Name: Obaid ULLAH
Roll No: 24K-0793

Date: D D M M Y Y

1. $(1073)_{10} \rightarrow$ binary

2	1073	
2	536	1
2	268	0
2	134	0
2	67	0
2	33	1
2	16	1
2	8	0
2	4	0
2	2	0
2	1	0

$(10000110001)_2$

2. $(81)_{10} \rightarrow$ binary

2	81	
2	40	1
2	20	0
2	10	0
2	5	0
2	2	1
	1	0

$(1010001)_2$

3. $(27.315)_{10} \rightarrow$ binary

2	27	
2	13	1
2	6	1
2	3	0
	1	1

$27 = (11011)_2$

$(11011.0101000101)_2$

$0.315 \times 2 = 0$
$0.63 \times 2 = 1$
$0.26 \times 2 = 0$
$0.52 \times 2 = 1$
$0.04 \times 2 = 0$
$0.08 \times 2 = 0$
$0.16 \times 2 = 0$
$0.32 \times 2 = 0$
$0.64 \times 2 = 1$
$0.28 \times 2 = 0$
$0.56 \times 2 = 1$

4.) a)
$$\begin{array}{r} 11010 \\ +\ 11100 \\ \hline (110110)_2 \end{array}$$

b)
$$\begin{array}{r} 101011 \\ +\ 110101 \\ \hline (1100000)_2 \end{array}$$

5) a)
$$\begin{array}{r} 10110 \\ -\ 100100 \\ \hline (001010)_2 \end{array}$$

b)
$$\begin{array}{r} 1001100 \\ -\ 110 \\ \hline (100110)_2 \end{array}$$

Q6) a) $(FA25)_{16} \rightarrow (\quad)_8$

$15 \times 16^3 + 10 \times 16^2 + 2 \times 16^1 + 5 \times 16^0$
$(64037)_{10} \rightarrow (175045)_8$

b) $(F920)_{16} \longrightarrow (174440)_8$

$15 \times 16^3 + 9 \times 16^2 + 2 \times 16^1 + 0 \times 16^0$
$(63776)_{10} \rightarrow (174440)_8$

c) $(1100)_{16}$

$1 \times 16^3 + 1 \times 16^2$
$(4352)_{10} \longrightarrow (10400)_8$

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7. convert octal to hexadecimal

a) $(777)_8 \rightarrow (1FF)_{16}$

step 1 → binary

7 7 7

$(111\ 111\ 111)_2$

step 2 → hexa

1 1111 1111

1 F F

b) $(123)_8 \rightarrow (53)_{16}$

step 1

1 2 3

$(001\ 010\ 011)_2$

step 2

0 1010 0011

0 5 3

c) $(635)_8 \rightarrow (19D)_{16}$

6 3 5

110 011 101

1 1001 1101

1 9 D

Q8) a) −83 → binary

83 → 1010011

Sign bit (−ve → 1)

$-83 \rightarrow (1\ 1010011)_2$

b) +101 → binary

101 → 1100101

sign bit (+ve → 0)

$+101 \rightarrow (01100101)_2$

c) −114 → binary

114 → 1110010

↳ (−ve → 1)

$-114 \rightarrow (1\ 1110010)_2$

Q9) a) − 66 → binary

66 → 1000010 (−ve → 1)

−66 → 1 1000010

For 1's compliment :- fliping

$(10111101)_2$

b) +116 → binary

↳ 1110100 (0 → +ve)

+116 → 0 1110100

c) −99 → binary

↳ 99 → 1100011 (−ve → 1)

$-99 \rightarrow (1\ 1100011)_2$

1's compliment (flip)

$(10011100)_2$

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Q10) a) -59

59 → 00111011

1's comp

1's → 11000100

2's → 11000100

\+ 1

11000101

(-59) → $(11000101)_2$

b) +102

102 → 01100110

$(01100110)_2$

c) 126

↳ 126 → 01111110

1's comp

↳ 10000001

2's comp

10000001

\+ 1

$(10000010)_2$

Q11)

a) 1001101

∴ signed so 1 = -ve

mag = 0011101

↳ decimal

$0\times2^6 + 0\times2^5 + 1\times2^4 \times 1\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0$

0 + 0 + 16 + 8 + 4 + 0 + 1

29

$\boxed{-29}$ Ans

b) 01110100

1. ↳ signed = 0 → +ve

mag = 1110100

↳ $1\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 + 0\times2^0$

64 + 32 + 16 + 4

$\boxed{= 116}$ → $\boxed{+116}$ Ans

c) 10111011

1. sign bit = 1 (-ve)

mag = 0111011

↳ $0\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$

0 + 32 + 16 + 8 + 0 + 2 + 1

59

$\boxed{-59}$ Ans

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Q12)

a) 10111001

↳ signed bit (1) → -ve

↳ mag in 1's form

10111001 → 01000110

↳ decimal

$0\times2^8 + 1\times2^7 + 1\times2^2 + 1\times2^1$

0 + 128 + 4 + 2

134

$\boxed{-134}$ Ans

b) 01100100

1. sign bit (0) (+ve)

