1.

Synchronous Sequential System
⇒ State updated at discrete times.

Asynchronous Sequential System
⇒ State updated at any time.

2. A a. 1101011_2

$1+2+8+32+64=107$

b. 110101101_2

$1+4+8+32+128+256=429$

c. 1110010_2

$2+16+32+64=114$

d. 825

2|825
2|412 ... 1
2|206 ... 0
2|103 ... 0
2|51 ... 1
2|25 ... 1
2|12 ... 1
2|6 ... 0
2|3 ... 0
1 ... 1

1100111001_2

e 514

2|514
2|257 ... 0
2|128 ... 1
2|64 ... 0
2|32 ... 0
2|16 ... 0
2|8 ... 0
2|4 ... 0
2|2 ... 0
1 ... 0

1000000010_2

B a. 1011100010111_2

5 12 8 11

5C8B

b. 1110011111110111_2

7 3 15 7

73F9

c. 1110011010110_2

1 12 13 6

1CD6

d. 3B2A

$10+2\times16+11\times16^2+3\times16^3=15146$

e. FEA9

$9+10\times16+14\times16^2+15\times16^3=65193$

3. a. 000111 + 010111

$$\begin{array}{r} 000111 \\ +\ 010111 \\ \hline 011110 \end{array}$$

$7+23=30$

b. 110000 + 010010

$$\begin{array}{r} 110000 \\ +\ 010010 \\ \hline (1)000010 \end{array}$$

$48+18=66$ cannot be stored in 6 bits, will overflow.

c. 100011 + 100111

$$\begin{array}{r} 100011 \\ +\ 100111 \\ \hline (1)001010 \end{array}$$

$35+39=74$ cannot be stored in 6 bits, will overflow.

d. 010011 + 101111

$$\begin{array}{r} 010011 \\ +\ 101111 \\ \hline (1)000010 \end{array}$$

$19+47=66$ cannot be stored in 6 bits, will overflow.

e. 010011 + 011100

$$\begin{array}{r} 010011 \\ +\ 011100 \\ \hline 101111 \end{array}$$

$19+28=47$

4. a, +15

2|15 ···1
2|7 ···1
2|3 ···1
1 ···1

+15 = 001111

b, -13

13 = 001100

-13 = 110100

-13 : 110011 + 1 = 110100

c. 0

000000

d. -32

100000 → 011111 + 1 = 100000

-32 = 100000

e, +32

2의 보수는 $-2^{n-1} \sim 2^{n-1}-1$ 까지 나타내므로

6bits 2의 보수에서 32는 저장할 수 없다.

5. a. 111001

111001 − 1 = 111000 → 000111 = 7

-7

b, 100110

100110 − 1 = 100101 → 011010 = 26

-26

c. 111111

111110 → 000001 = 1

-1

d. 011011 = 27

e 010110 = 22

6. a, 111010, 000111

111010
000111
1 000001

ignored carry

1

b. 101010, 100110

101010
100110
(1)001000

overflow

-48

100111 1
011 0000

c. 111001, 110001

111001
110001
(1)101010

ignored carry

-22

101001
010110

d. 101100, 101100

101100
101100
(1)011000

overflow

010111

-40

101000

e. 100110, 001100

100110
001100
110010

111001

-14

001110

7. a. $f = bc' + b'c + ac$

$g = (a+c)(a'+b+c')$

a	b	c	bc'	b'c	ac	f	a+c	a'+b+c'	g
0	0	0	0	0	0	0	0	1	0
0	0	1	0	1	0	1	1	1	1
0	1	0	1	0	0	1	0	1	0
0	1	1	0	0	0	0	1	1	1
1	0	0	0	0	0	0	1	1	1
1	0	1	0	1	1	1	1	0	0
1	1	0	1	0	0	1	1	1	1
1	1	1	0	0	1	1	1	1	1

f and g are not equal

b. $f = a'b + ac' + a'bd'$

$g = ad' + a'bc + a'bd'$ f and g are not equal

a	b	c	d	a'b	ac'	a'bd'	f	ad'	a'bc	a'bd'	g
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0
0	1	0	0	1	0	1	1	0	0	1	1
0	1	0	1	1	0	0	1	0	0	0	0
0	1	1	0	1	0	1	1	0	1	1	1
0	1	1	1	1	0	0	1	0	1	0	1
1	0	0	0	0	1	0	1	1	0	0	1
1	0	0	1	0	1	0	1	0	0	0	0
1	0	1	0	0	0	0	0	1	0	0	1
1	0	1	1	0	0	0	0	0	0	0	0
1	1	0	0	0	1	0	1	1	0	0	1
1	1	0	1	0	1	0	1	0	0	0	0
1	1	1	0	0	0	0	0	1	0	0	1
1	1	1	1	0	0	0	0	0	0	0	0

8. a. $x'z + xy'z + xyz$

$= x'z + xz(y+y')$ P8a

$= x'z + xz$ P5a

$= z(x'+x)$ P8a

$= z$ P5a

b. $x'y'z' + x'y'z + xy'z + xyz'$

$= x'y'(z+z') + x(y'z+yz')$ P8a

$= x'y' + x(y'z+yz')$ P5a

$= (x+y')(x'+y'z+yz')$ P14a

$= xx' + xy'z + xyz' + y'x' + y'z + yyz$ P8a, P8b

$= xy'z + xyz' + x'y' + y'z$ P5b

$= y'z + xyz' + x'y'$ P12a

$= y'(x'+z) + xyz'$ P1a, P8a

$= y'(xz)' + y(xz')$ P11b

c. $(x+y+z)(x+y+z')(x+y'+z)(x+y'+z')$

$= [x+y+zz'][x+y'+zz']$ P8b

$= (x+y)(x+y')$ P5a

$= x$ P9b

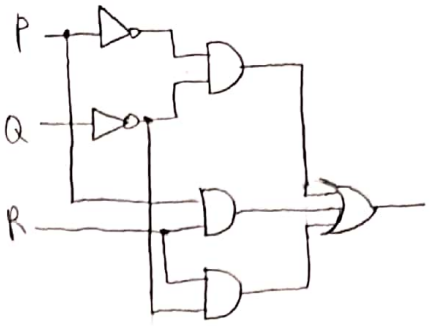
d. $(a+b+c)(a+b'+c)(a+b'+c')(a'+b'+c')$

$= [a+c+bb'][b'+c'+aa']$ P8b

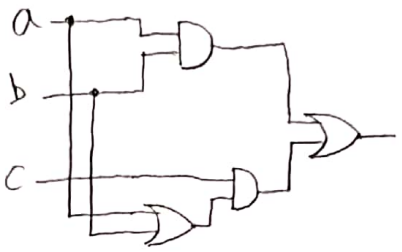
$= (a+c)(b'+c')$ P5a

$= b'c + ac'$ P14a

9. a. $P'Q' + PR + Q'R$



b. $ab + c(a+b)$



10. a.

$a'bc + b'd + ac'$

합의 형태이며 가장 간략하다.

b. $(a'+b+c)(b'+d)(a+c')$

$= (a'+b+c)(a+c')(b'+d)$

$= [a(b+c) + a'c'](b'+d)$ 가장 간단한 형태

$= ab'(b+c) + ad(b+c) + a'b'c' + a'c'd$

$= ab'c + abd + acd + a'b'c' + a'c'd$

합의 형태