8.5

1. 解：

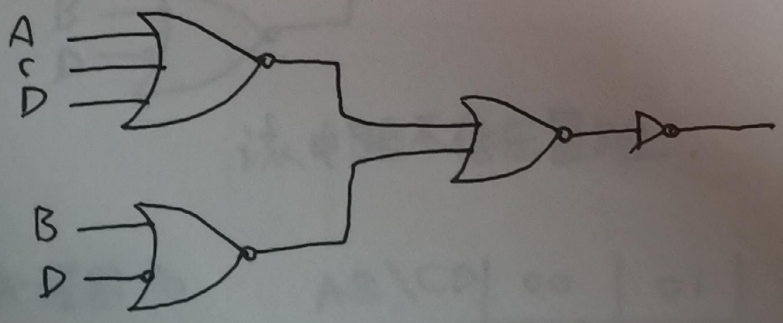
a. 卡诺图为

AB\CD	00	01	11	10
00	1	1	1	0
01	1	0	×	0
11	0	0	×	0
10	0	1	1	0

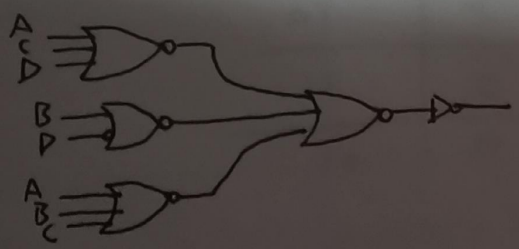
可化简为 $f(A,B,C,D)=\bar{A}\bar{C}\bar{D}+\bar{B}D$

门电路可表示为

$$f(A,B,C,D)=[(A+(+D)'+(B+D')']''$$



该电路存在冒险，可以引入冗余蕴含项 $\bar{A}\bar{B}\bar{C}$，电路为

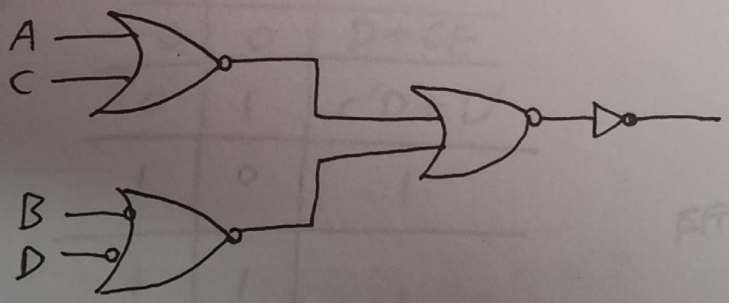


b. 卡诺图为

AB\CD	00	01	11	10
00	1	1	X	X
01	1	1	1	0
11	0	1	1	0
10	0	0	0	0

化简为 $f(A,B,C,D)=\bar{A}\bar{C}+BD$

门电路可表示为 $f(A,B,C,D)=[(A+C)'+(B'+D')]''$



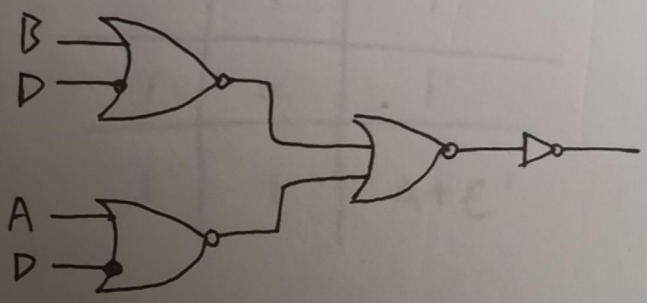
该电路不存在冒险.

c. 卡诺图为

AB\CD	00	01	11	10
00	0	1	1	0
01	X	1	1	0
11	0	0	0	0
10	0	1	X	0

化简为 $f(A,B,C,D) = \bar{B}D + \bar{A}D$

门电路可表示为 $f(A,B,C,D) = [(B+D')' + (A+D')']''$



该电路不存在冒险.

2. 解:

a.

A	B	Q
0	0	D+CE
0	1	C'D+D'
1	0	1
1	1	1

所以需要 6个逻辑单元

b.

B	C	Q
0	0	A+D
0	1	A+D+E
1	0	1
1	1	A+D'

至少需要 4个逻辑单元.

c.

