CW3 - SOLUTIONS

① (a)

1	1010101
(2)	101010
4	10101
(8)	1010
16	101
(32)	10
64	1
85	

(b)

1	313
(10)	156
(100)	78
1000	39
10000	19
100000	9
(1000000)	4
(10000000)	2
100000000	1
100111001	

② (a)
$$\begin{array}{r} 111011 \\ +\ldots111 \\ \hline 1000010 \end{array}$$

(b)
$$\begin{array}{r} 111010 \\ +\ldots1010 \\ \hline 1000100 \end{array}$$

(c)
$$\begin{array}{r} 1010 \\ +\ 1101 \\ \hline 10111 \\ +\ 1011 \\ \hline 100010 \\ +\ 1111 \\ \hline 110001 \end{array}$$

(d)
$$\begin{array}{r} 01110 \\ +\ 10111 \\ \hline 100101 \end{array}$$

Modulo 2^5,

$01110 + 10011 \equiv 00101$

③ (a)

11011	101
(110110)	10
1101100	1
10000111	

(b)

(1101)	1010
11010	101
(110100)	10
1101000	1
10000010	

(c)

01111	10101
(11110)	01010
11100	00101
(11000)	00010
10000	00001
11011	

Modulo 2^5,

$01111 \cdot 10101 \equiv 11011$

④ (a)

33	21
(66)	10
132	5
(264)	2
528	1
693	

(b)

(141)	66
282	33
(564)	16
(1128)	8
(2256)	4
(4512)	2
9024	1
9306	

⑤ (a)
$$\begin{array}{r} 1'00'1'0'0 \\ -\quad 1011 \\ \hline 011001 \end{array}$$

(b)
$$\begin{array}{r} 1'00'0'0'0 \\ -\quad 11110 \\ \hline 000010 \end{array}$$

(c) $0110110 - 0011011 \equiv 0110110 + (1111111 + 1) - 0011011$

$\equiv 0110110 + (1111111 - 0011011) + 1$

$\equiv 0110110 + 1100100 + 1 \equiv$
$$\begin{array}{r} 0110110 \\ +1100101 \\ \hline 10011011 \end{array} \equiv 0011011$$

(d) $101101 - 110011 \equiv 101101 + (111111 - 110011) + 1$

$\equiv 101101 + 001100 + 1 \equiv$
$$\begin{array}{r} 101101 \\ +001101 \\ \hline 111010 \end{array} \equiv 111010$$