

- ① 每个元件本身是组合逻辑电路
- ② 输出连线不能互连
- ③ 输出连线不能反馈到连线输入端

2. 三态门：

特点：其输出既可以是0, 1, 又可以是高阻态。

同时有一个额外的输出使能控制端EN
工作方式：用于连接总线，多个三态输出连在一起等

$$3. \quad X = b \oplus a$$

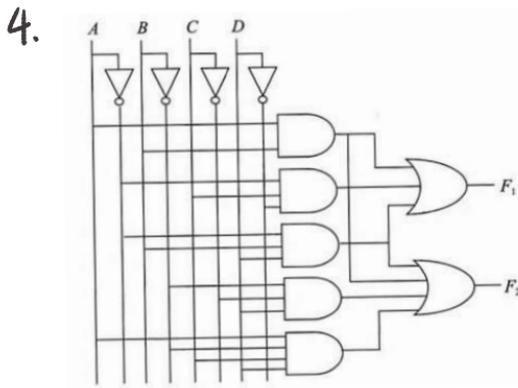
$$Y = c \oplus b$$

$$Z = C$$

$$\Rightarrow C = Z$$

$$b = c \oplus y = z \oplus y$$

$$a = b \oplus x = z \oplus y \oplus x$$



$$F_1 = AB + \bar{A}C\bar{D} + \bar{A}BD$$

$$F_2 = AB + \bar{A}BD + \bar{B}\bar{C}D + A\bar{B}CD$$

J.

a_2	a_1	b_2	b_1	$IA - IB$
0	0	0	0	00
0	0	0	1	01
0	0	1	0	10
0	0	1	1	11
0	1	0	0	01
0	1	0	1	00
0	1	1	0	01
0	1	1	1	10
1	0	0	0	10
1	0	0	1	01
1	0	1	0	00
1	0	1	1	01
1	1	0	0	11
1	1	0	1	10
1	1	1	0	00
1	1	1	1	00

$IA - IB$

00

01

10

11

01

00

01

10

10

01

00

01

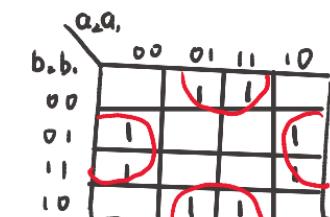
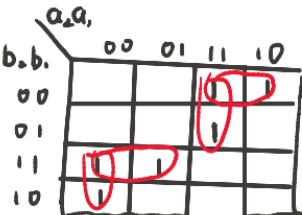
11

10

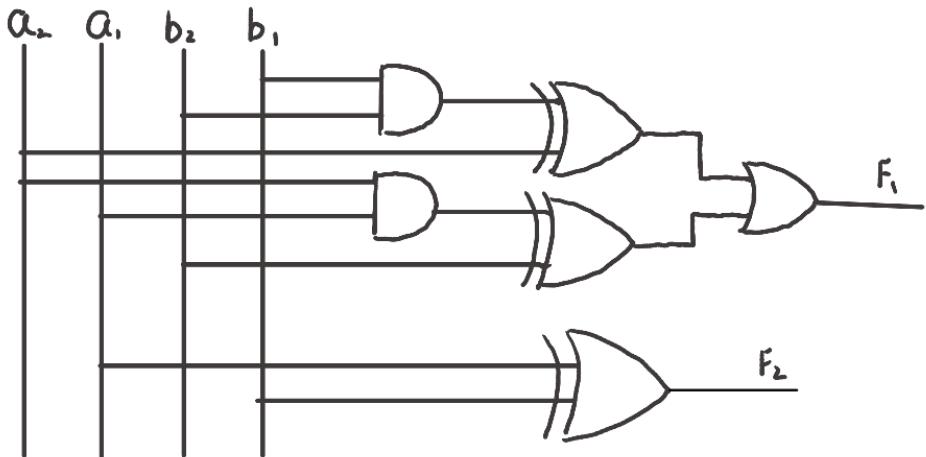
01

00

$$a_2\bar{b}_2\bar{b}_1 + a_2a_1\bar{b}_2 + \bar{a}_2b_1b_2 + \bar{a}_2\bar{a}_1b_2$$



$$\bar{a}_2b_1 + a_2\bar{b}_1$$



$$|A-B| = (F_1, F_2)$$

6. (a)