B	D	Q
0	0	A+CE
0	1	1
1	0	1
1	1	A+C'

需要4个逻辑单元

d.

C	D	Q
0	0	A+B
0	1	1
1	0	A+B+B'E
1	1	A+B'

至少需要5个逻辑单元

所以最好采用 b、c 方案

3. 解：卡诺图为

(V0,0。)

I_3I_2 \ I_1I_0	00	01	11	10
00	0xx	100	101	101
01	110	110	110	110
11	111	111	111	111
10	111	111	111	111

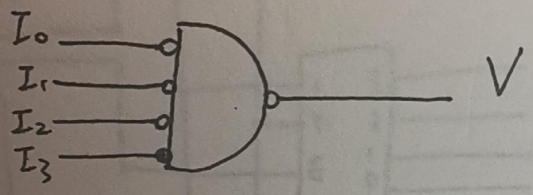
则 $V = I_0 + I_1 + I_2 + I_3$

$O_1 = I_2 + I_3$

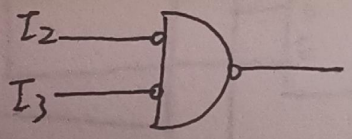
$O_2 = I_3 + \overline{I_2} I_1$

利用与非门和非门实现，有

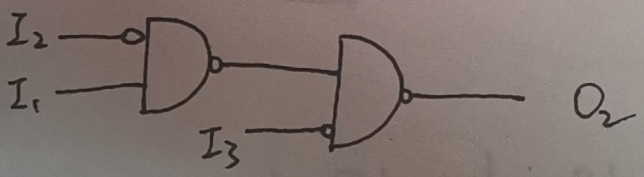
①



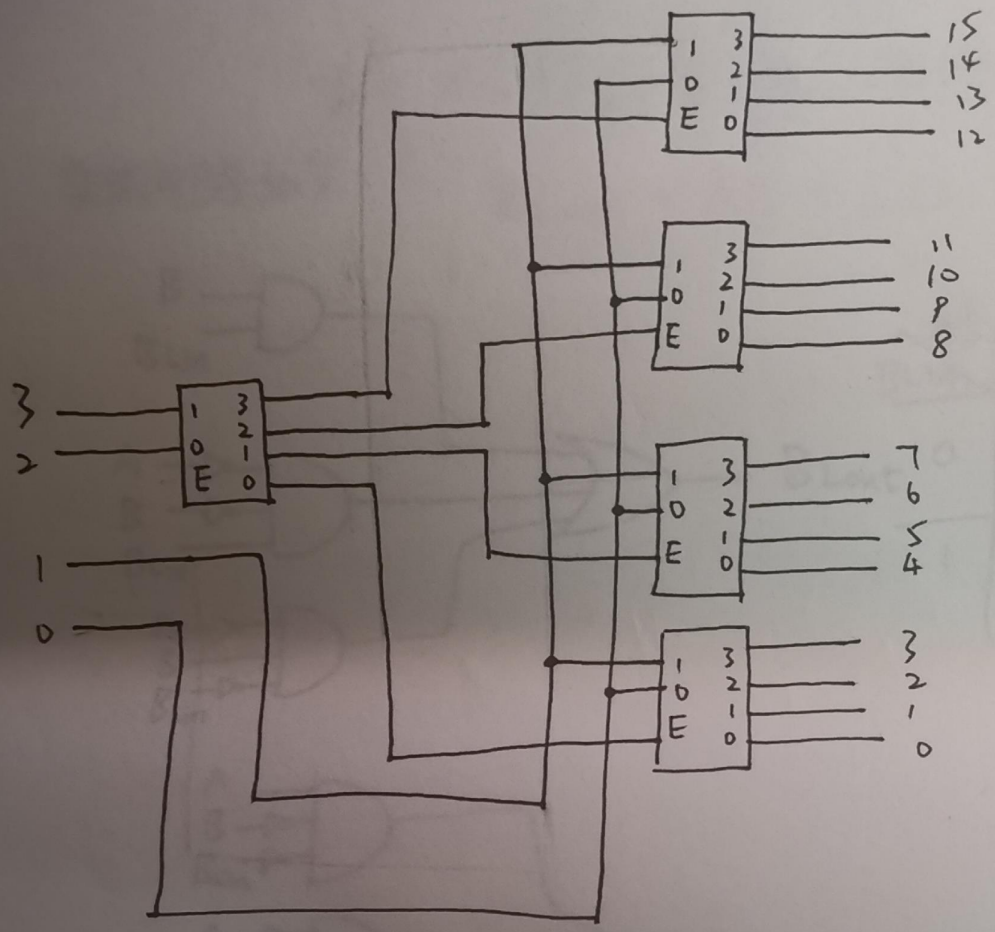
②



③



4. 解：使用5个 2:4 译码器



5. 解：

(a)

