Lab-6

Q1.)

(1)

2	51	
2	25	1
2	12	1
2	6	0
2	3	0
2	1	1
	0	1

2	77	
2	38	1
2	19	0
2	9	1
2	4	1
2	2	0
2	1	0
	0	1

8-bit representation

$(51)_{20} = 0011\,0011$ $\qquad$ $(77)_{20} = 01001101$

$$
\begin{array}{r}
0011\,0011 \\
+\ 0100\,1101 \\
\hline
(1000\,0000)_2
\end{array}
$$

$= (128)_{10}$

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(2)

2	53	
2	26	1
2	13	0
2	6	1
2	3	0
2	1	1
	0	1

2	112	
2	56	0
2	28	0
2	14	0
2	7	0
2	3	1
2	1	1
	0	1

$53 = 00110101$ $\quad$ $112 = 01110000$

Complement of $112 = (10001111 + 00000001)$

$= 10010000$
(-112)

$$53 + (-112) = \begin{array}{r} 00110101 \\ +\ 10010000 \\ \hline 11000101 \end{array}$$

$\Rightarrow -2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0$

$= -59$

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(3)

2	35	
2	17	1
2	8	1
2	4	0
2	2	0
2	1	0
	0	1

2	23	
2	11	1
2	5	1
2	2	1
2	1	0
	0	1

35 = 00100011

23 = 00010111

$$(-23) = \left(\begin{array}{r} 11101000 \\ +\ 00000001 \end{array}\right)$$

$$= 11101001$$

$$35 + (-23) = \begin{array}{r} 00100011 \\ +\ 11101001 \\ \hline 1(00001100) \end{array}$$

Out of 8-bit

$$= (12)_{10}$$

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(4)

2	87	
2	43	1
2	21	1
2	10	1
2	5	0
2	2	1
2	1	0
	0	1

2	12	
2	6	0
2	3	0
2	1	1
	0	1

12 = 00001100

87 = 01010111

$$
\begin{array}{rr}
87+12 = & 01010111 \\
+ & 00001100 \\
\hline
 & 01100011 \\
 & = (99)_{10}
\end{array}
$$

(5)

2	75	
2	37	1
2	18	1
2	9	0
2	4	1
2	2	0
2	1	0
	0	1

2	54	
2	27	0
2	13	1
2	6	1
2	3	0
2	1	1
	0	1

54 = 00110110

75 = 01001011

$$-75 = 10110100$$
$$+\ 00000001$$
$$\overline{10110101}$$

$$-54 = 11001010$$

$$(-75) + (-54) = \quad 10110101$$
$$+\ 11001010$$
$$\overline{\cancel{1}\,01111111}$$

Out of 8-bit

The answer ~~shol~~ should be -129 but it cannot be represented in 8-bit form because it has range of -128 to 127

Q2.) ① $(1)_{10} = (00000001)_2 = 1.0 \times 2^0$

Sign $\rightarrow$ +ve : 0

Exponent $\rightarrow$ 0+127 : $(127)_{10}$

$= (01111111)_2$

mantissa : $\underbrace{000\cdots0}_{23\ \text{zeros}}$

Output : $0 - 01111111 - \underbrace{00\cdots0}_{23\ \text{zeros}}$

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(2) $(12.375)_{10} = (00001100.011)_2$

$= 1.100011 \times 2^3$

Sign → +ve : 0

Exponent → $127+3 : (130)_{10}$

$= (10000010)_2$

mantissa : $1\,0001100\underbrace{--0}_{17\text{ zeroes}}$

Output : $0 - 10000010 - 10001100\underbrace{...0}_{17\text{ zeroes}}$

(3) $(0.25)_{10} = (00000000.01)_2$

$= 1.0 \times 10^{-12}$

matissa

Sign : -ve : 1

Exponent → $127-2 : (125)_{10}$

$= (01111101)_2$

matissa => $\underbrace{000--0}_{23\text{ zeros}}$

Output → $1 - 01111101 - \underbrace{000 ... 0}_{23}$