

数电作业 第一章 自动化7班 220320726 袁尚品

T1 (0111 1001)_{8421BCD} = (79)₁₀
 = (1001111)₂

2	129	
2	34	...1
2	19	...1
2	9	...1
2	4	...1
2	2	...0
2	1	...0
	0	...1

T2 1.1 ① $2^9 = 512 < 600 < 2^{10} = 1024$ = 进制需10位
 ② $8^3 = 512 < 600 < 8^4$ 八进制需4位
 ③ $16^2 = 256 < 600 < 16^3$ 十六进制需3位

T3. 1.4(4) (1001.0101)₂ = $1 \times 2^3 + 1 \times 2^0 + 1 \times 2^{-2} + 1 \times 2^{-4} = 9.3125$

T4. 1.5(4) (101100.110011)₂ = (54.63)₈
 (00101100.11001100)₂ = (2C.CC)₁₆
 即 (101100.110011)₂ = (54.63)₈ = (2C.CC)₁₆

T5 1.9(1) (25.7)₁₀ = (11001.1011)₂
 = (119.B)₁₆

2	25	
2	12	...1
2	6	...0
2	3	...0
2	1	...1
	0	...1

0.7	
x 2	...1
1.4	
0.4	
x 2	...0
0.8	
0.8	
x 2	...1
1.6	
0.6	
x 2	...1
1.2	

1.9(2) (188.875)₁₀ = (10111100.111)₂
 = (BCE)₁₆

2	188	
2	94	...0
2	47	...0
2	23	...1
2	11	...1
2	5	...1
2	2	...1
2	1	...0
	0	...1

0.875	
x .2	...1
1.750	
0.75	
x .2	...1
1.50	
0.5	
x 2	...1
1	

T6. 1.12(1) +1) (3) -13

2	11	
2	5	...1
2	2	...0
2	1	...0
	0	...1

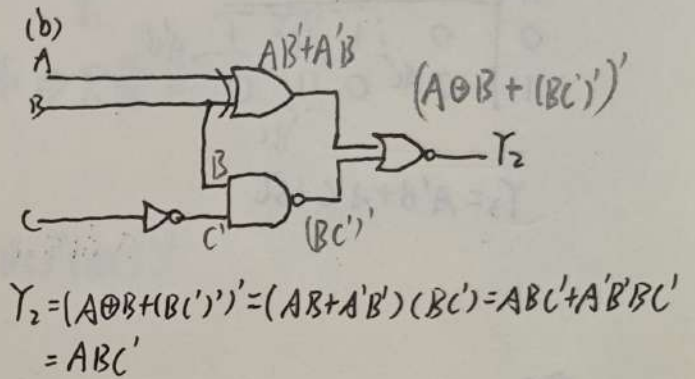
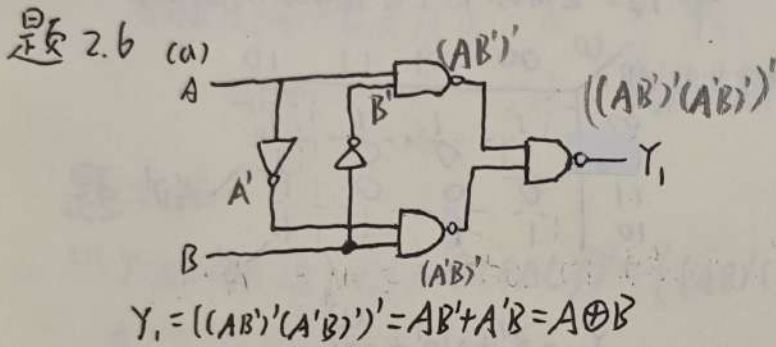
原码 00010001
 反码 00010001
 补码 00010001

2	13	
2	6	...1
2	3	...0
2	1	...1
	0	...1

原码 10001101
 反码 11110010
 补码 11110011

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- 题2.2 (1) 左边 $AB'+B+A'B=AB'+B+A'B=AB'+AB+B=A(B'+B)+B=A+B$ 右边
 (2) 左边 $(A+c')(B+D)(B+D')=(A+c')(B+BD'+BD+DD')=(A+c')B=AB+BC'$ 右边
 (4) 左边 $A'B'C'+A(B+C)+BC=A'B'C'+AB+AC+BC$
 右边 $(A'B'C'+A'B'C+A'BC')'=(AB'C')'(A'B'C)'(A'BC)'=(A'+B+C)(A+B+C')(A+B'+C)$
 $=(A'C'+AC+B)(A+B'+C)=A'B'C'+AB+AC+BC$
 左边与右边相等



题 2.8

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

$Y = A'BC + AB'C + ABC'$

题 2.10 (1) $Y = A'BC + A + BC' = A'BC + ABC + AB'C + A'B'C = \sum m(1, 3, 5, 7)$

(2) $Y = AB'C'D + BCD + A'D = AB'C'D + ABCD + A'B'CD + A'B'CD + A'B'CD + A'B'CD = \sum m(1, 3, 5, 7, 9, 15)$

(3) $Y = A + B + CD = ABCD + ABCD' + ABC'D + ABC'D' + AB'CD + AB'CD' + AB'C'D + AB'C'D' + A'BCD + A'BCD' + A'BC'D + A'BC'D' + A'B'CD + A'B'CD' + A'B'C'D + A'B'C'D' = \sum m(3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15)$

(4) $Y = AB + ((BC)'(C'D))' = AB + BC + CD = ABCD + ABCD' + ABC'D + ABC'D' + A'BCD + A'BCD' + A'BC'D + A'BC'D' + A'B'CD + A'B'CD' + A'B'C'D + A'B'C'D' = \sum m(3, 6, 7, 11, 12, 13, 14, 15)$

题 2.13 (2) $Y = AB'C + A + B + C = A + B + C + C = 1$

(4) $Y = AB'CD + ABD + AC'D = AD(B'(C+B+C')) = AD(B+C) = AD \cdot 1 = AD$

(6) $Y = ACC'D + AA'BC + BC((B'+AD)(CE))' = ABCD(CE)' = ABCD(C'+E') = ABCDE'$

(8) $Y = A + B'C(A+B'+C)(A+B+C) = A + (AB'+B'C)(A+B+C) = A + B'C(A+B+C) = A + B'C$

(10) $Y = AC + ACD + AC'D + AB'E'F + ABE'F + B(D \oplus E) + BC'(D \oplus E) = AC + AD + AE'F + B(D \oplus E)$

题 2-15. (1)

	BC	00	01	11	10
A	0	0	1	1	0
	1	0	1	1	0

$Y_1 = C$

(2) $Y_2 = AB'C + BC + A'B'C'D$

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

$Y_2 = AC + BC + A'B'D$

(3) $Y_3 = \sum m(1, 2, 3, 7)$

	BC	00	01	11	10
A	0	0	1	1	1
	1	0	1	1	0

$Y_3 = A'B + A'C + BC$

(4) $Y_4 = \sum m(0, 1, 2, 3, 4, 6, 8, 9, 10, 11, 14)$

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

$Y_4 = B' + A'D' + CD'$

题 2-16.

