

1. F

6. F

2. F

7. F

3. T

8. T

4. F

9. T

5. T

10. T

1.

$$(a) (615, 3)_8 = (\underline{110} \underline{001} \underline{101} . \underline{011})_2$$

$$= (\underline{0001} \underline{1000} \underline{1101} . \underline{0110})_2$$

$$= (187.6)_{16}$$

(b)

$$0.1875 \times 2 = 0.375$$

$$0.375 \times 2 = 0.75$$

$$0.75 \times 2 = 1.5$$

$$0.5 \times 2 = 1$$

取小數點前的整數

$$(0.1875)_{10} = (0.0011)_2$$

$$(25.1875)_{10} = (11001.0011)_2$$

$$= (\underline{011} \underline{001} . \underline{001} \underline{100})_2$$

$$= (31.14)_8$$

(c)

$$10101010$$

2.

$$13 = (1101)_2$$

$$49 = (110001)_2$$

$$28 = (11100)_2$$

$$-13 = (1110011)_2$$

$$-49 = (1001111)_2$$

(a)

$$\begin{array}{r} 1110011 \\ + 1001111 \\ \hline 11000010 \end{array}$$

$$\Rightarrow -(111110) = -62$$

(b)

$$\begin{array}{r} 0011100 \\ + 1001111 \\ \hline 1101011 \end{array}$$

$$\Rightarrow -(010101) = -21$$

Overflow detection in hardware:

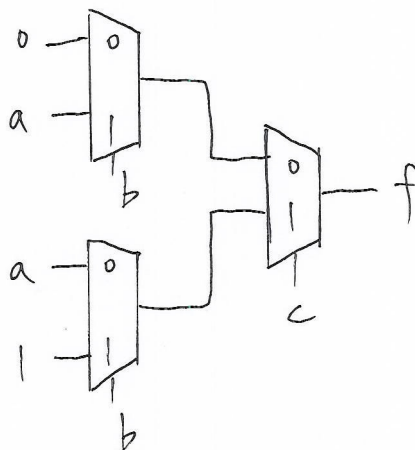
Compare the carry into the last bit with the carry out of the last bit.

If they are different, there is overflow.

