

数电实验 12

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一、实验目的

1. 8421BCD 码检测电路

2. AD 和 DA 转换电路

二、实验要求

1. 8421BCD 码检测电路

2. 先把数转换为电, 再把电转换为数, 对比先前两次数是否相同

三、实验内容

1.

$A=000$ $B=001$ $C=010$
 $D=011$ $E=100$ $F=101$

$Q_3^n Q_2^n Q_1^n$ X 0 1 XQ_3^n $Q_2^n Q_1^n$ 00 01 11 10

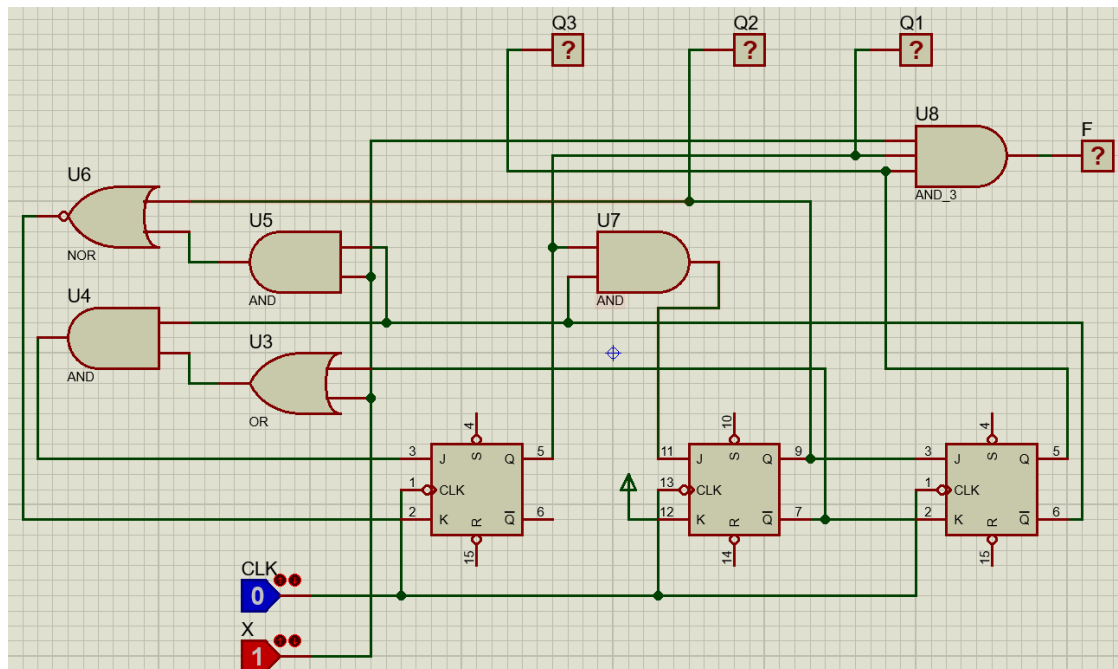
$Q_3^n Q_2^n Q_1^n$	000	$001/0$	$010/0$	$011/0$	$100/0$	$101/0$	$110/0$	$111/X$	$101/X$
001	$010/0$	$011/0$	$100/0$	$101/0$	$110/0$	$111/X$	$101/X$	$110/X$	$100/X$
010	$100/0$	$101/0$	$110/0$	$111/X$	$101/X$	$110/X$	$100/X$	$111/X$	$101/X$
011	$101/0$	$110/0$	$111/X$	$101/X$	$110/X$	$100/X$	$111/X$	$101/X$	$110/X$
100	$000/0$	$001/0$	$010/0$	$011/0$	$100/0$	$101/0$	$110/0$	$111/X$	$101/X$
101	$001/0$	$010/0$	$011/0$	$100/0$	$101/0$	$110/0$	$111/X$	$101/X$	$110/X$

$Q_1^{n+1} = \overline{Q_3} \overline{Q_2} \overline{Q_1} + Q_2 Q_1 + X Q_3$
 $Q_2^{n+1} = \overline{Q_3} \overline{Q_2} Q_1$
 $Q_3^{n+1} = Q_2$
 $F = X Q_3 Q_1$