(3) $Y = A'B' + BC' + A'B + ABC$

	BC	00	01	11	10
A	0	1	1	1	1
	1	1	1	1	1

$Y = 1$

(5) $Y = AB'C' + A'B' + A'D + C + BD$

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

$Y = B' + C + D$

题 2-20

	BC	00	01	11	10
A	0	1	1	1	1
	1	1	0	1	0

$Y = A' + BC + B'C'$

题 2.24

$Y_1 = \sum m(1, 8, 9, 10, 12, 13, 14)$

$Y_2 = \sum m(0, 1, 2, 3, 6, 7, 10, 14)$

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

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

单独: $Y_1 = AC' + AD' + B'C'$; $Y_2 = A'B' + A'C + CD'$

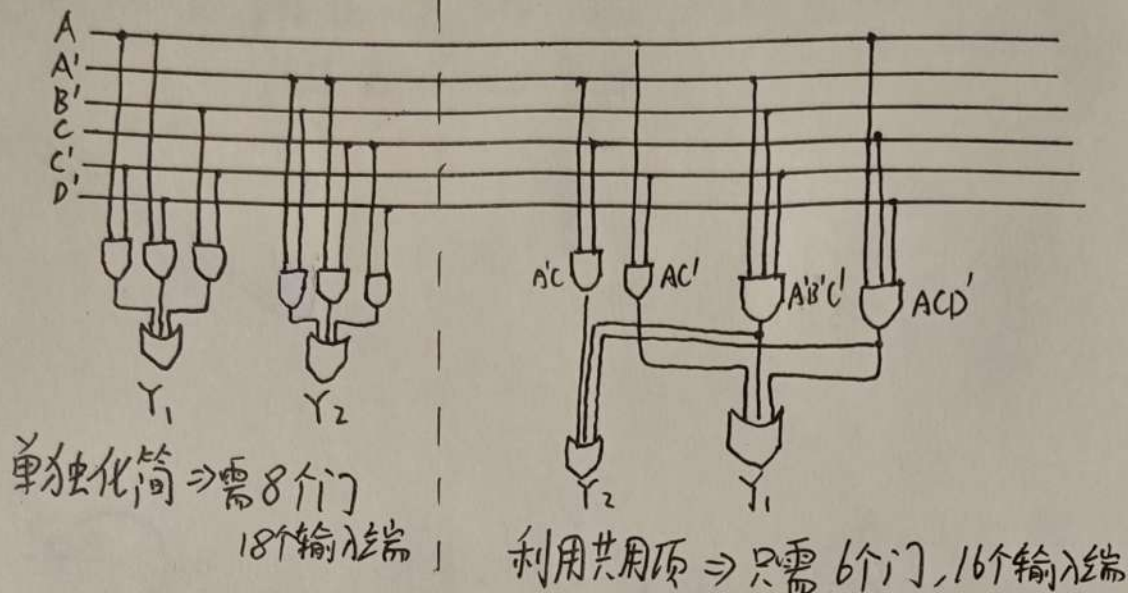
题 2-21 (1) $Y_1(A, B, C) = \sum m(0, 1, 2, 4) + d(5, 6)$

	BC	00	01	11	10
A	0	1	1	0	1
	1	1	1	0	1

$Y = B' + C'$

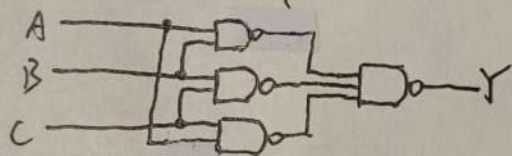
总体: $\begin{cases} Y_1 = AC' + A'B'C' + ACD' \\ Y_2 = A'C + A'B'C' + ACD' \end{cases}$

图画在另一张纸

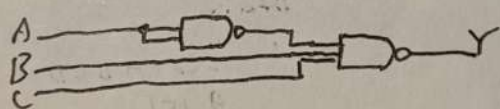


题 2.26

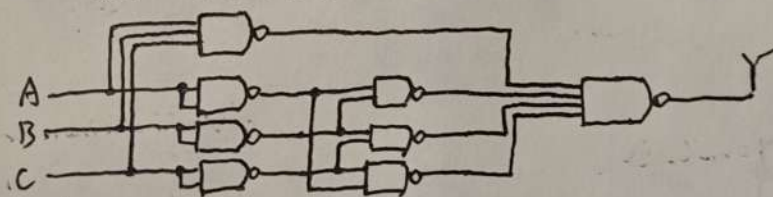
(1) $Y = AB + BC + AC = (AB + BC + AC)'' = ((AB)'(BC)')(AC)'$



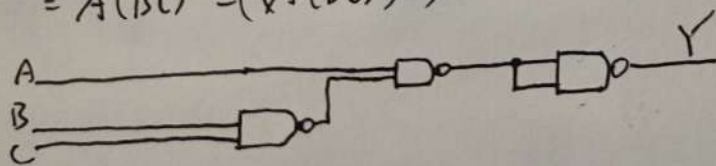
(2) $Y = (A'+B)(A+B')C + (BC)' = A'B'C + ABC + B'+C' = ABC + B'+C' = A+B'+C'$
 $= ((A+B'+C'))' = (A'BC)'$



