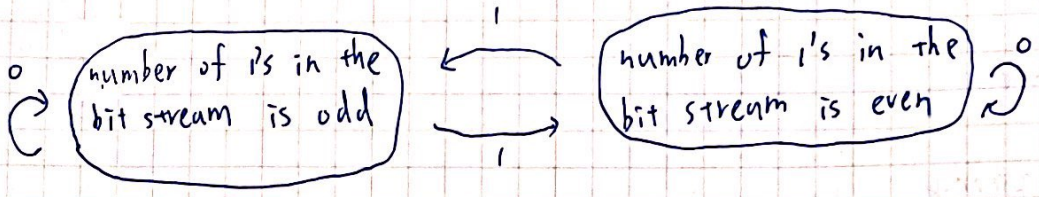
0814823 陳彥羽

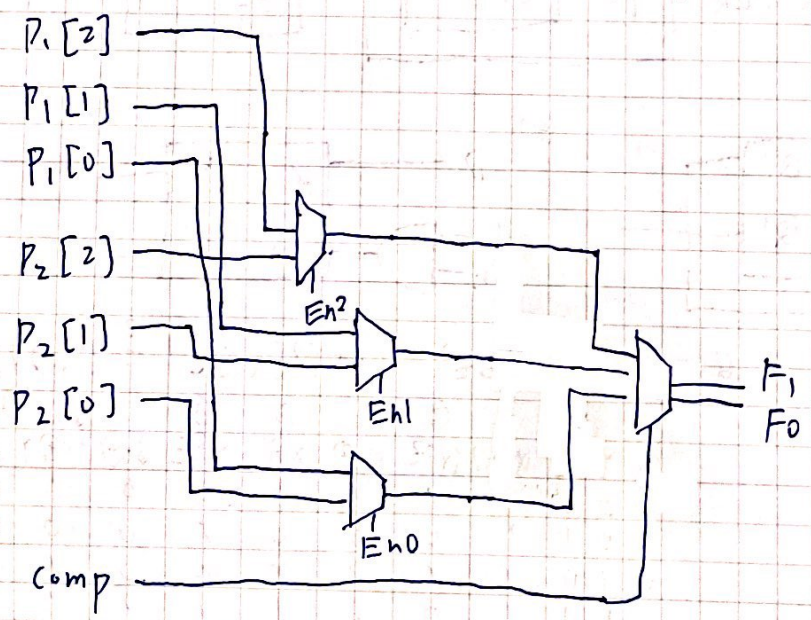
1.

(a) state graph:



(b)

2.



3. (a)

$118_{10} = 1110110_2$

$-118_{10} = 11000101_2$

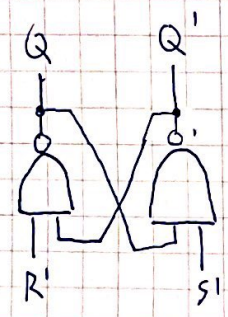
(b)

p	q	~p	~p or q
0	0	1	1
0	1	1	1
1	0	0	0
1	1	0	1

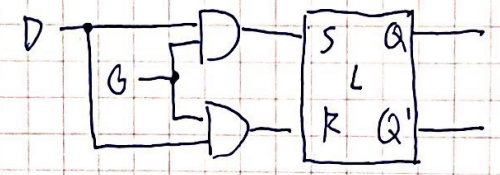
$p=1 \rightarrow q=1$

$p=0 \rightarrow q=X$

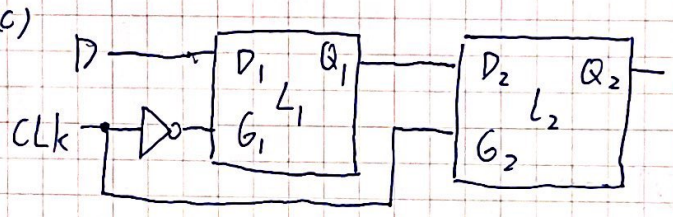
4. (a)