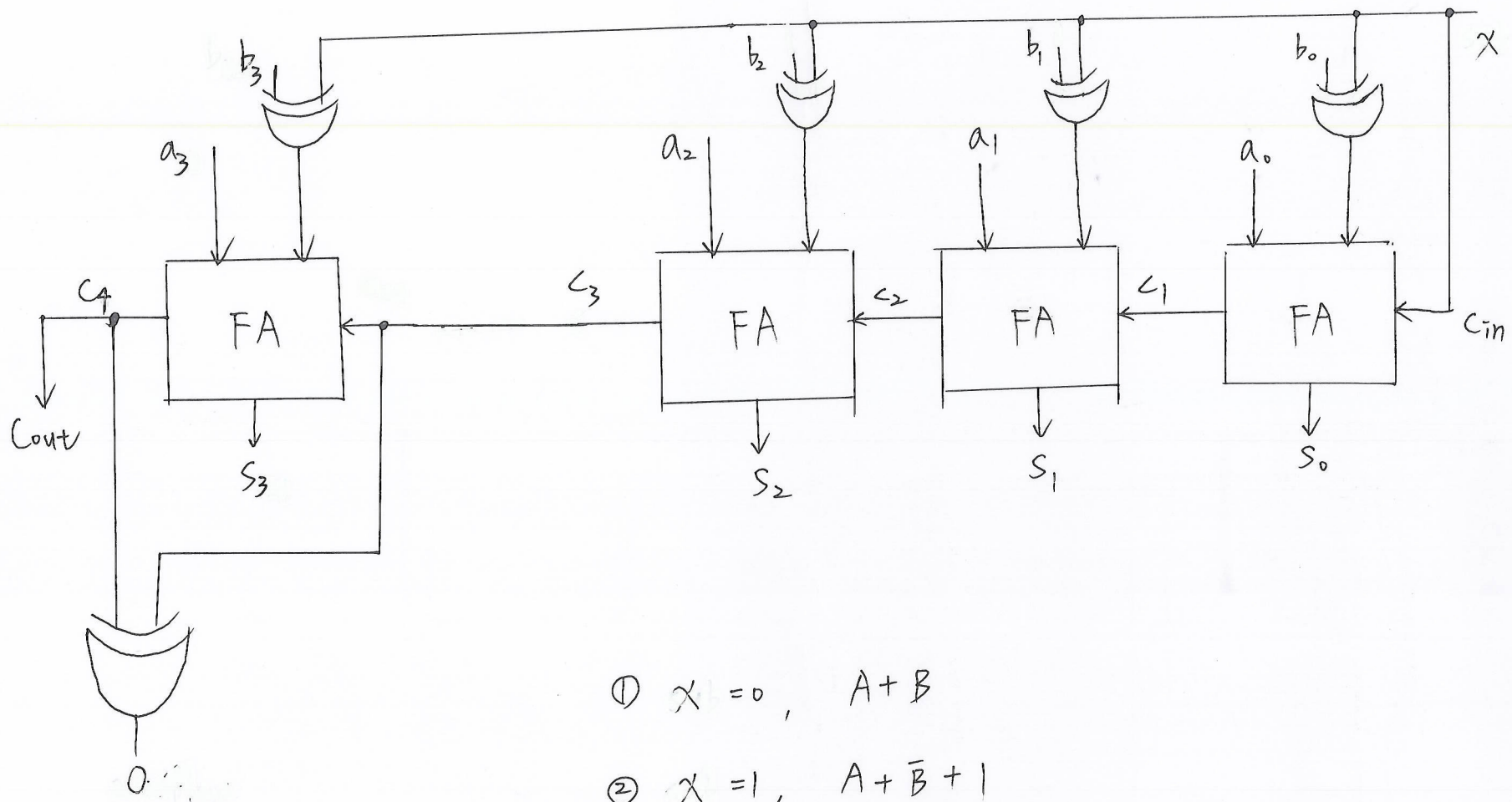
$\therefore$  (a) (b) both have "no" overflow.

