数字电子技术

3.9 ABCD 表示四个开关的开闭状态，Y 表示灯的亮灭

写出真值表
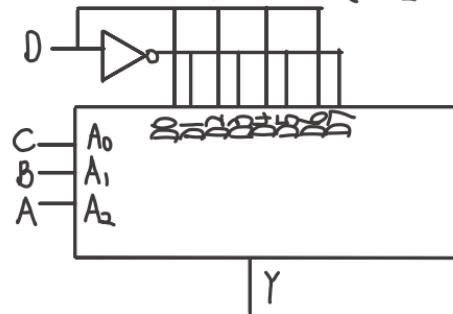
A	B	C	D	Y
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1

续表

1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

∴ 写出逻辑表达式

$$Y = \sum (m_1, m_2, m_4, m_7, m_8, m_{11}, m_{13}, m_{14})$$

可以使用数据选择器构建电路

3.10 写出真值表
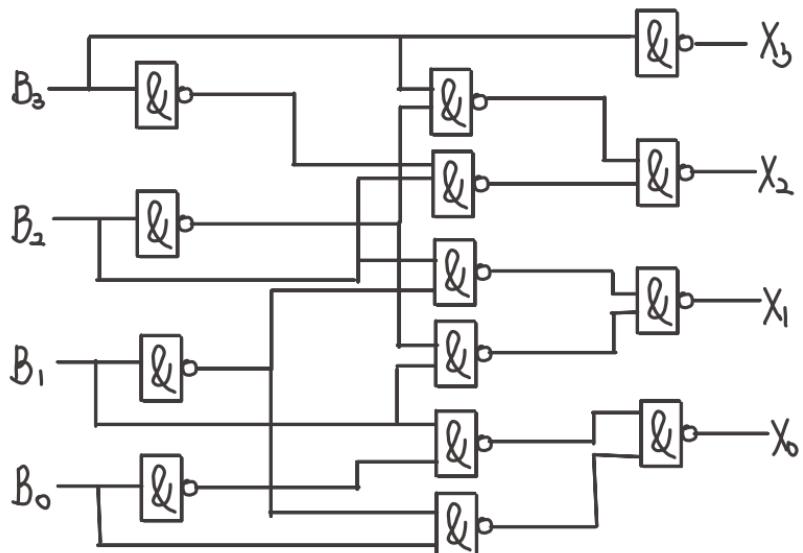
8421 BCD码				循环码				余3码				2421码			
B_3	B_2	B_1	B_0	X_3	X_2	X_1	X_0	Y_3	Y_2	Y_1	Y_0	E_3	E_2	E_1	E_0
0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1
0	0	1	0	0	0	1	1	0	1	0	1	0	0	1	0
0	0	1	1	0	0	1	0	0	1	1	0	0	0	1	1
0	1	0	0	0	1	1	0	0	1	1	1	0	1	0	0

0101   0111   1000   1011
0110   0101   1001   1100
0111   0100   1010   1101
1000   1100   1011   1110
1001   1101   1100   1111

其余部分对应结
果为无关项,略去

(1) 8421 BCD码转循环码

$$X_3 = B_3 \qquad X_2 = \overline{\overline{\overline{B_3}\,B_2}\ \ \overline{B_3\,\overline{B_2}}} \qquad X_1 = \overline{\overline{\overline{B_2}\,B_1}\ \ \overline{B_2\,\overline{B_1}}} \qquad X_0 = \overline{\overline{\overline{B_1}\,B_0}\ \ \overline{B_1\,\overline{B_0}}}$$
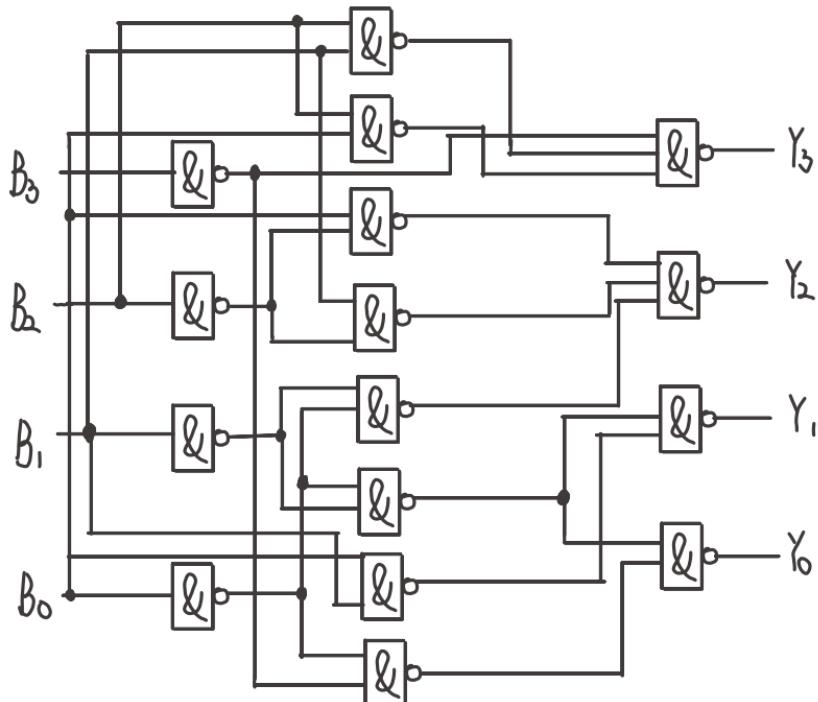
(2) 8421 BCD码转余3码