注: 实验内容的条理性和美观性将影响实验报告的分數。对实验结果是否拍照不作要求, 重点在于实验内容的描述和关键代码的解释。

$$\begin{aligned}
 Q_1^{n+1} &= \bar{Q}_3 \bar{Q}_2 \bar{Q}_1 + Q_2 Q_1 + X \bar{Q}_3 = \bar{Q}_3 \bar{Q}_2 \bar{Q}_1 + Q_2 Q_1 + X \bar{Q}_3 (Q_1 + \bar{Q}_1) \\
 &= \bar{Q}_3 \bar{Q}_2 \bar{Q}_1 + Q_2 Q_1 + X \bar{Q}_3 Q_1 + X \bar{Q}_3 \bar{Q}_1 \\
 &= (X \bar{Q}_3 + \bar{Q}_3 \bar{Q}_2) \bar{Q}_1 + (X \bar{Q}_3 + Q_2) Q_1 \\
 Q_2^{n+1} &= \bar{Q}_3 \bar{Q}_2 Q_1 + 0 \cdot \bar{Q}_1 \\
 Q_3^{n+1} &= Q_2 \cdot (Q_3 + \bar{Q}_3) = Q_2 Q_3 + Q_2 \bar{Q}_3 \\
 F &= X Q_3 Q_1 \\
 \therefore Q_{n+1} &= J \bar{Q}_n + \bar{K} Q_n \\
 \therefore J_1 &= X \bar{Q}_3 + \bar{Q}_3 \bar{Q}_2 \quad K_1 = \overline{X \bar{Q}_3 + Q_2} \\
 &= (X + \bar{Q}_2) \bar{Q}_3 \\
 J_2 &= \bar{Q}_3 Q_1 \quad K_2 = 1 \\
 J_3 &= Q_2 \quad K_3 = \bar{Q}_2
 \end{aligned}$$

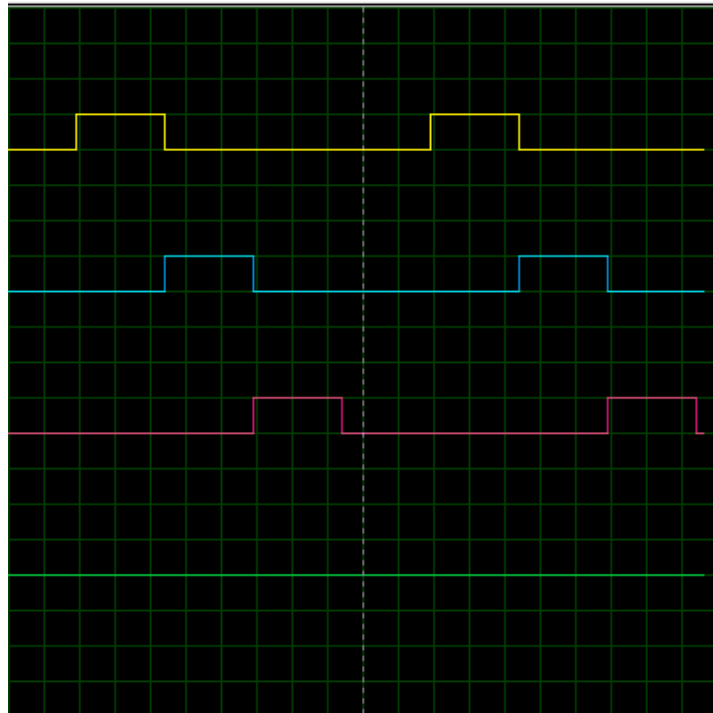
电路图：



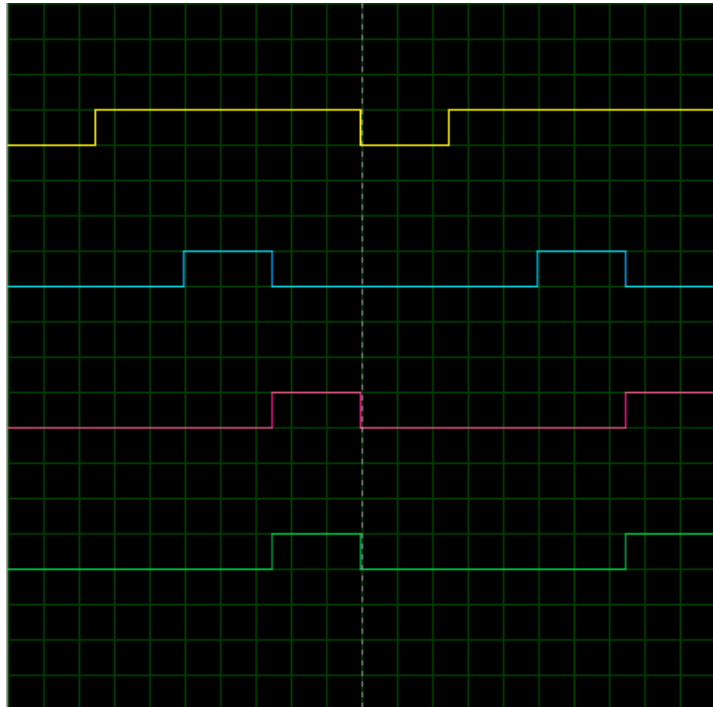
检验：

波形图由上到下分别为 Q1 Q2 Q3 F

X 为 0 时:

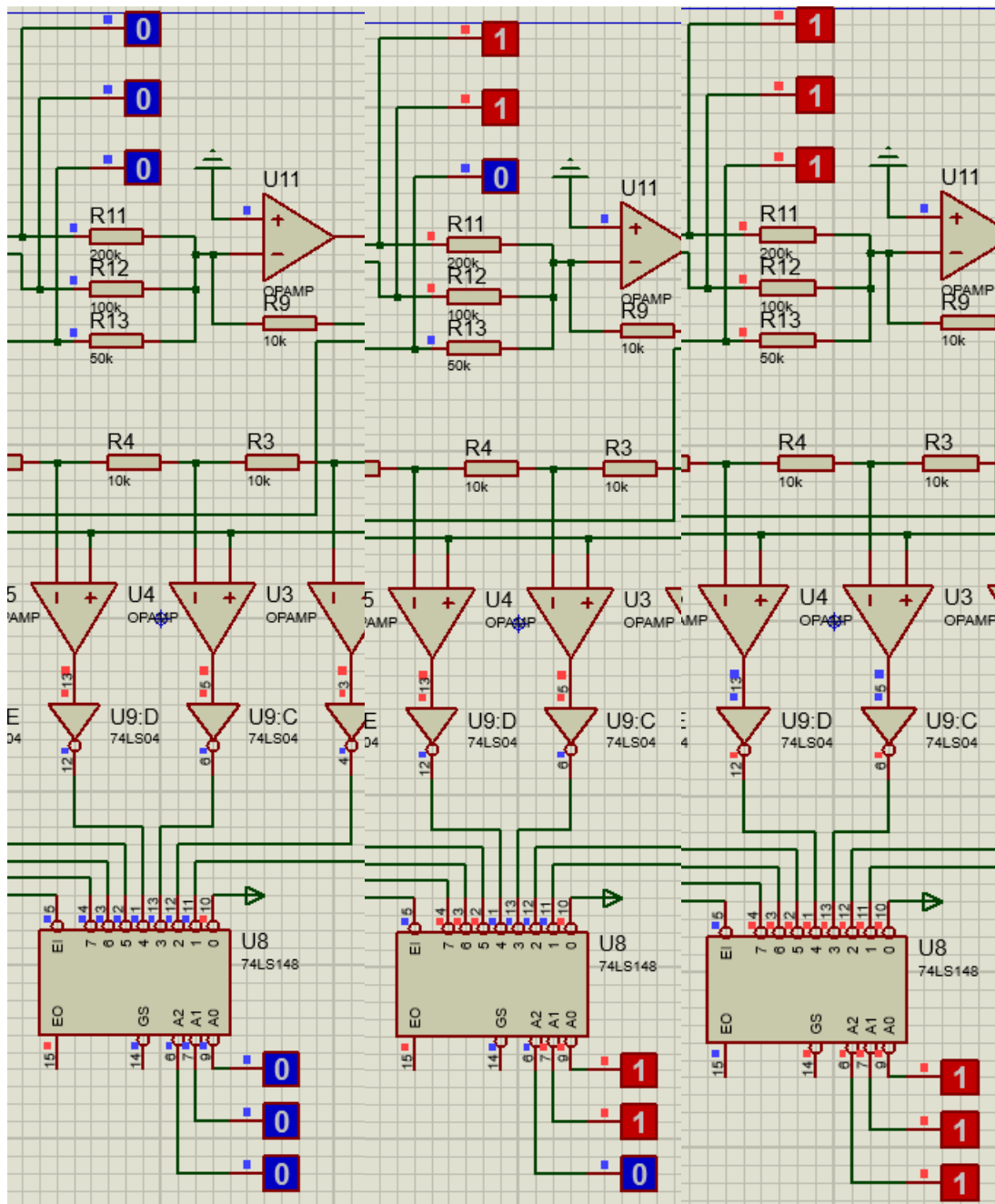


X 为 1 时:



2.

DA 转换电路:



四、实验总结

1. 掌握了如何通过卡诺图化简得到逻辑方程，实现 8421BCD 码检验电路
2. 掌握了如何实现 AD 和 DA 电路，并且设置正确的电压和电阻值达到所需要的效果