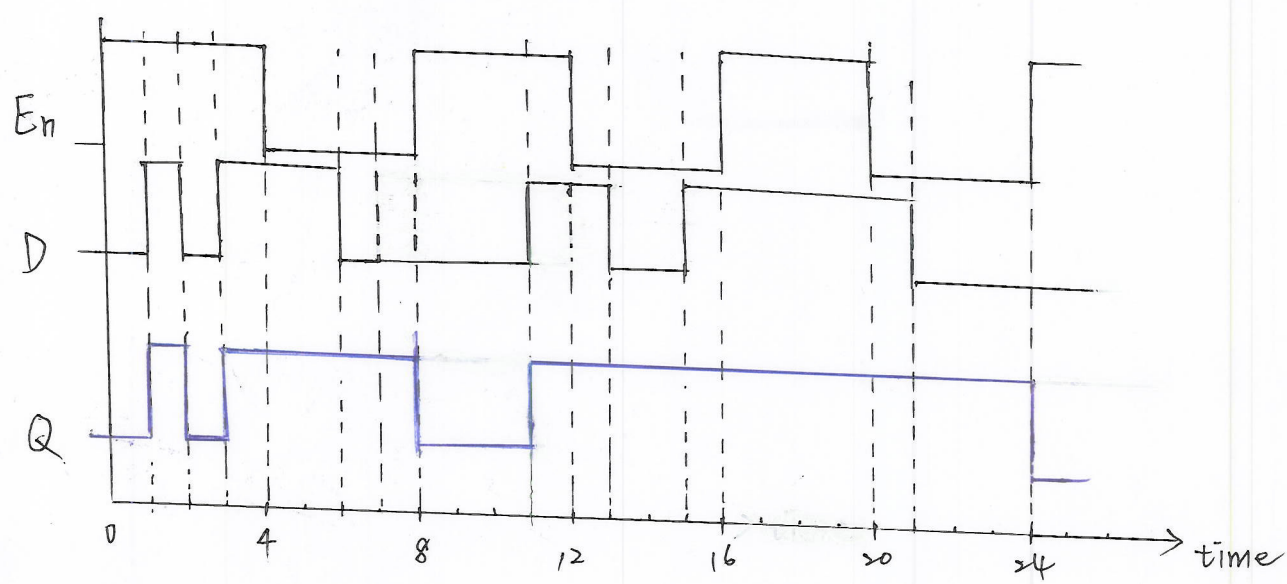
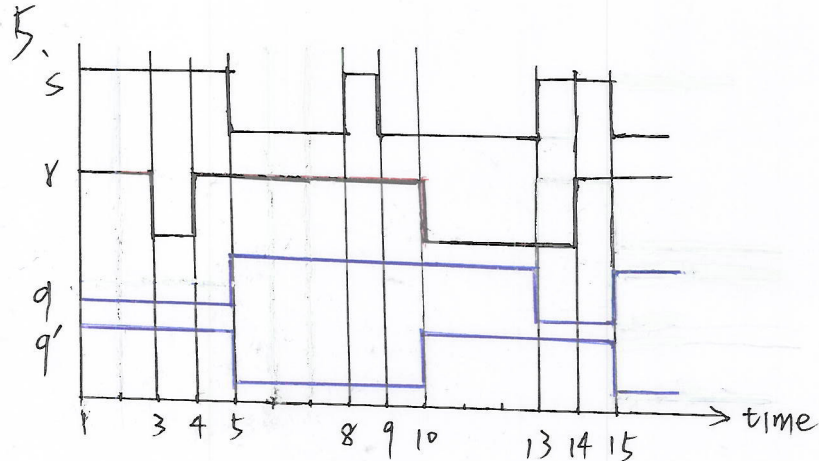
3.

c	b	a	f	
0	0	0	0	0
0	0	1	0	
0	1	0	0	a
0	1	1	1	
1	0	0	0	a
1	0	1	1	
1	1	0	1	
1	1	1	1	1



4.





6.

ps			ns		
$s_2$	$s_1$	$s_0$	$ns_2$	$ns_1$	$ns_0$
0	0	0	0	0	1
0	0	1	1	0	1
0	1	0	x	x	x
0	1	1	0	0	0
1	0	0	x	x	x
1	0	1	0	1	1
1	1	0	x	x	x
1	1	1	x	x	x

