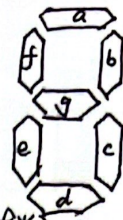


第六周数字逻辑基础实验 [实验报告]

一、实验内容 实验2-3组合电路(七段译码器编码)

必做实验: 设计7段数码显示器译码电路



二、实验原理 通过7个阳极=极管发光显示十进制数。(高电平有效发光)
(ang)

①真值表

十进制数	输入(BCD码)				输出(7个)						
	D ₃	D ₂	D ₁	D ₀	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1

②逻辑表达式

以 a 输出的卡诺图化简逻辑表达式为例

D ₃ D ₂	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	1	1	1	1
10	1	1	1	1

$$a = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

同理得到 $b = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$

$$c = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2$$

$$d = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

$$e = \bar{D}_3 \bar{D}_2 + D_3 \bar{D}_2$$

$$f = D_3 \bar{D}_2 + \bar{D}_3 \bar{D}_2 + D_3 D_2 + D_3 \bar{D}_2$$

$$g = D_3 \bar{D}_2 + \bar{D}_3 \bar{D}_2 + D_3 D_2 + D_3 \bar{D}_2$$

若忽略化简过程为多输出函数, 则为3简化电路. 要考虑公共项蕴含, 从而调整各逻辑表达式:

为: $a = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2 + D_3 \bar{D}_2$

$$b = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

$$c = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

$$d = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

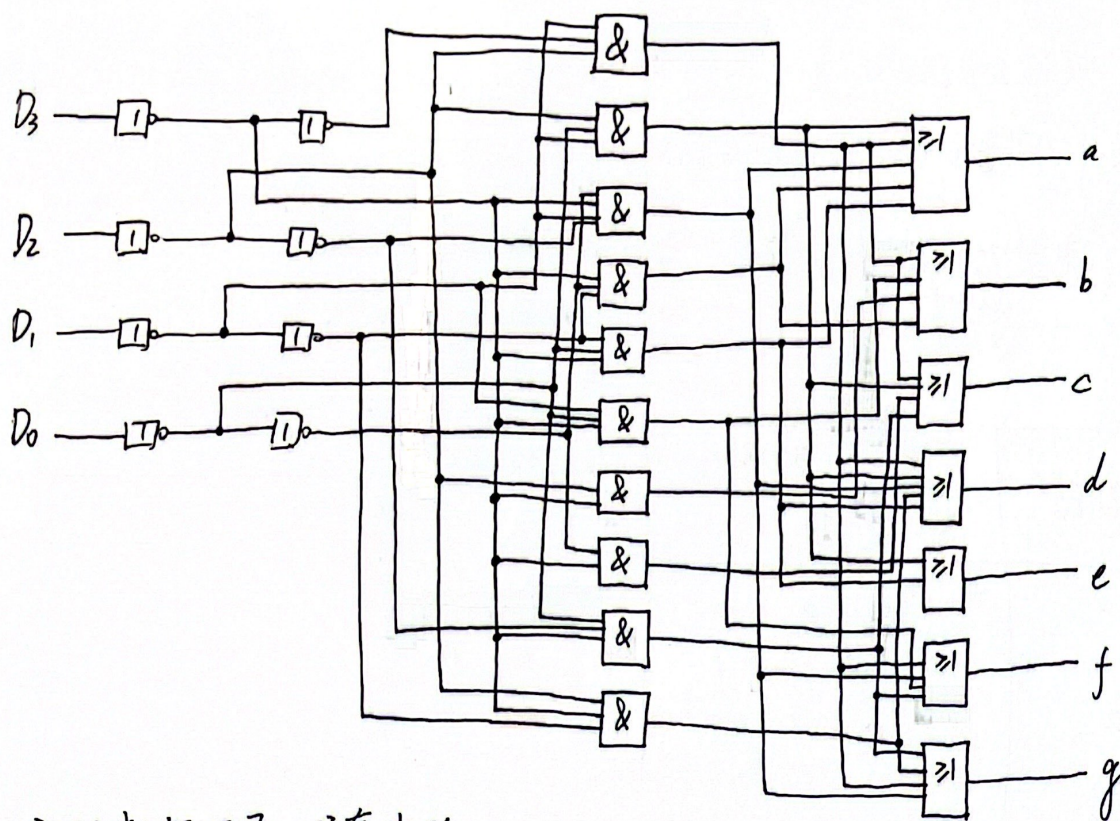
$$e = \bar{D}_3 \bar{D}_2 + D_3 \bar{D}_2$$