$$Y_3 = \overline{\overline{B_3}\ \ \overline{B_2\,B_0}\ \ \overline{B_2\,B_1}} \qquad Y_2 = \overline{\overline{\overline{B_2}\,\overline{B_0}}\ \ \overline{\overline{B_2}\,\overline{B_1}}\ \ \overline{B_2\,B_1\,\overline{B_0}}}$$
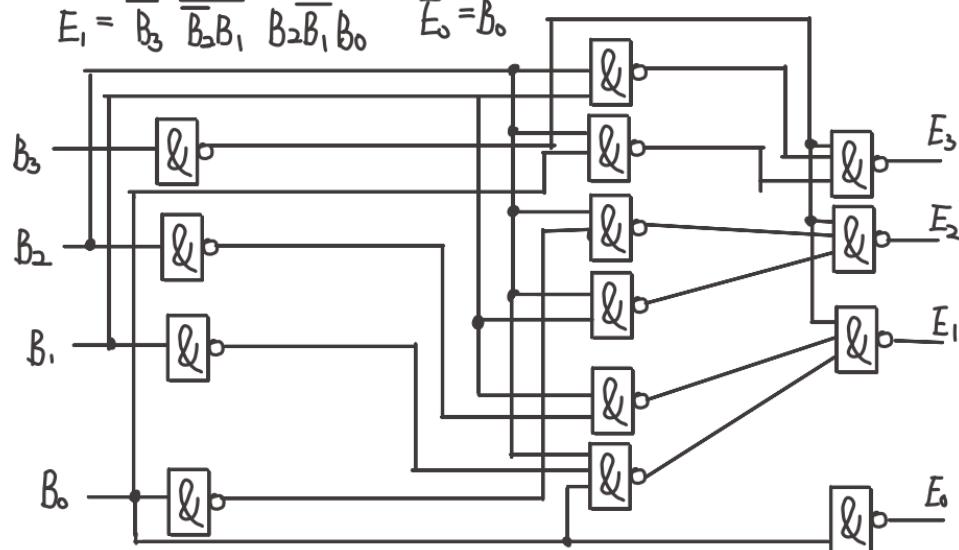
$$Y_1 = \overline{\overline{\overline{B_1}\,\overline{B_0}}\ \ \overline{B_1\,B_0}} \qquad Y_0 = \overline{\overline{\overline{B_3}\,\overline{B_0}}\ \ \overline{B_3\,B_0}}$$

(3) 8421BCD码转2421码

$$E_3 = \overline{\overline{B_3}\ \overline{\overline{B_2 B_0}}\ \overline{\overline{B_2 B_1}}} \qquad E_2 = \overline{\overline{B_3}\ \overline{\overline{B_2 \overline{B_0}} + \overline{B_2 B_1}}}$$

$$E_1 = \overline{\overline{B_3}\ \overline{\overline{B_2 B_1}}\ \overline{\overline{B_2 \overline{B_1} B_0}}} \qquad E_0 = B_0$$
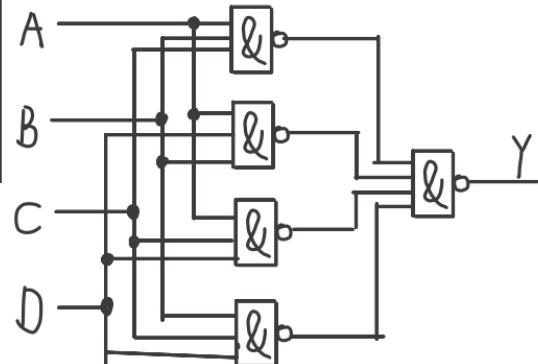
311 (1)四变量表决·给定真值表