state table

$s_1 s_0$		$ns_2$	
$s_2$	$s_0$	$s_2$	$s_0$
0	1	0	x
x	0	x	x

$s_1 s_0$		$ns_1$	
$s_2$	$s_0$	$s_2$	$s_0$
0	0	0	x
1	1	x	x

$s_1 s_0$		$ns_0$	
$s_2$	$s_0$	$s_2$	$s_0$
1	1	0	x
x	1	x	x

$$ns_2 = s_0 \wedge \bar{s}_1 \wedge \bar{s}_2$$

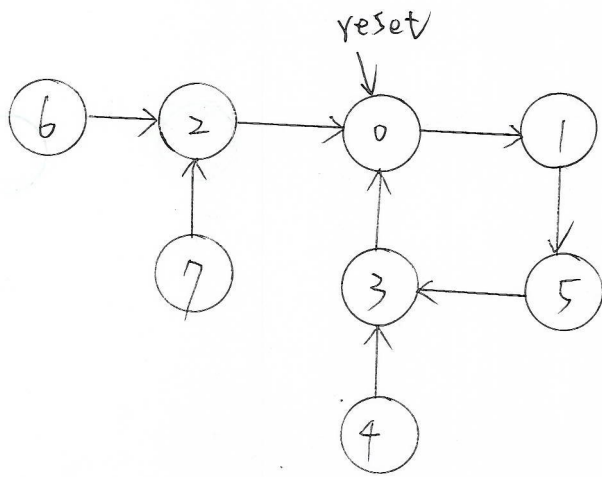
$$ns_1 = s_2$$

$$ns_0 = \bar{s}_1$$

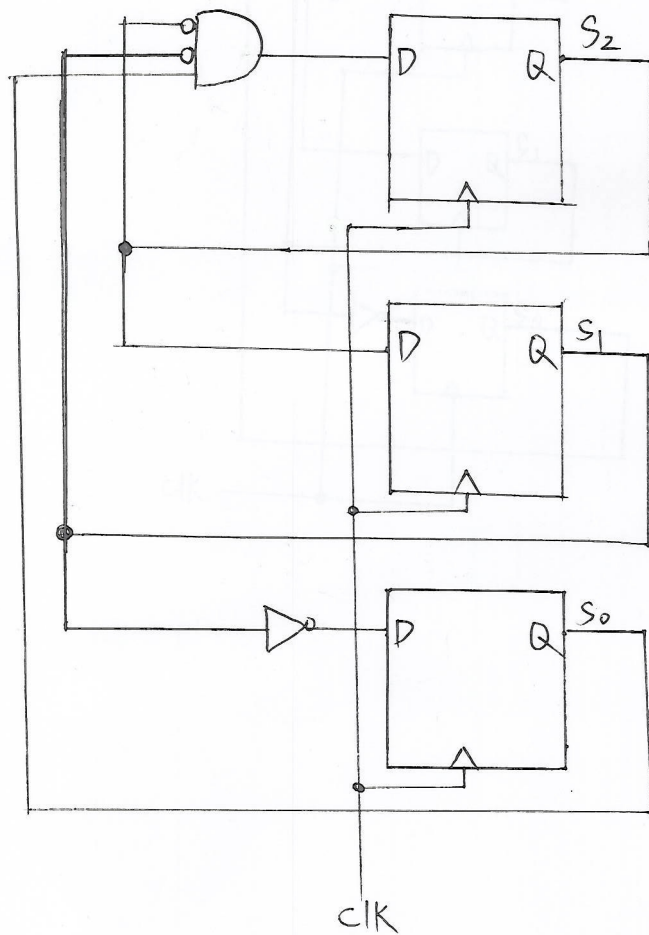
$s_2 s_1 s_0$	$ns_2$	$ns_1$	$ns_0$
0 0 0	0	0	1
0 0 1	1	0	1
0 1 0	0	0	0
0 1 1	0	0	0
1 0 0	0	1	1
1 0 1	0	1	1
1 1 0	0	1	0
1 1 1	0	1	0

optimized state table

6. State diagram:

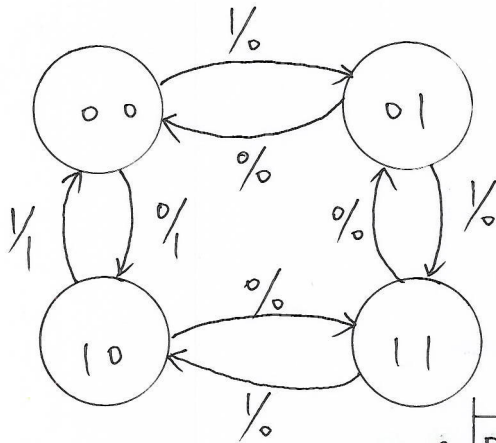


logic diagram:



7. (a) Mealy Machine

(b)