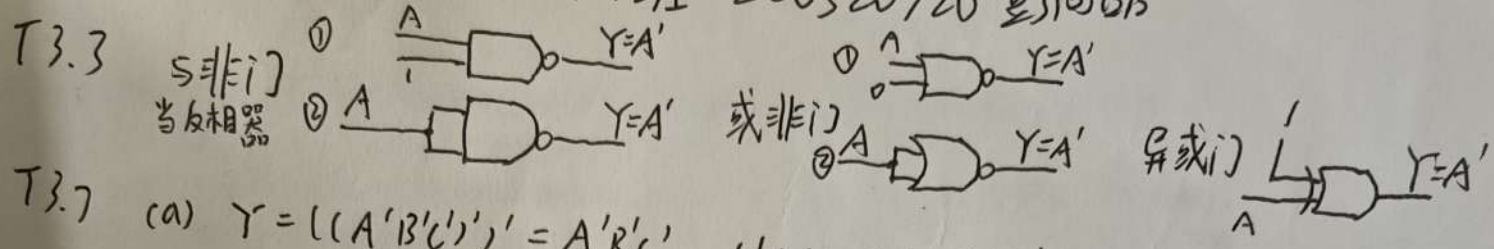
(3) $Y = (ABC' + AB'C + A'BC)' = (A'+B'+C)(A'+B+C')(A+B'+C') = (A'+B'+C)(A+B'+C')$
 $= A'B' + A'C' + B'C' + ABC = ((A'B)')(A'C)')(B'C)')(ABC)'$



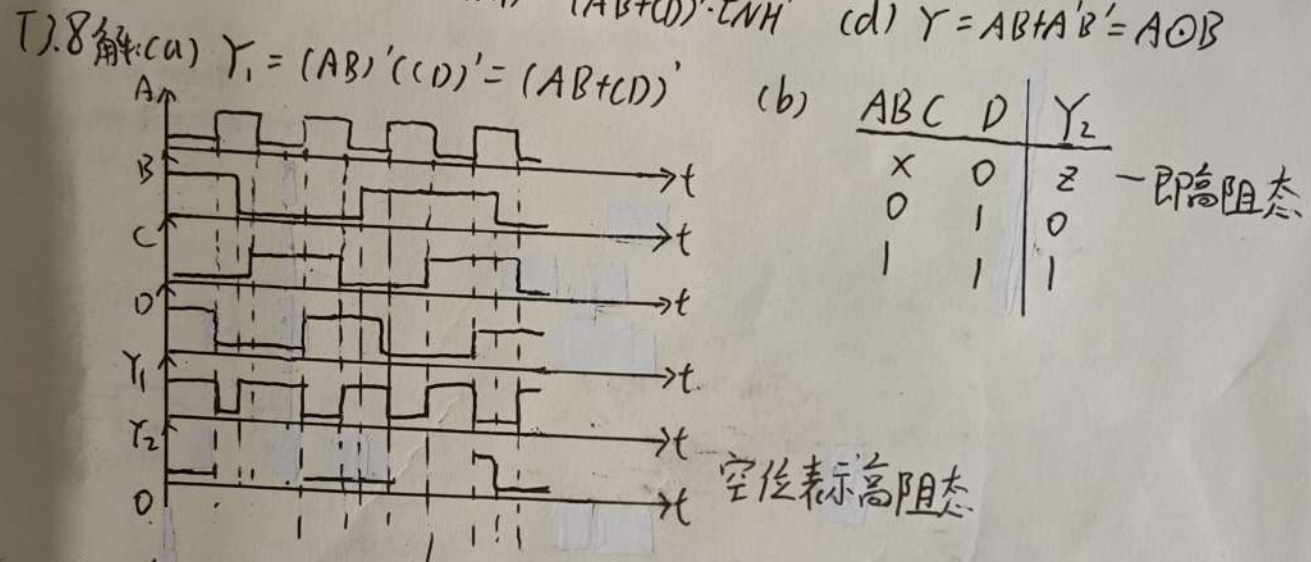
(4) $Y = AB' + AC' + ((AB)')(A'B)')(BC)'' = AB' + AC' + (AB)'(A+B)(B'+C') = AB' + AC'$
 $= A(BC)' = (A(BC)')'$



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T3.7 (a) $Y = [(A'B'C)']' = A'B'C'$ (b) $Y = (A'+B'+C) = ABC$
 (c) $Y = (AB+CD+ENH)' = (AB+CD)' \cdot ENH'$ (d) $Y = AB+AB' = A \oplus B$

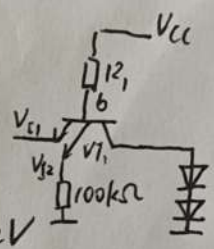


T3.12 解: CMOS 输入接电阻接地 \Rightarrow 低电平输入

$Y_1=1, Y_2=1, Y_3=0, Y_4=0$

T3.13 解: 相当于 V_{i2} 端接电阻 $100k\Omega$ 接地; 悬空相当于无穷大电阻接地

- (1) V_{i1} 悬空 \Rightarrow 接高电平, T₁ 集电结正偏
 $V_{B1}=2.1V \Rightarrow V_{E2}=2.1V-0.7V=1.4V$
- (2) $V_{i1}=0.2V$, T₁ 发射结正偏, $V_{B1}=0.9V \Rightarrow V_{E2}=0.2V$
- (3) $V_{i1}=3.2V$, T₁ 集电结正偏, $V_{B1}=2.1V \Rightarrow V_{E2}=1.4V$
- (4) $V_{i1} \approx 0, \Rightarrow V_{E2} \approx 0$
- (5) V_{i1} 相当于接高电平, T₁ 集电结正偏 $\Rightarrow V_{E2}=1.4V$



答: (1) 1.4V (2) 0.2V (3) 1.4V (4) 0 (5) 1.4V

T3.17 解: 每个输入端有一个输入电流

① $V_{OL} \leq 0.4V$ 时, $N_1 \leq \frac{I_{OLmax}}{I_{iLmax}} = 5$ ② $V_{OH} \geq 3.2V$ 时, $N_2 \leq \frac{I_{OH(max)}}{2 \cdot I_{iHmax}} = 5$

答: 可驱动 5 个同样的或非门。

T3.23 解: (1) ① 饱和基极电流 $I_{BS} = \frac{1}{\beta} (\frac{V_{CC}-V_{CESat}}{R_C+R_{CESat}}) + 5 I_{IL} = 0.09mA$
 $I_{R1} = \frac{V_{CC}-V_{BE}}{R_B} = I_B + 50mA = 0.14mA \Rightarrow R_B = 30.7k\Omega$ 综上, $0.29k\Omega \leq R_B \leq 30.7k\Omega$
 ② $\frac{V_{CC}-V_{OL}}{R_B} \leq 16mA \Rightarrow R_B \geq 0.29k\Omega$