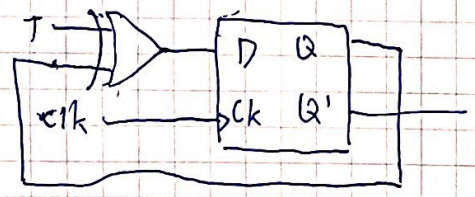
(b)



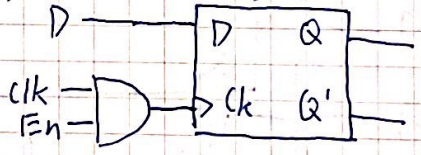
(c)



(d)



(e)



5.

	A	B	C	D	E	F	Z
	0	0	0	1	1	0	1
	0	0	1	0	0	1	1
x	0	1	0	X	X	X	1
	0	1	1	1	1	1	1
	1	0	0	1	0	0	0
	1	0	1	1	0	1	1
x	1	1	0	X	1	X	0
	1	1	1	0	0	0	0

$Z = DE + F$

6. $(X'+Y')(X \equiv Z) + (X+Y)(X \oplus Z) \stackrel{?}{=} (X \oplus Y) + Z'$

X	Y	Z	① $(X'+Y')$	② $(X \equiv Z)$	①·②	③ $X+Y$	④ $X \oplus Z$	③·④	①·②·(③+④)	⑤ $X \oplus Y$	⑥ Z'	⑤+⑥
0	0	0	1	1	1	0	0	0	1	0	1	1
0	0	1	1	0	0	0	1	0	0	0	0	0
0	1	0	1	1	1	1	0	0	1	1	1	1
0	1	1	1	0	0	1	1	1	1	1	0	1
1	0	0	1	0	0	1	1	1	1	1	1	1
1	0	1	1	1	1	1	0	0	1	1	0	1
1	1	0	0	0	0	1	1	1	1	0	1	1
1	1	1	0	1	0	1	0	0	0	0	0	0

完全一樣，因此兩式相等成立

7. $F = B + C\left[(A'+B)'B\right]' = B + C\left[(A'+B) + B'\right] = B + C$

8.

Q	Q^+	U	V
0	0	X	0
0	1	1	1
1	0	1	1
1	1	0	0

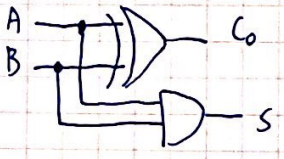
9.

(a)

A	B	C_o	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

$C_o = AB$

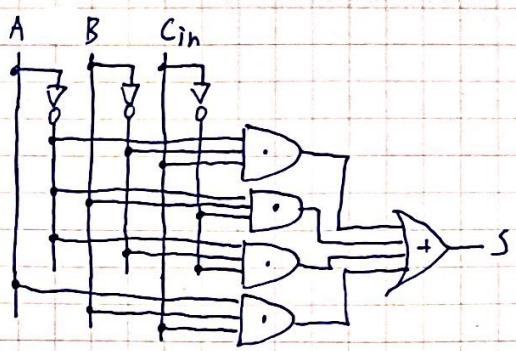
$S = A \oplus B$



(b)

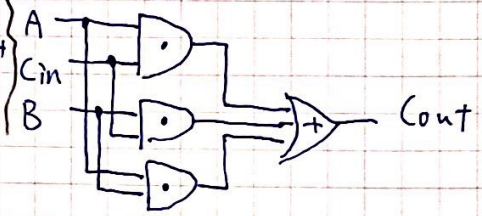
A	B	C_{in}	C_o	S
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$S = A'B'C_{in} + A'B\,C_{in}' + AB'C_{in}' + AB\,C_{in}$

