

Assignment -2  
(Number System)

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Course Section :- MATH1901 - 24 JAN MNRT3

Q-1 What is  $(10111.01)_2$  in base 10?

Sol<sup>n</sup>1

$$(Number)_2 = \sum_{\text{each digit}} \text{face value} \times \text{place value}$$

$$(10111.01)_2 = (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\ + (0 \times 2^{-1}) + (1 \times 2^{-2})$$

$$= (1 \times 16) + 0 + (1 \times 4) + (1 \times 2) + (1 \times 1) + 0 + \left(1 \times \frac{1}{4}\right)$$

$$= 16 + 4 + 2 + 1 + \frac{1}{4}$$

$$= 23 + 0.25$$

$$= 23.25$$

$$\text{Ans :- } (10111.01)_2 = (23.25)_{10}$$

Q-2 What is  $(10110)_{16}$  in base 10?

Sol<sup>n</sup>2

$$(Number)_{16} = \sum_{\text{each digit}} \text{face value} \times \text{place value.}$$

$$(10110)_{16} = (1 \times 16^4) + (0 \times 16^3) + (1 \times 16^2) + (1 \times 16^1) + (0 \times 16^0) \\ = (1 \times 65536) + 0 + (1 \times 256) + (1 \times 16) + (0 \times 1) \\ = 65536 + 0 + 256 + 16 + 0 \\ = 65808$$

$$\text{Ans:- } (10110)_{16} = (65808)_{10}$$

Q-3 what is  $EAD.4_{16}$  in base 10?

Sol<sup>n</sup> 3

$$\begin{aligned}(EAD.4)_{16} &= (E \times 16^2) + (A \times 16^1) + (D \times 16^0) + (4 \times 16^{-1}) \\&= (14 \times 256) + (10 \times 16) + (13 \times 1) + \left(\frac{1}{4}\right) \\&= 3584 + 160 + 13 + 0.25 \\&= 3757.25\end{aligned}$$

Ans:-  $(EAD.4)_{16} = (3757.25)_{10}$

Q-4 what is  $101.1_{10}$  in binary expressed to six digits after the binary point without rounding?

By Method 1:-

Sol<sup>n</sup> 4 Step-1:- Find the largest power of the base that is not larger than the number

Step-2:- Determine how many times this power goes into the number. The result becomes the first digit in the converted number. Calculate the remainder from the division problem

Step 3:- Repeat the above steps. If powers are skipped, zeros should be inserted

$(101.1)_{10}$  to binary

128	64	32	16	8	4	2	1

| 1 0 0 1 0 |

Brief Explanation:-

→ Highest power of 2 not larger than 101 is 64.

64 divides into 101 once with a remainder of 37

64	32	16	8	4	2	1
1	1	1	1	1	1	1

→ Highest power of 2 not larger than 37 is 32;  
Remainder = 5

→ As 5 does not divide into either 16 or 8, they are populated with 0

64	32	16	8	4	2	1
1	1	0	0			

→ Highest power of 2 not larger than 5 is 4  
 Remainder = 1

64	32	16	8	4	2	1
1	1	0	0	1		

→ As 1 does not divide into 2, they are populated with 0

64	32	16	8	4	2	1
1	1	0	0	1	0	

→ Highest power of 2 not larger than 1 is 1  
 Remainder is 0

64	32	16	8	4	2	1
1	1	0	0	1	0	

Solution

$$\begin{array}{r}
 0.1 * 2 = 0.2 \quad 0 \\
 0.2 * 2 = 0.4 \quad 0 \\
 0.4 * 2 = 0.8 \quad 0 \\
 0.8 * 2 = +.6 \quad 1 \\
 0.6 * 2 = +.2 \quad 1 \\
 0.2 * 2 = 0.4 \quad 0
 \end{array}$$

$$(0.1)_{10} = 0.000110$$

$$\text{Ans: } (101.1)_{10} = (1100101.000110)_2$$

Q-5 What is  $(999.4)_{10}$  in binary expressed to six digits after the binary point without rounding?