(2) 高电平时电流过大, 使电路受损, TTL 电路与晶体管 be 结烧坏。

题4.3. 由图可知 $Y_1 = ABC + A'BC + A'BC' + ABC'$ 真值表

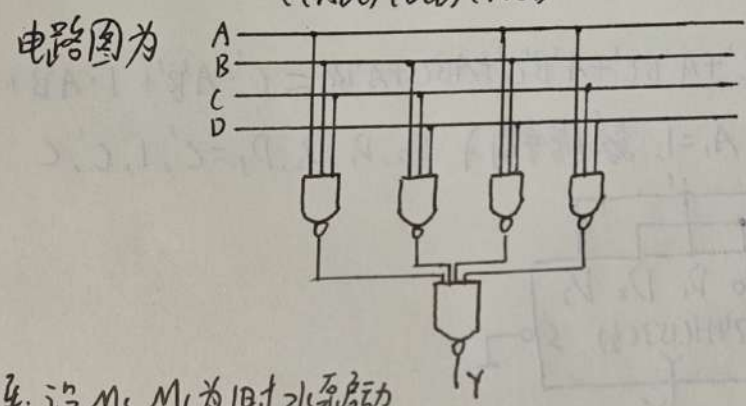
A	B	C	Y_1	Y_2
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$Y_2 = AB + AC + BC$

意义: Y_1 : ABC中奇数个1时 Y_1 为1, 即奇校验电路
 Y_2 : ABC中至少2个为1时 Y_2 为1, 即三变量表决器
 \Rightarrow { 一个全加器电路, A, B, C三个数相加
 Y_1 是和, Y_2 是进位输出

题4.5 解: 由题意知 $Y = ABC + BCD + ABD + ACD$

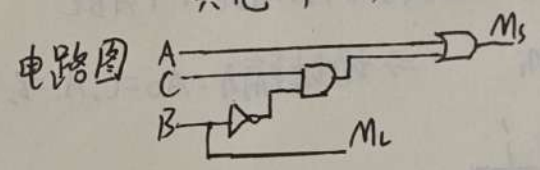
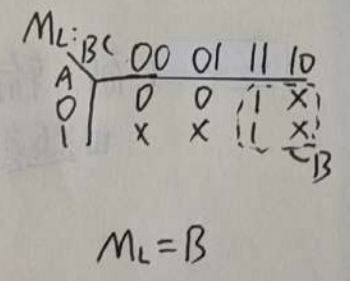
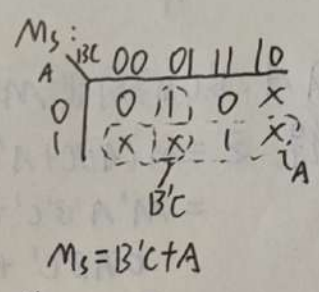
$= ((ABC)'(BCD)'(ABD)'(ACD)')'$ 为与非-与非式



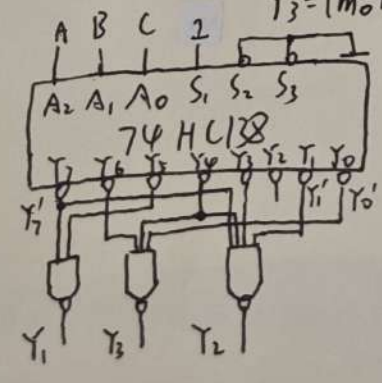
题4.6 解: 设 M_s, M_L 为1时水泵启动
 为0时水泵停止

真值表

A	B	C	M_s	M_L
0	0	0	0	0
0	0	1	1	0
0	1	1	0	1
1	1	1	1	1
其他			x	x



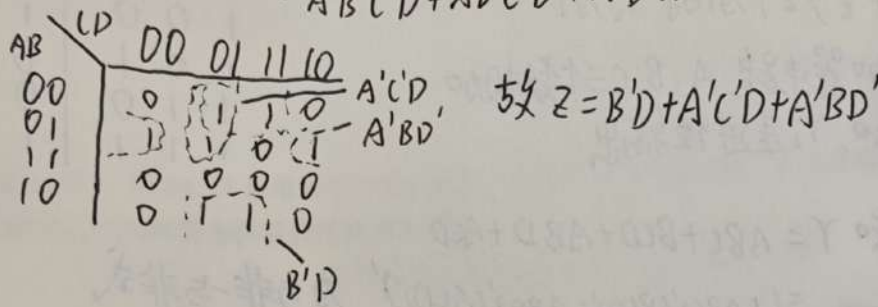
题4.12 解: 原逻辑函数: $Y_1 = ABC + AB'C = m_5 + m_7 = (m_5' m_7)'$; $Y_2 = (m_1' m_3' m_4' m_7)'$
 $Y_3 = (m_0' m_4' m_6)'$



题 4.16 解: $Z = \sum_{i=0}^7 D_i m_i$

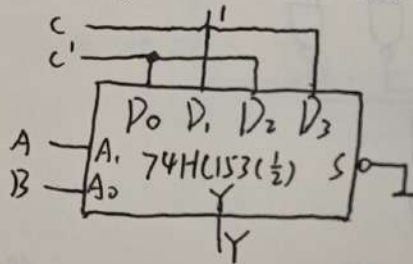
$$= D(C' B' A' + C' B' A + C B' A' + C B' A) + C' B A' + D'(C B A')$$

$$= A' B' C' D + A B' C' D + A' B' C D + A B' C D + A' B C' + A' B C D'$$



题 4.18 解: $Y = AB'C' + A'BC' + A'B'C' + ABC + A'BC = C' \cdot A'B' + 1 \cdot A'B + C' \cdot AB' + CAB = \sum_{i=0}^3 D_i m_i$