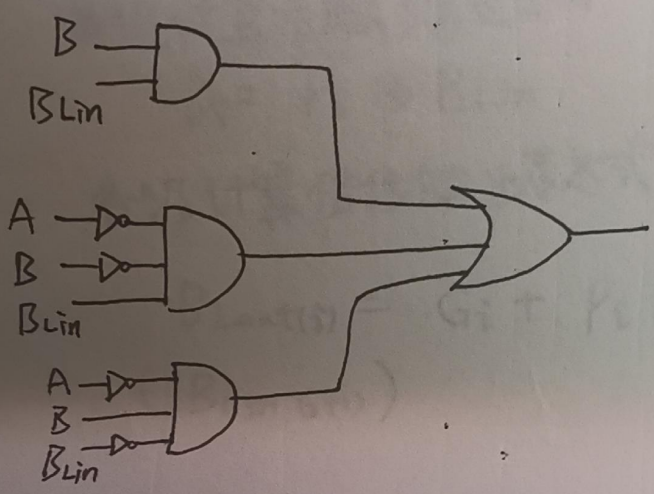
A	B	BLin	BLout	D
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

可得 $B_{Lout} = B\bar{B}B_{Lin} + \bar{A}\bar{B}B_{Lin} + \bar{A}B\bar{B}_{Lin}$ -0.5

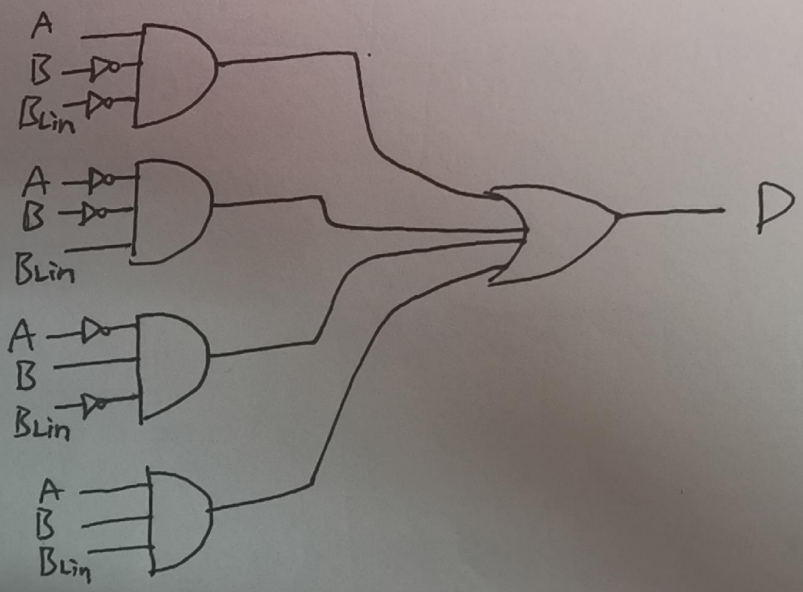
$D = A\bar{B}\bar{B}_{Lin} + \bar{A}\bar{B}B_{Lin} + \bar{A}B\bar{B}_{Lin} + ABB_{Lin}$

实现电路如下

$B_{Lout} = \bar{A}B + BB_{Lin}\bar{A} + BB_{Lin}B$



AB / BLin	00	01	11	10
0	0	1	0	0
1	1	1	1	0



(6) 类比超前进位加法器

各级借位传播信号 $P_i = \overline{A_i \oplus B_i} = \overline{A_i} \oplus B_i$

各级借位产生信号 $G_i = \overline{A_i} B_i$

各级计算差输出表达式为

$D_i = P_i \oplus B_{Lin}$

各级计算借位输出表达式为

$B_{Lout(i)} = G_i + P_i B_{Lin(i)}$

$(B_{Lin(i+1)})$