Sol<sup>n</sup>5 By Method 2:-

Step-1:- Repeatedly divide the number to be converted by the base to be converted to, keeping track of the remainders.

Step 2:- When left with zero, the converted number

is simply the remainders arranged from left to right in the opposite order

Division	Remainder
2) 999	1
2) 499	1
2) 249	1
2) 124	0
2) 62	0
2) 31	1
2) 15	1
2) 7	1
2) 3	1
2) 1	1
0	

down to  
up

$$(999)_{10} = (1111100111)_2$$

Solution

$0.4 * 2 = 0.8$	0	
$0.8 * 2 = +.6$	1	
$0.6 * 2 = +.2$	1	(1)
$0.2 * 2 = 0.4$	0	
$0.4 * 2 = 0.8$	0	
$0.8 * 2 = +.6$	1	
$0.6 * 2 = 1.2$		↓

$$(0.4)_{10} = (0.011001)_2$$

$$\text{Ans} - (999.4)_{10} = (1111100111.011001)_2$$

Q-6 What is  $(9856)_{10}$  in base 16?

Sol<sup>n</sup> 6

Division	Remainder	
16) 9856	0	
16) 616	8	↑ down to
16) 38	B	↑ up
16) 2	2	
0		

$$(2680)_{16}$$

Ans:-  $(9856)_{10} = (2680)_{16}$

Q-7 what is  $(BF)_{16}$  in binary?

Sol<sup>n</sup> 7

Step 1: Find the equivalent decimal number of given hexadecimal number.

Step 2: Then Convert decimal number into Binary number

$(BF)_{16}$  convert to Decimal

$$\begin{aligned}(BF)_{16} &= (11 \times 16^1) + (15 \times 16^0) \\ &= (11 \times 16) + (15 \times 1) \\ &= 176 + 15 \\ &= (191)_{10}\end{aligned}$$

$$(BF)_{16} = (191)_{10}$$

Now, Convert  $(191)_{10}$  into Binary by using Method 1

256	128	64	32	16	8	4	2	1
x	1	0	1	1	1	1	1	1

Step 1  $191 - 128 = 63$

Step 2 As 63 does not divide into 64, they are populated with 0

Step 3  $63 - 32 = 31$   
 Step 4  $31 - 16 = 15$   
 Step 5  $15 - 8 = 7$   
 Step 6  $7 - 4 = 3$   
 Step 7  $3 - 2 = 1$   
 Step 8 Remainder is 0 (1-1)

$$(191)_{10} = (1011111)_2$$

Ans:-  $(BF)_{16} = (1011111)_2$

Q-8 What is  $(11.1110011)_2$  in base 16?  
 Sol<sup>n</sup>8 Firstly, convert binary into decimal.

$$\begin{aligned}
 (11.1110011)_2 &= (1 \times 2^0) + (1 \times 2^1) + (1 \times 2^{-1}) + (1 \times 2^{-2}) \\
 &\quad + (1 \times 2^{-3}) + (0 \times 2^{-4}) + (0 \times 2^{-5}) \\
 &\quad + (1 \times 2^{-6}) + (1 \times 2^{-7})
 \end{aligned}$$

$$= 2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + 0 + 0 + \frac{1}{64} + \frac{1}{128}$$

$$= 3 + 0.5 + 0.25 + 0.125 + 0 + 0 + 0.015625 + 0.0078125$$

$$= (3.8984375)_{10}$$

Decimal to hexadecimal

$$(3.8984375)_{10} \rightarrow (?)_{16}$$

Division

16) 3

Remainder

3

$$0.8984375 * 16 = 14.375 \quad 14(E)$$

$$0.375 * 16 = 6.00 \quad 6$$

$$(0.8984375)_{10} = (.E6)_{16}$$

Therefore,

$$(11.1110011)_2 = (3.E6)_{16}$$

Q-9 What is the binary result of

$$(111000)_2 - (1111)_2 ?$$

Column	1	2	3	4	5	6
Carry				1	1	
Carry	0	10	10	10	10	10
	+	+	0	0	0	0
-	1	1	1	1	1	1
	1	0	1	0	0	1