令 $A_0 = B, A_1 = 1, \text{数据输入 } D_0, D_1, D_2, D_3 = C', 1, C', C$



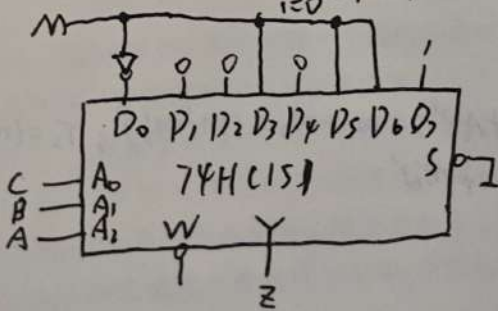
题 4.23 解: 输入 A, B, C, 输出 Z

$$\text{由题意得, } Z = M'(ABC + A'B'C') + M(ABC + ABC' + AB'C + A'BC)$$

$$= M'A'B'C' + 0A'B'C' + 0A'BC' + MA'BC + 0AB'C' + MAB'C + MABC' + 1ABC$$

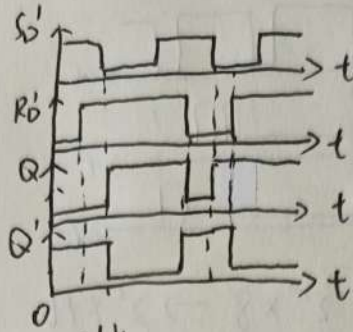
$$= \sum_{i=0}^7 D_i m_i$$

\Rightarrow 地址输入: $A_0 = C, A_1 = B, A_2 = A$

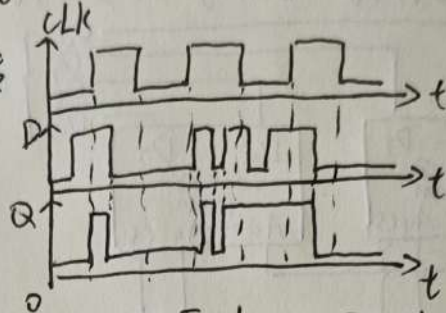


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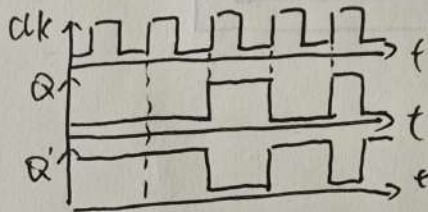
题5.1. $S_0=0 \rightarrow$ 写1
 $R_0=0 \rightarrow$ 写0
 $S_0=R_0=1 \rightarrow$ 保持



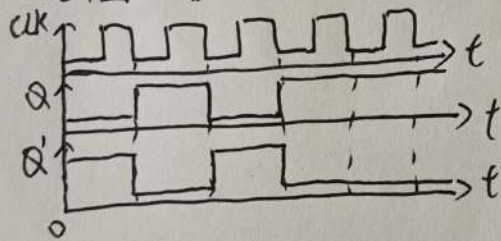
题5.6. 解: 如图, 高电平触发



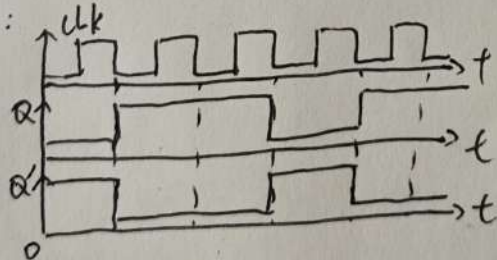
题5.9. 解: 因为上升沿触发, R_0 为异步置零端 (画图时省略 R_0, J, k 波形)



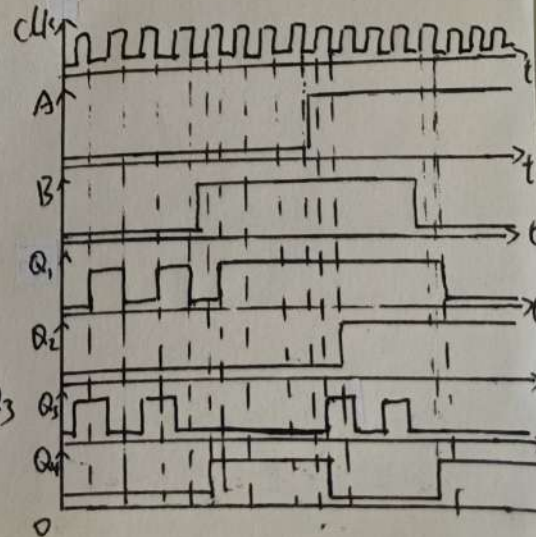
题5.14. 解: (画图时省略 R_0', S, R)



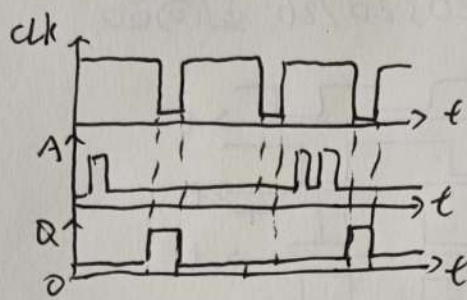
题5.16. 解:



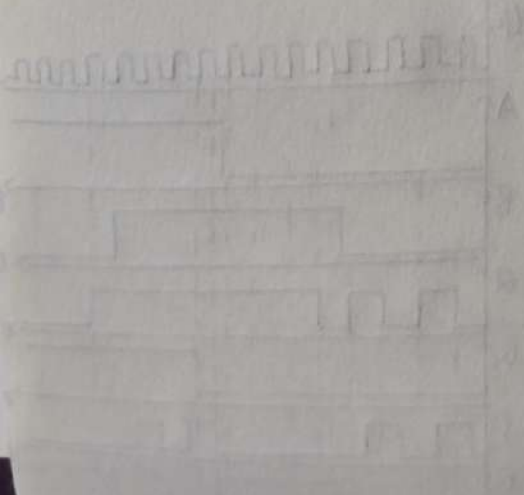
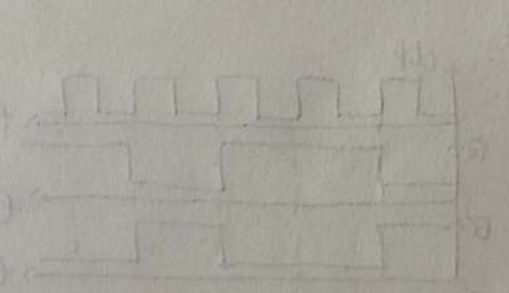
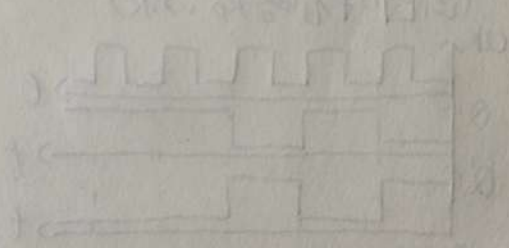
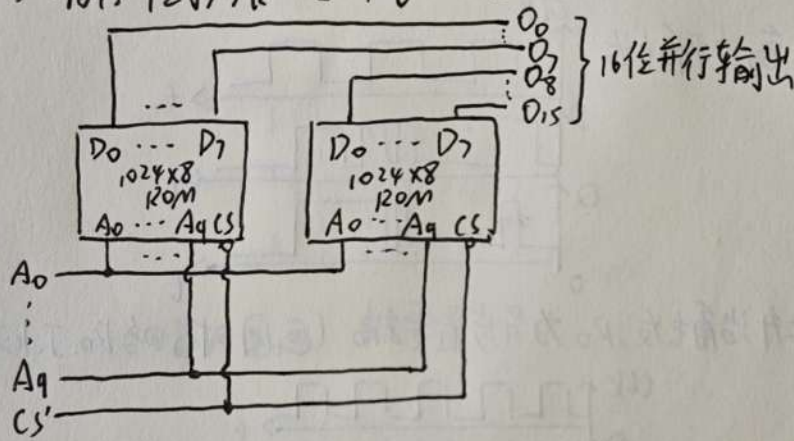
- ① 下降沿触发, $J_1=A, k_1=B'$
 代入 $Q^* = JQ' + k'Q \Rightarrow Q_1^* = A'Q' + BQ$
- ② 下降沿触发, $S_2=AB, R_2=(A+B)$
 代入 $Q^* = SR'Q \Rightarrow Q_2^* = AB + (A+B)Q_1$
- ③ 上升沿触发, $T = A \oplus B$
 代入 $Q^* = T \oplus Q_2 \Rightarrow Q_3^* = A \oplus B \oplus Q_2$
- ④ 上升沿触发, $D = A \oplus B$
 代入 $Q^* = D \Rightarrow Q_4^* = A \oplus B$