$$f = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

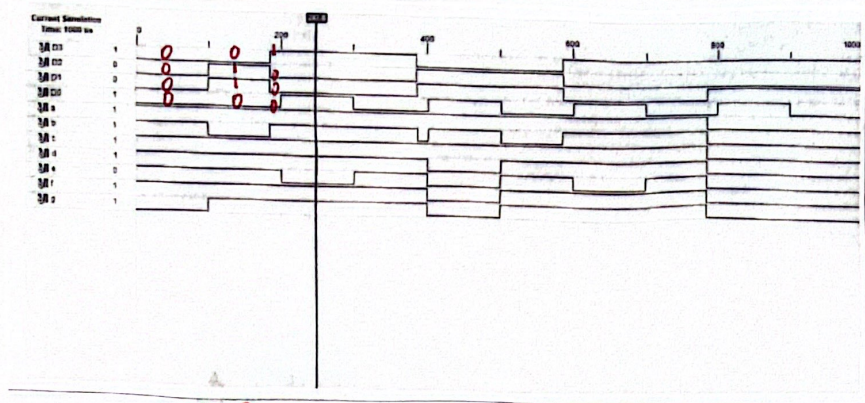
$$g = \bar{D}_3 \bar{D}_2 + \bar{D}_3 D_2 + D_3 \bar{D}_2 + D_3 D_2$$

① 缺使能 E
② 真值表不全 (10-15?)

③ 电路图



三、实验数据记录 (仿真波形)



希望波形图输入是按顺序变化。

1. 实验结果

- 仿真的波形图结果与所列真值表结果一致, 验证了所列逻辑表达式和所作电路图的正确性
- 实验结果表明了七段译码器用于显示十进数的可操作性

一、理论原理 (设计高电平有效的4-2优先编码器)

① 真值表 I_3, I_2, I_1, I_0 (优先级↓), S 选通输入, Y_1, Y_0, E_x, Y_s 输出.

输入					输出			
S	I_3	I_2	I_1	I_0	Y_1	Y_0	E_x	Y_s
0	x	x	x	x	0	0	0	0
1	0	0	0	0	0	0	1	0
1	1	x	x	x	1	1	0	1
1	0	1	x	x	1	0	0	1
1	0	0	1	x	0	1	0	1
1	0	0	0	1	0	0	0	1

② 简化逻辑函数表达式.

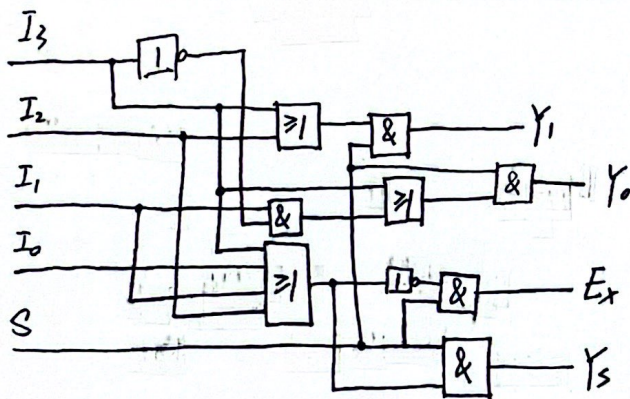
③ 作出电路图.

$$Y_1 = (I_3 + I_2)S$$

$$Y_0 = (I_3 + \bar{I}_3 I_1)S$$

$$E_x = \overline{(I_3 + I_2 + I_1 + I_0)}S$$

$$Y_s = \bar{E}_x S = \overline{(\bar{I}_3 + \bar{I}_2 + \bar{I}_1 + \bar{I}_0)} S = (I_3 + I_2 + I_1 + I_0) S$$



二、仿真模拟验证(波形图结果如下)

<< 模拟与数字电路基础实验 >>

↑ 按教材来，需要的话找我，有pdf.

。将中二编码器与7段数字显示器译码电路相连后，分析输入信号 $I_3 \sim I_0$ 与输出信号 $a \sim g$ 之间的逻辑关系。

——我不太清楚有什么关系

指的是 Y_1, Y_0 与 $a \sim g$ 的关系么？

如何相连呢，也包括 Y_5 与 E_x 的使用么？

图 2-3-4