↳ no 1's

↳ decimal

$1\times2^6 + 1\times2^5 + 1\times2^2$

64 + 32 + 4

$\boxed{100}$ Ans

c) 10111101

↳ sign bit (1) (-ve)

↳ mag in 1's form

10111101 → 01000010

$1\times2^6 + 1\times2^1$

64 + 2 = 66

$\boxed{-66}$ Ans

Q13) a) 10101100

↳ S.B → 1 (-ve)

↳ mag in 2's

10101100 → 01010011 (1's)

\+ 1

01010100

↳ decimal

$1\times2^6 + 1\times2^4 + 1\times2^2$

64 + 16 + 4

84

$\boxed{-84}$

b) 01111001

↳ S.B → 0 (+ve)

no 2's

↳ $1\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 1\times2^0$

64 + 32 + 16 + 8 + 1

$\boxed{121}$

c) 11110000

↳ S.B → 1 (-ve)

↳ mag in 2's

11110000 → 00001111 (1's)

+1

00010000

↳ decimal 1×2^4

16

$\boxed{-16}$

Q14) a) -38 & -27

→ 38 →(binary) 00100110

1's comp → 11011001

2's 〃 + 1

11011010

→ 27 →(binary) 00011011

1's comp 11100100

2's 〃 + 1

11100101

11011010

11100101

$\cancel{1}(10111111)_2$

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Q14) b) 59 & -39

•) 59 → (binary) 00111011

•) -39 → (bin) 00100111

1's comp 11011000

2's " + 1

11011001

00111011

11011001

$1(00010100)_2$

$(10100)_2$ Ans

c) -58 & 65

•) 58 → bin → 00111010

1's comp → 11000101

\+ 1

11000110

65 → bin → 01000001

11000110

01000001

x00000101

$(00000111)_2$

d) -102 & -85

•) 102 → bin → 01000001

1's comp → 10111110

2's comp → + 1

10111111

•) 85 → 01010101

1's comp → 10101010

2's comp → + 1

10101011

10111111

\+ 10101011

$1(01101010)_2$ Ans

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Q15)

↳ Binary coded decimal (bcd) ~~pd~~ represents each decimal digit (0-9) using 4-bit binary insted of converting the entire number into binary

example :-

- decimal 25 → BCD: 00100101

whereas regular binary : 11001

Difference :-

↳ BCD makes it easier to handle decimal no. but is less memory efficient then regular binary.

↳ used in application where human readable decimal values are needed

Q16) BCD used in

1) Banking → prevents rounding errors in transactions
2) seven segment display → found in fuelpump, elevator
3) Industrial automation → used in plcs for numeric control
4) calculators → handles decimal math accurately
5) digital clocks & watches → Easy time display.

Q17)

a) 57

BCD: 01010111

b) 109

BCD: 0001 0000 1000

Q18)

a) 7+9

BCD ⇒ 0111 + 1001

  0111
+ 1001
00010000

BCD:: 0001000 = $(16)_{10}$

b) 25+58

BCD

25 → 0010 0101

  0101 1000
  0111 1101
+   0110
  10000010

$(10000010) = (83)_{10}$

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c) 76+84

BCD

76 → 0111 0110

84 → + 1000 0100

1111 1010

+ 0110 0110

000 1011 0000 0

BCD → 000101100000 = $(160)_{10}$

d) 89+68

BCD

89 → 1000 1001

68 → 0110 1000

1111 0001

+ 0110 0000

000 10101 0001

~~0001 1010~~ 0

BCD (0001 0101 0111)

Q19)

a) 110011001

no.of 1's → 5 (odd)

error in code

b) 10111111010001010

no.of 1's → 10 (even)

no error

c) 01010110

no. of 1's → 5 (odd)

error

d) 0111000100101101

no.of 1's → 8 (even)

no error

Q20)

a) 0110

no. of 1 = 2 (even)

↳ odd → add 1

$\boxed{10110}$ Ans

b) 101101

↳ no. of 1's = 4 (even)

odd → add 1

1101101

c) 1010101111

no.of 1's (9) odd

already odd

(01011010111111) Ans

d) 10001110010 1

↳ no. of 1's ~~odd~~ 6 (even)

odd → add 1

(110001110010 1) Ans