	AB	
C	00 01 11 10	
0	1 0 0 0	
1	0 1 1 1	

$$\bar{A}B + BC + A\bar{B}\bar{C}$$

(c)

	AB	
C	00 01 11 10	
0	1 0 0 0	
1	0 1 1 1	

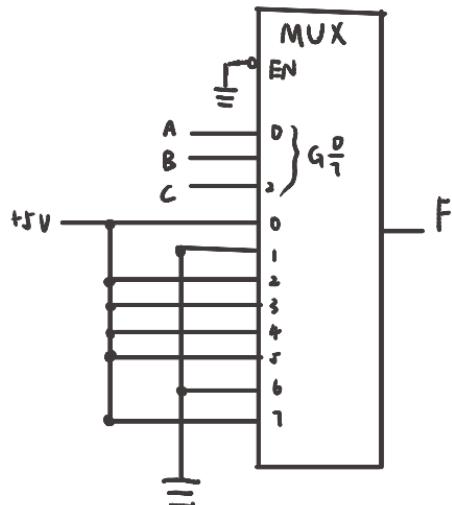
$$C + \bar{A}B + A\bar{B}$$

(b)

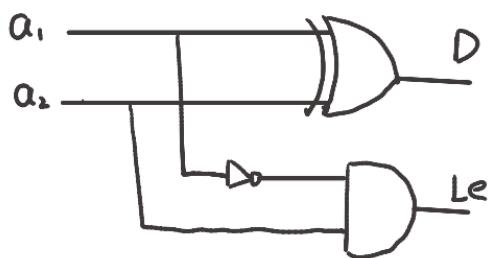
	AB	
C	00 01 11 10	
0	0 1 0 0	
1	1 0 1 1	

$$AC + AB + \bar{A}\bar{B}C$$

$$7. F = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C + ABC$$



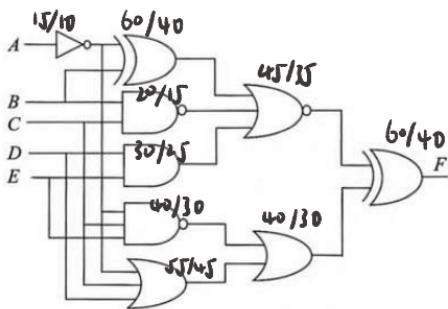
a_1	a_2	D	L_e
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0



9.

逻辑门	T_{pd} (ps)	T_{cd} (ps)
NOT	15	10
2 输入 OR	40	30
3 输入 OR	55	45
2 输入 AND	30	25
3 输入 AND	40	30
2 输入 NOR	30	25
3 输入 NOR	45	35
2 输入 NAND	20	15
3 输入 NAND	30	25
2 输入 XOR	60	40

(a)



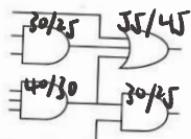
(b)

图5 题9/10图

传输延迟: $15 + 60 + 40 + 60 = 180 \text{ ps}$

最小延迟: $15 + 30 + 40 = 90 \text{ ps}$

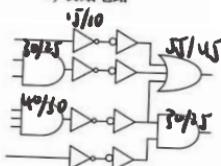
10.



$$\text{a) } T_{pd} = 40 + 55 = 95 \text{ ps}$$

$$T_{cd} = 25 \text{ ps}$$

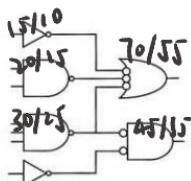
a) 初始电路



$$\text{b) } T_{pd} = 40 + 15 \times 2 + 55 = 125 \text{ ps}$$

$$T_{cd} = 10 \times 2 + 25 = 45 \text{ ps}$$

b) 加入反相器对的电路



$$\text{c) } T_{pd} = 30 + 70 = 100 \text{ ps}$$

$$T_{cd} = 10 + 35 = 45 \text{ ps}$$

c) 使用反相输出端和反向输入端的电路

b) 的传输延迟最长, a) 最短