Ans:-

$$(111000)_2 - (1111)_2 = (101001)_2$$

Explanation :-

Step-1 :-  $0-1$  not possible then the zero at position  $6^{\text{th}}$  take carry from the nearest number. If the number is zero then it will take the carry from the first 1 i.e. on the  $3^{\text{rd}}$  position in given number. Take carry until we want our desire value as shown in given solution

$$\underline{\text{Step-2 :- }} 10-1 = 1$$

Step-3 :- After given its carry to  $6^{\text{th}}$  position the position  $5^{\text{th}}$  carry remains with 1 and  $1-1=0$

$$\underline{\text{Step-4 :- }} \text{Similarly, } 1-1=0$$

Step-5 :- Again  $0-1$  not possible take carry and it become 10.

$$10-1 = 1$$

$$\underline{\text{Step 6 :- }} 0-0=0$$

$$\underline{\text{Step 7 :- }} 1-0=1$$

Ans :-

$$(111000)_2 - (1111)_2 = (101001)_2$$

Q10 what is the binary result of  $(1011)_2 + (0111)_2$

Soln 10

Column	1	2	3	4	5
Carry	1	1	1		
	1	0	1	1	1
+	0	1	1	1	0
Ans :-	1	0	1	0	1

Explanation Step 1 :-  $1+0=1$

Step 2 :-  $1+1=10$

place 0 in column number 4 and carry 1 to column no. 3

Step 3:-  $1+1+1 = 11$

place 1 at column no. 3 and Carry 1 to column number 2

Step 4:-  $1+0+1 = 10$

again, 0 remains at 2 and carry 1 to column no. 1

Step 5:-  $1+1+0 = 10$

Ans:-  $(10111)_2 + (01110)_2 = (100101)_2$

Q-11 What is the sum in hexadecimal of two values  $(46FF)_{16}$  and  $(2998)_{16}$ ?

Sol<sup>n</sup> 11

Column      1    2    3    4

Carry      1    1    1

$$\begin{array}{r} 46FF \\ + 2998 \\ \hline \end{array}$$

Ans      7097

Step 1:-  $F+8 = 15+8 = 23$

23 is represented as 17 in hexadecimal

place 7 at column number 4 and carry 1 to column no. 3

Step 2:-  $1+F+9 = 1+15+9 = 25$

25 is represented as 19 in hexadecimal  
place 9 at column no. 3 and carry 1 to column no. 2

Step 3:-  $1+6+9 = 16$

16 is represented as 10 in hexadecimal  
place 0 at column 2 and carry 1 to column 1

Step 4:-

$$1+4+2 = 7$$

Ans:-  $(46FF)_{16} + (2998)_{16} = (7097)_{16}$

Q-12 What is  $(FEB1)_{16} + \cancel{(2C08)}_{16}$  expressed in decimal (base 10)?

Column	1	2	3	4
Carry	1	1		
	F	E	B	1
	<u>+ 2</u>	C	D	8
n	<u>1</u>	2	B	8
			<u>9</u>	

Step 1:-  $1+8=9$

Step 2:-  $B+D = 11+13 = 24$

24 is represented as 18 in hexadecimal  
place 8 at column no. 3 and carry 1 to column no. 2

Step 3:-  $1+E+C = 1+\cancel{15}+12 = \cancel{27} 27$

27 is represented as 1B  
place B at column 2 and carry 1 to column 1

Step 4:-  $1+f+2 = 1+15+2 = 18$

18 is represented as 12 in hexadecimal

$$(FEB1)_{16} + (2CD8)_{16} = (12B89)_{16}$$

Convert expression into Decimal

$$\begin{aligned}
 (12389)_{16} &= (1 \times 16^4) + (2 \times 16^3) + (8 \times 16^2) + (8 \times 16^1) + (9 \times 16^0) \\
 &= (1 \times 65536) + (2 \times 4096) + (11 \times 256) + (8 \times 16) + (9 \times 1) \\
 &= 65536 + 8192 + 2816 + 128 + 9 \\
 &= (76681)_{10}
 \end{aligned}$$

Ans:  $(76681)_{10}$