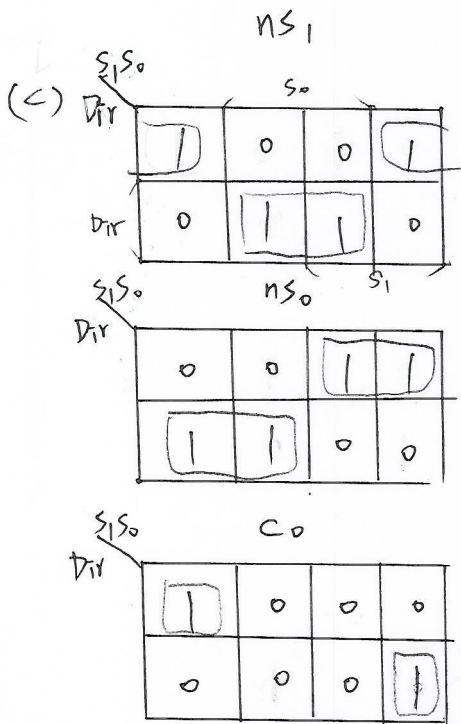


state table

$S_1$	$S_0$	Dir	$ns_1$	$ns_0$	$C_0$
0	0	0	1	0	1
0	0	1	0	1	0
0	1	0	0	0	0
0	1	1	1	1	0
1	0	0	1	1	0
1	0	1	0	0	1
1	1	0	0	1	0
1	1	1	1	0	0

state table

$S_1 S_0$	$ns_1 ns_0$		$C_0$	
	Dir=0	Dir=1	Dir=0	Dir=1
00	10	01	1	0
01	00	11	0	0
10	11	00	0	1
11	01	10	0	0



