ans 11122.010101

$0.375 \times 3 = 1 + 0.125$

$0.125 \times 3 = 0 + 0.375$

$0.375 \times 3 = 1 + 0.125$

$(125)_1 = 175$

$0.125 \times 1 = 1.0$ ⟹ Ans = 175.01

$(125)_{16} = 7 16 = 7D$

$0.125 \times 16 = 2 + 0$ ⟹ 0.7D.2

(ii) $(110.16)_{10}$ → Binary

1010

$0.16 \times 2 = 0 + 0.32$
$0.32 \times 2 = 0 + 0.64$ Ans $1010 + 0010\ 10100$
$0.64 \times 2 = 1 + 0.28$
$0.28 \times 2 = 0 + 0.52$
$0.52 \times 2 = 1 + 0.12$
$0.12 \times 2 = 0 + 0.24$

Base-3

101

$0.16 \times 3 = 0 + 0.48$
$0.48 \times 3 = 1 + 0.44$
$0.44 \times 3 = 1 + 0.32$ Ar $101.011\ 022$
$0.32 \times 3 = 0 + 0.96$
$0.96 \times 3 = 2 + 0.88$
$0.88 \times 3 = 2 + 0.64$

Be Octal

12

$0.16 \times 8 = 1 + 0.28$ B 12.12172
$0.28 \times 8 = 2 + 0.24$
$0.24 \times 8 = 1 + 0.42$
$0.42 \times 8 = 7 + 0.36$

Hexadecimal

A

$0.16 \times 16 = 2 + 0.53$
$0.53 \times 16 = 8 + 0.96$ A : 28F5 . . .
$0.96 \times 16 = 15(F) + 0.36$
$0.36 \times 16 = 5 + 0.76$

13.

In 12-bit, it is 1111 1111 1111 or 4095 in decimal. and it is negative (-ve) more over larger +ve no 2^{n-1} it will be 2048. Then 2 number 2048-4095 = -2048. i.e largest -ve number.

14. CODE/THIS 2022

$C = 01000011$ $O = 00100000$
$O = 01001111$ $2 = 00110010$
$D = 01000100$
$E = 01000101$
$/ = 00101111$
$T = 01010111$
$H = 01001000$
$C = 010101010011$

H.Q.

15) Biggest Binary number with 5 bits

$2^5 = 32$ And the biggest binary number

decimal is 31 in binary !!!!! .

16)
```
    2 B F C
    5 4 A 7
  _____
    8 0 4 3
```

C+7=13   3   carry

```
        15
         ↓
        14
```
2+7+1= 10   1
C+A+1=15   1
B+4+1 = 10   1
2+5 = 7
```

17) $|ABC7|_{16}$ to binary

A = 1010

B = 1011

C = 1100

7 = 0111

$(ABC7)_{16} = (1010\ 1011\ 1100\ 0111)_2$

18) In Hex, A+7+4

```
    - B 3 F
  _____
    135
```

Binary to ordinary

i) $0.1001 = 1/2 + 0/4 + 0/8 + 0/16$

$= 9/16$

ii) $1.0011 = 1 + 0 + 0 + 1/8 + 1/16 = 17/16$

iii) $1.1111 = 1 + 1/2 + 1/4 + 1/8 + 1/16 = 31/16$

20) $11/17$ is 0.647 (decimal)

Binary Expansion:

$\frac{7}{17} = \frac{?}{2^1}$

$\frac{?0}{17\times2} = \frac{?\ 11}{2^2}$

$\frac{0.00}{17\times2^2} = \frac{11}{2^3}$

$0.647\times2 = 1 + 0.294$

$0.294\times2 = 0 + 0.58$

$0.58\times2 = 1 + 0.178$

$0.17\times2 = 0 + 0.35$

$0.35\times2 = 0 + 0.7$

$(0.1010100010II)_2$

21) $\frac{9.00}{12\times2^3} = ?\frac{11}{2^4}$ $5/11 = 0.2127\times2 = 0 + 0.54$

$0.54\times2 = 1 + 0.9$

$0.09\times2 = 0 + 0.18$

$\vdots$

$0.72\times2 = 1 + 0.4$

$0.05\times2 = 0.90$

$= 0.001001100100$ HQ