A	B	C	D	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1

续表

A	B	C	D	Y
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

求逻辑表达式

$$Y = \overline{\overline{BCD}\ \overline{ACD}\ \overline{ABD}\ \overline{ABC}}$$
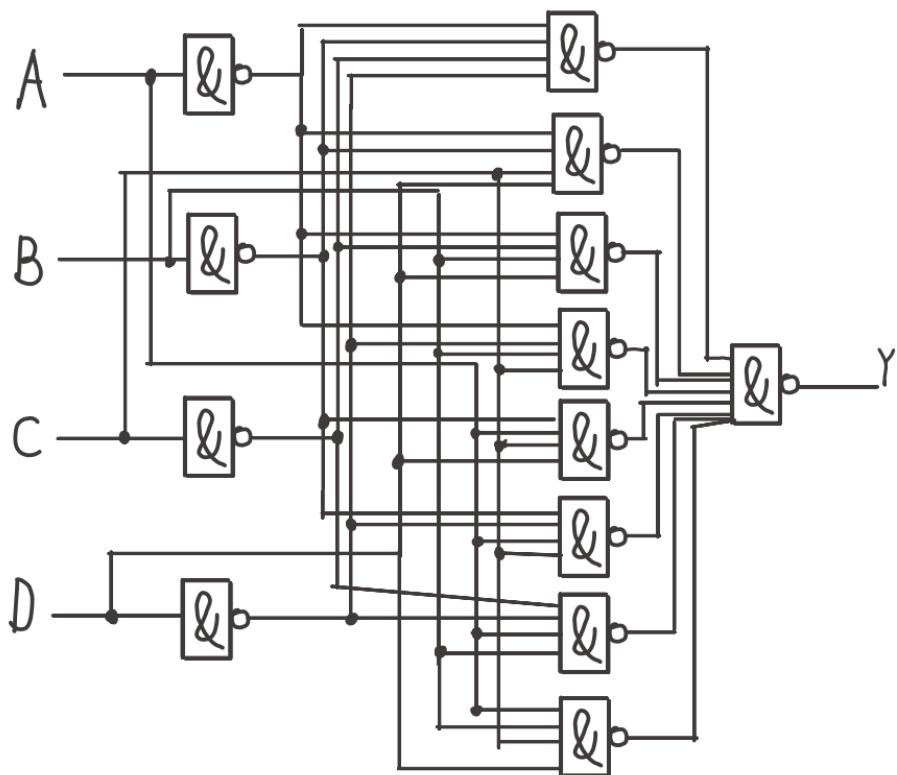
(二) 偶校电路·真值表如下

A	B	C	D	Y
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0

续表
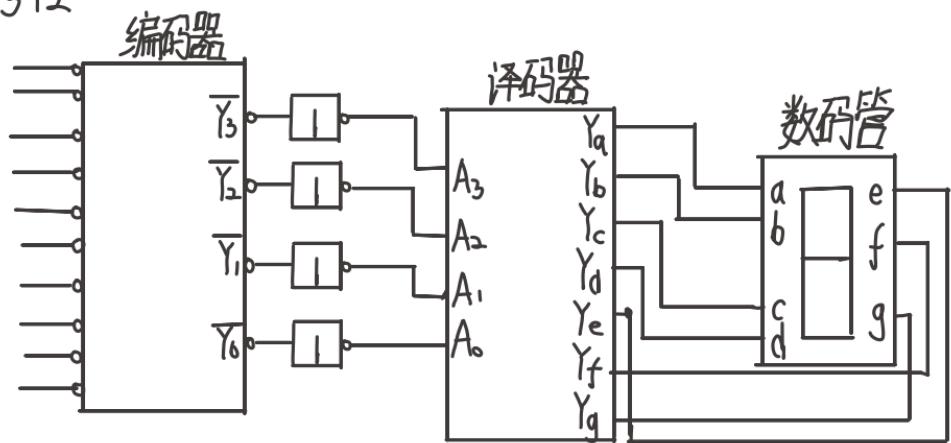
A	B	C	D	Y
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1
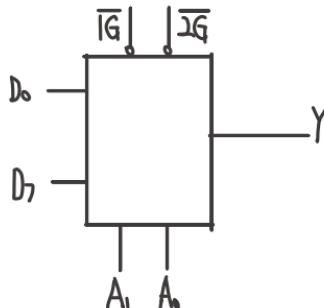
逻辑表达式 $Y = \sum(m_0, m_3, m_5, m_6, m_9, m_{10}, m_{12}, m_{15})$