题5.24解:



题5.30解: 位扩展 $2^{10} \times 8 \rightarrow 2^{10} \times 16$



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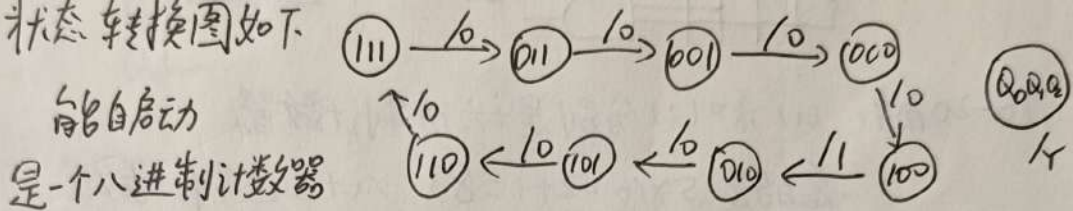
T6.4 解: $D_0 = (Q_1 \oplus Q_2) \oplus (Q_0' Q_1) = Q_1 Q_2' + Q_0 Q_1' Q_2 + Q_0' Q_1 Q_2' \xrightarrow{\text{吸收}} Q_1 Q_2' + Q_0 Q_1' Q_2 + Q_0' Q_2'$

故驱动方程 $\begin{cases} D_0 = Q_1 Q_2' + Q_0 Q_1' Q_2 + Q_0' Q_2' \\ D_1 = Q_0 \\ D_2 = Q_1 \end{cases}$

代入 $Q^* = D \Rightarrow \begin{cases} Q_0^* = Q_1 Q_2' + Q_0 Q_1' Q_2 + Q_0' Q_2' \\ Q_1^* = Q_0 \\ Q_2^* = Q_1 \end{cases}$

输出方程 $Y = Q_0 Q_1' Q_2'$

状态转换图如下



T6.10 解:

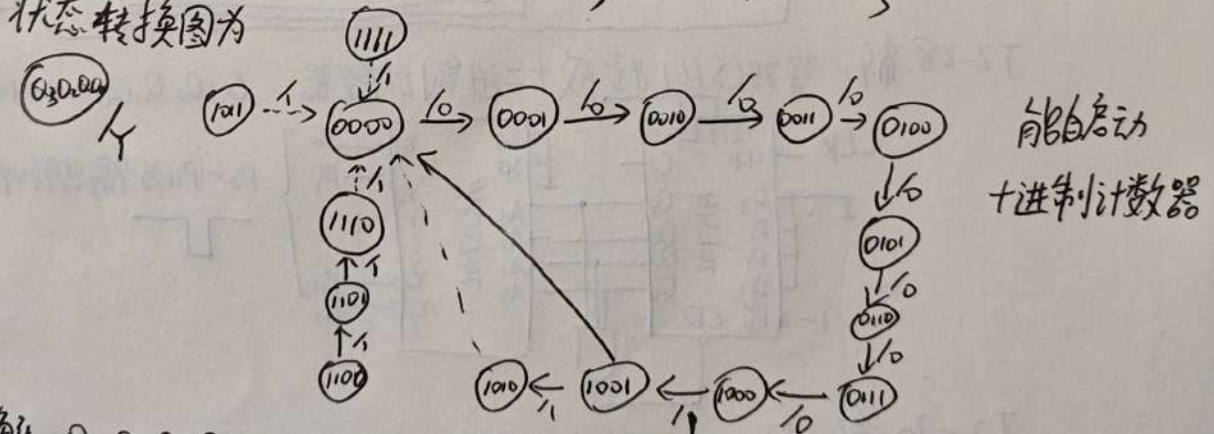
CLK	A ₃	A ₂	A ₁	A ₀	B ₃	B ₂	B ₁	B ₀	C ₄	C ₃	C ₂	C ₁	C ₀	S
(初始)	0	1	0	0	1	0	0	1	1	0	1	0	0	0
1	0	1	0	0	0	0	0	1	1	1	1	0	0	0
2	0	0	1	0	0	0	0	0	1	1	1	0	0	0
3	1	0	0	1	0	0	0	0	0	1	1	0	0	1
4	1	1	0	0	0	0	0	0	0	0	0	0	0	1