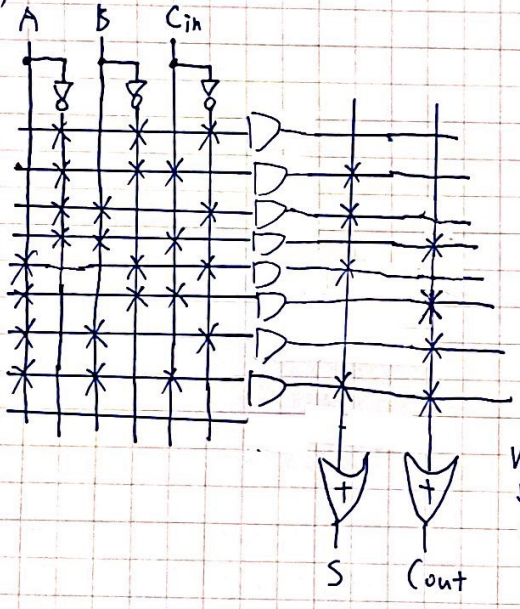


(c)

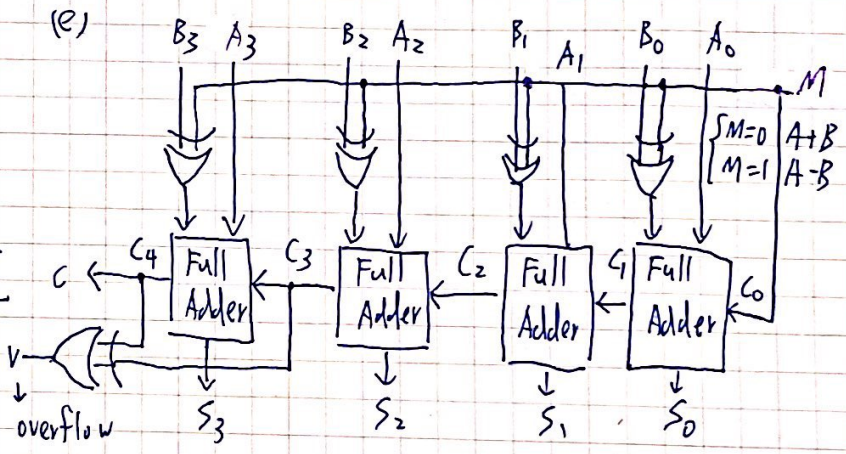
$C_{out} = A\,C_{in} + B\,C_{in} + AB$



(d)



(e)



(f)

(b): sum: 2+5+5 = 12ns C_{out}: 5+5 = 10ns

(c): Half adder delay: { C_o: 5ns, S: 2+5+5 = 12ns }

sum: 12ns × 2 = 24ns C_{out}: 5+5 = 10ns

(d) sum: 2+5+5 = 12ns C_{out}: 2+5+5 = 12ns ✗

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11. ① : 0/1 ② 1/0 ③ 0/0 ④ 0/0 ⑤ A

(1)

(2)

Present state	Next state X=0	Next state X=1	Output Z X=0	Output Z X=1
A	B	C	1	0
B	D	~~F~~ E	1	0
C	~~E~~	~~G~~ E	0	1
D	H	~~K~~ H	0	1
E	~~I~~ H	M	1	0
~~F~~	~~J~~ H	~~N~~ M	1	0
~~G~~	~~K~~ H	~~P~~ M	1	0
H	A	A	0	1
~~I~~	A	A	0	1
~~J~~	A	X	0	X
~~K~~	A	X set to A	0	X
~~L~~	A	X	0	X set to 1
M	A	X	1	X
~~N~~	A	X	1	X
~~P~~	A	X	1	X

Present state	Next state X=0	Next state X=1	Z X=0	Z X=1
A	B	C	1	0
B	D	E	1	0
C	E	E	0	1
D	H	H	0	1
E	H	M	1	0
H	A	A	0	1
M	A	X	1	X

(3)

X	A	B	C	A^+	B^+	C^+	Z
0	0	0	0	0	0	0	
0	0	0	1				
0	0	1	0				
0	0	1	1				
0	1	0	0				
0	1	0	1				
0	1	1	0				
0	1	1	1				
1	0	0	0				
1	0	0	1				
1	0	1	0				
1	0	1	1				
1	1	0	0				
1	1	0	1				
1	1	1	0				
1	1	1	1				