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3|3

芯片 74153 简化结构如左图
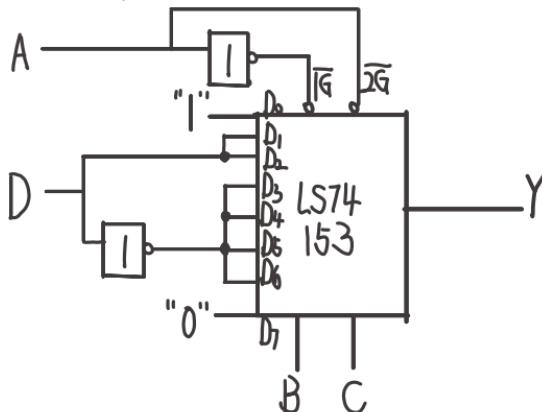
逻辑表达式 (当只使用 MUX1 时)
$$Y = A_1 A_0 D_3 + A_1 \overline{A_0} D_2$$
$$\overline{A_1} A_0 D_1 + \overline{A_1}\cdot\overline{A_0} D_0$$

(1) $Y_1 = \sum\limits_{ABCD}(m_0, m_1, m_3, m_5, m_6, m_8, m_{10}, m_{12})$ 〔需要使用两个MUX 表达式和其它不同〕
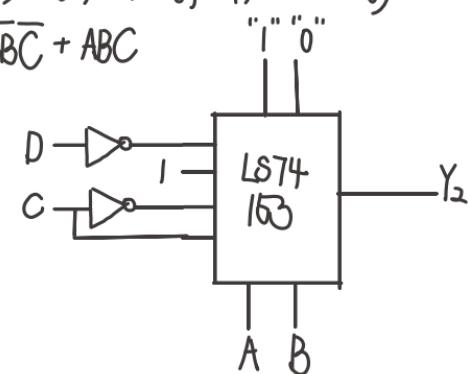
· 令 $\overline{1G} = \overline{A}$, $\overline{2G} = A$, $A_1 = B$, $A_0 = C$ $D_0 = 1$, $D_1 = D_2 = D$

   $D_3 = D_4 = D_5 = D_6 = \overline{D}$ $D_7 = 0$ 电路图如下

(2) $Y_2 = \sum\limits_{ABCD}(m_0, m_2, m_4, m_5, m_6, m_7, m_8, m_9, m_{14}, m_{15})$

$= \overline{A}\,\overline{B}\,\overline{D} + \overline{A}B + A\overline{B}\,\overline{C} + ABC$
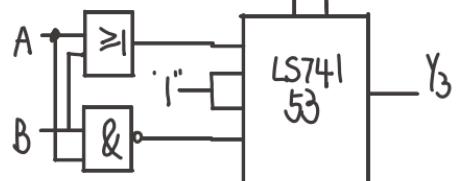
$A_1 = A$. $A_0 = B$ $\overline{1G} = 0$ $\overline{2G} = 1$

$D_0 = \overline{D}$ $D_1 = 1$ $D_2 = \overline{C}$ $D_3 = C$

电路图连接如左 ($D_4 \sim D_7$ 略)

(3) $Y_3 = A\overline{B} + B\overline{C} + C\overline{D} + D\overline{A} = \overline{C}\overline{D}(A+B) + C\overline{D} + \overline{C}D + CD\overline{AB}$

∴ $A_1 = C$ $A_0 = D$ $D_0 = A+B$ $D_1 = D_2 = 1$ $D_3 = \overline{AB}$

$\overline{1G} = 0$ $\overline{2G} = 1$
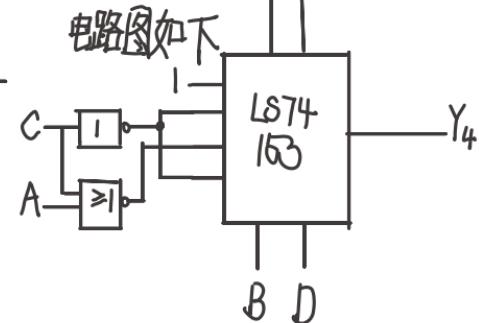
电路图如下
($D_4 \sim D_7$ 略)