即经过4个时钟信号后, $A_3 A_2 A_1 A_0 = 1100, B_3 B_2 B_1 B_0 = 0000$ 作用: 4位串行加法器

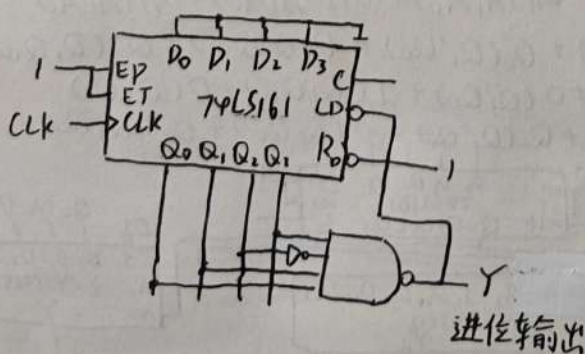
T6.12 解:

当 $(Q_1 Q_1)' = 1$ 时异步置零, 进位输出 $Y = Q_3$

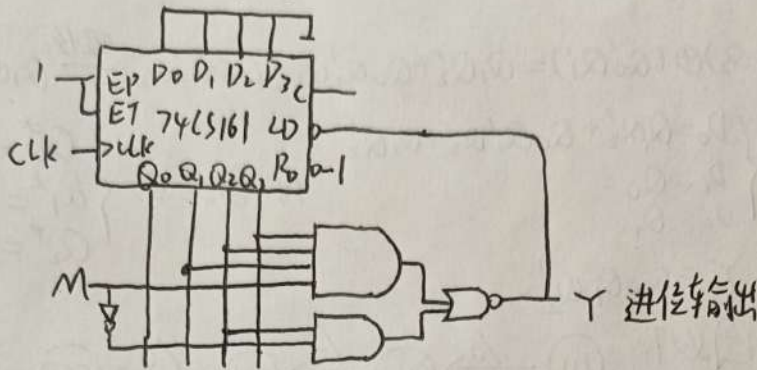
状态转换图为



T6.14 解: $Q_3 Q_2 Q_1 Q_0 = 1011$ 时同步置数, (+)

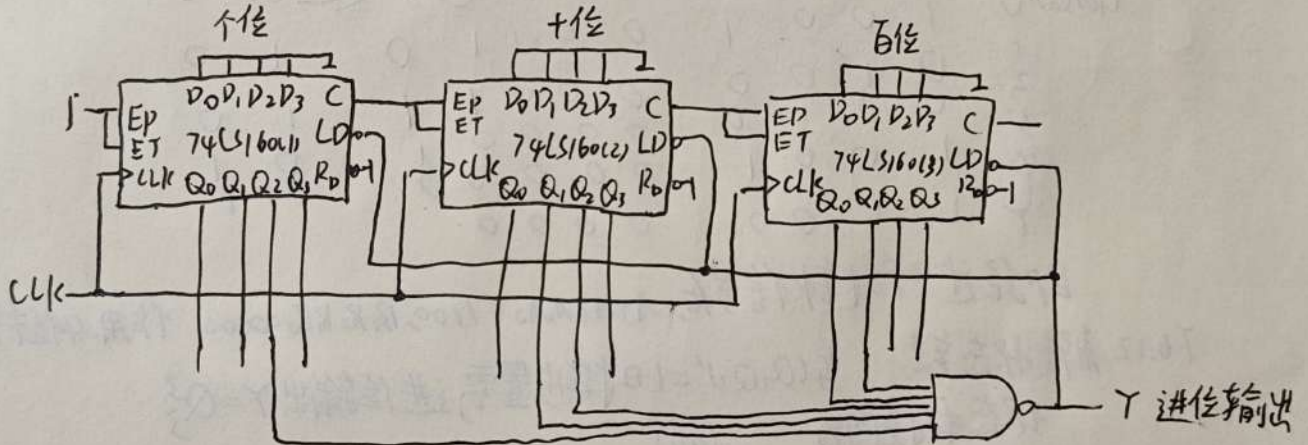


T6-16解: $M=0$ 时 $Q_3Q_2Q_1Q_0=0100 \rightarrow LD'=0$
 $M=1$ 时 $Q_3Q_2Q_1Q_0=1110 \rightarrow LD'=0$