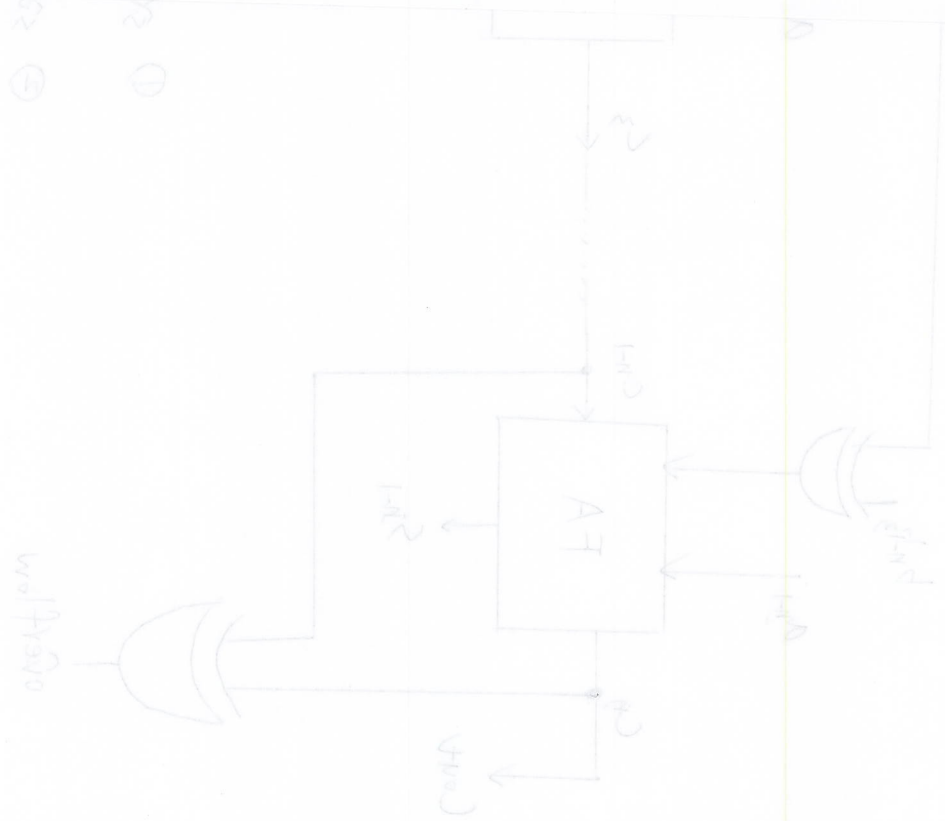
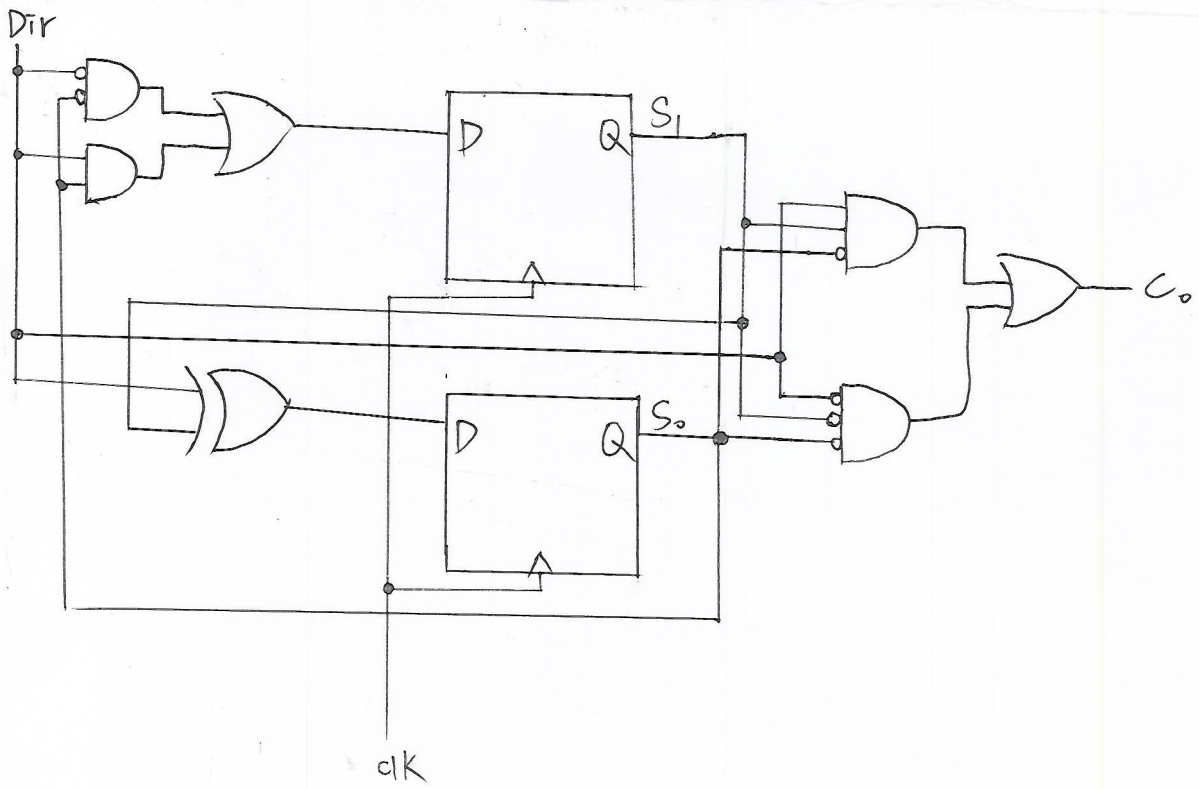
$$ns_1 = (S_0 \wedge Dir) \vee (\bar{S}_0 \wedge \bar{Dir})$$

$$ns_0 = (\bar{S}_1 \wedge Dir) \vee (S_1 \wedge \bar{Dir})$$

$$C_0 = (\bar{S}_0 \wedge \bar{S}_1 \wedge \bar{Dir}) \vee (\bar{S}_0 \wedge S_1 \wedge Dir)$$



7.



7. 1000 1011