(4) $Y_4 = BD + \overline{C}D + \overline{A}\overline{C} = BD\overline{C} + B\overline{D}\ \overline{AC} + \overline{B}\overline{D}C + \overline{B}\overline{D}$

∴ $A_1 = B$ $A_0 = D$ $\overline{1G} = 0$ $\overline{2G} = 1$

$D_0 = 1$ $D_1 = D_3 = \overline{C}$ $D_2 = \overline{AC} = \overline{A+C}$

电路图如下

($D_4 \sim D_7$ 略)
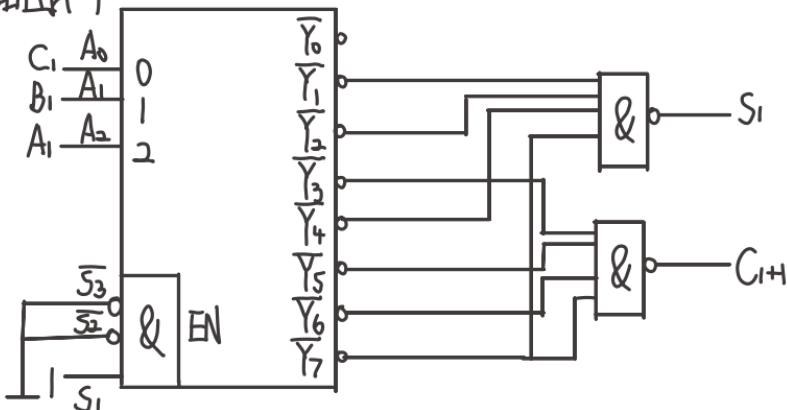
314 解·全加器表达式 $S_i = \sum m(1,2,4,7) = \overline{\overline{Y_1}\ \overline{Y_2}\ \overline{Y_4}\ \overline{Y_7}}$

$C_{i+1} = \sum m(3,5,6,7) = \overline{\overline{Y_3}\ \overline{Y_5}\ \overline{Y_6}\ \overline{Y_7}}$

电路图如下

3.15　已知数据选择器输出逻辑函数
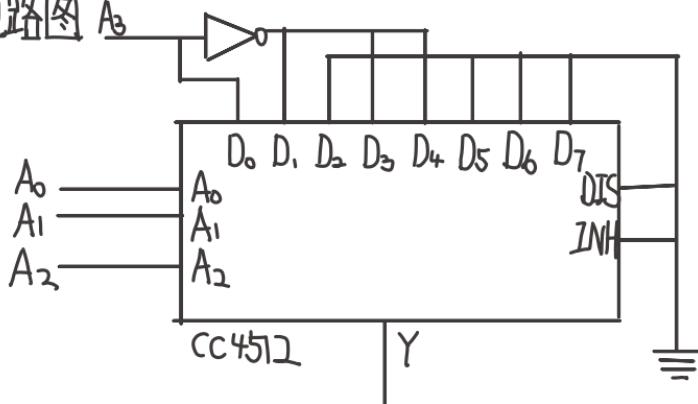
$$Y = \bar{A_2}\bar{A_1}\bar{A_0}D_0 + \bar{A_2}\bar{A_1}A_0 D_1 + \bar{A_2}A_1\bar{A_0}D_2 + \bar{A_2}A_1 A_0 D_3$$
$$+ A_2\bar{A_1}\bar{A_0}D_4 + A_2\bar{A_1}A_0 D_5 + A_2 A_1\bar{A_0}D_6 + A_2 A_1 A_0 D_7$$

(1) 已知 $Y_1 = \sum(m_1, m_3, m_4, m_8)$

$$= \bar{A_3}\bar{A_2}\bar{A_1}A_0 + \bar{A_3}\bar{A_2}A_1 A_0 + \bar{A_3}A_2\bar{A_1}\bar{A_0} + A_3\bar{A_2}\bar{A_1}\bar{A_0}$$

∴ $D_1 = D_3 = D_4 = \bar{A_3}$　　$D_0 = A_3$　　$D_2 = D_5 = D_6 = D_7 = 0$

电路图　

(2) $Y_2 = \sum(m_0, m_1, m_3, m_5, m_6, m_7, m_{10}, m_{12}, m_{15})$

· $D_0 = D_3 = 1$　　$D_1 = D_2 = D_7 = A_0$　　$D_5 = D_6 = \bar{A_0}$　　$D_4 = 0$