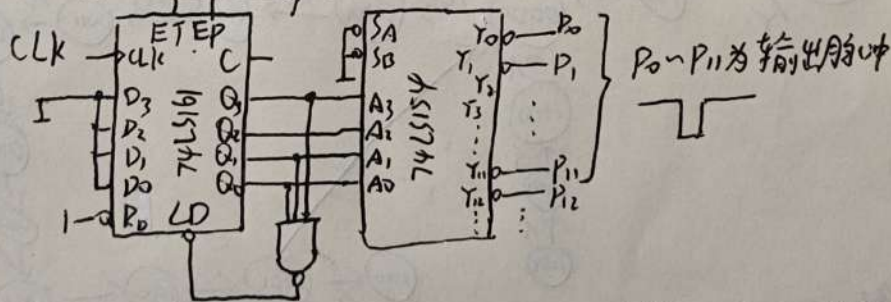


T6-20解: (1) 和 (2) 分别是十六进制计数器
 总的是 $5 \times 16 + 2 + 1 = 83$ 八十三进制计数器

T6-22解: 采用同步置数法, 译出三百六十四时 $LD'=0$, 置为零



T2-28解: 将74LS161接成十二进制计数器 $Q_3Q_2Q_1Q_0=1011$ 时译出 $LD'=0$



T2-30解: 用74LS161的低3位作为八进制计数器; 查八选三译码器74HC153

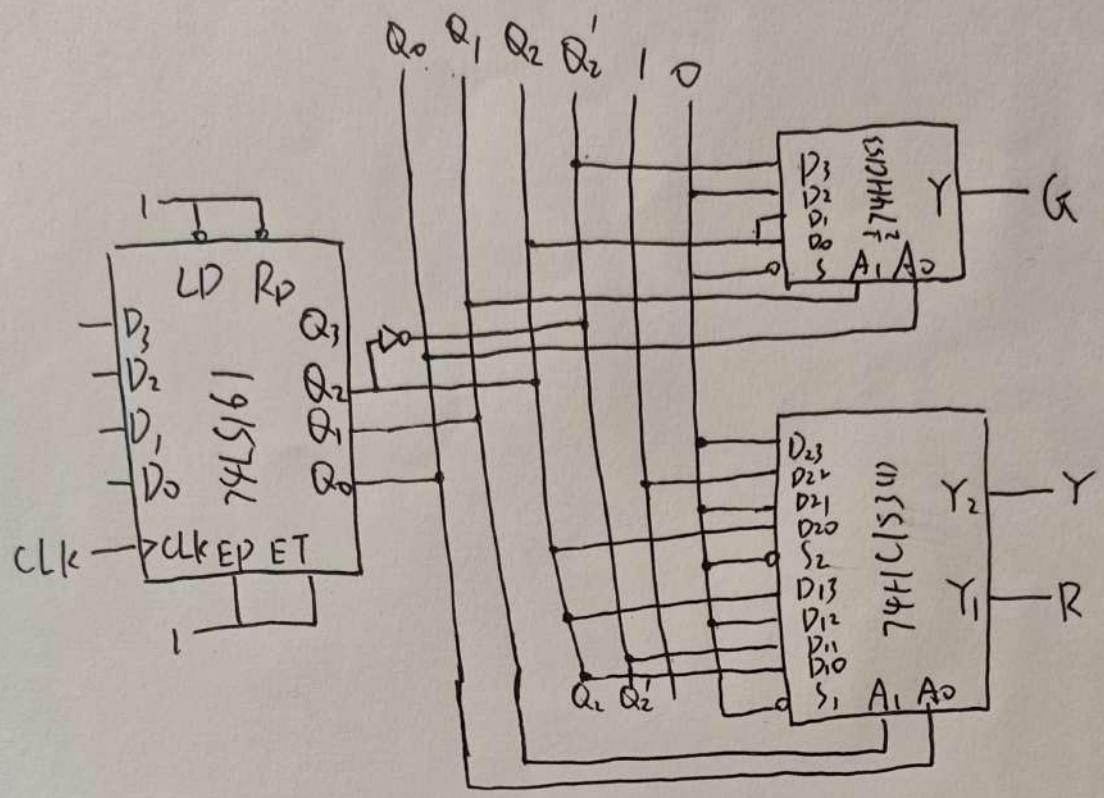
Q_2	Q_1	Q_0	R	Y	G
0	0	0	0	0	0
0	0	1	1	0	0
0	1	0	0	1	0
0	1	1	0	0	1
1	0	0	1	1	1
1	0	1	0	0	1
1	1	0	0	1	0
1	1	1	1	0	0

$$Y_1 = D_{10}(A_1'A_0') + D_{11}(A_1'A_0) + D_{12}(A_1'A_0') + D_{13}(A_1'A_0)$$

$$\Rightarrow R = Q_2(Q_1'Q_0') + Q_2'(Q_1'Q_0) + D(Q_1'Q_0') + Q_2(Q_1'Q_0)$$

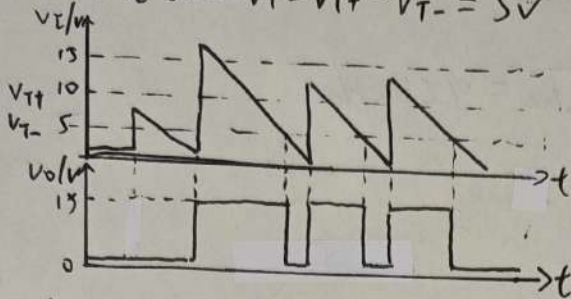
$$Y = Q_2(Q_1'Q_0') + 0(Q_1'Q_0) + 1(Q_1Q_0') + 0(Q_1Q_0)$$

$$G = Q_2(Q_1'Q_0') + Q_2(Q_1'Q_0) + 0(Q_1Q_0') + Q_2'(Q_1Q_0)$$

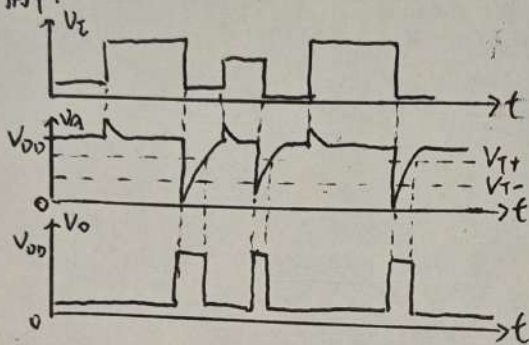


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T7.3 解: ① V_i 从 0 升高使 $V_A = V_{TH}$ 时 $V_A = V_{TH} = \frac{R_2}{R_1 + R_2} V_i \Rightarrow V_{T+} = \frac{4}{3} \times 2.5 = 10V$
 ② V_i 从 V_{DD} 降使 $V_A = V_{TH}$ 时 $V_A = V_{TH} = \frac{R_2}{R_1 + R_2} V_i + \frac{R_1}{R_1 + R_2} V_{DD} \Rightarrow V_{T-} = 5V$
 回差电压 $\Delta V_T = V_{T+} - V_{T-} = 5V$

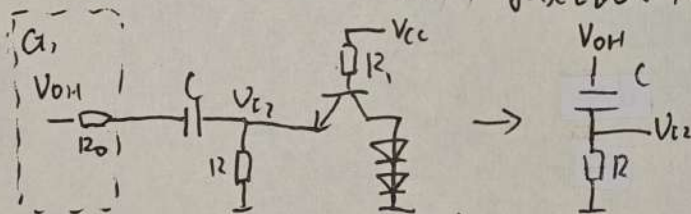


T7.6 解:



V_A 的脉冲中幅度与输入信号 V_i 的变化幅度有关
 $\Rightarrow V_o$ 脉冲中的宽度不仅取决于电路内部的参数, 还与 V_i 的幅度有关, 故不能作单稳态电路

T7.10 解: 电容充电 V_{C2} 从 V_{OH} \rightarrow V_{TH} , 等效电路如下



$T = RC$

由 $f(t) = f(\infty) + [f(0^+) - f(\infty)]e^{-\frac{t}{T}}$ 得 $t_w = T \ln \frac{f(\infty) - f(0^+)}{f(\infty) - f(t_w)} = RC \ln \frac{0 - V_{OH}}{0 - V_{TH}}$
 代入数据, 有 $t_w = 2.7 \mu s$

T7.14 解: $T = 2.2RC = 2.2 \times 9.1 \times 10^3 \times 10^{-9} s = 2.002 \times 10^{-5} s$, $f = \frac{1}{T} = 4.995 \times 10^4 Hz$

T7.16 解: $T = \frac{1}{f} = \frac{1}{10 MHz} = 10^{-7} s$ 由题意, $T = 2 \times 5 t_{pd} \Rightarrow t_{pd} = 10^{-8} s = 10 ns$

T.7.21 解:

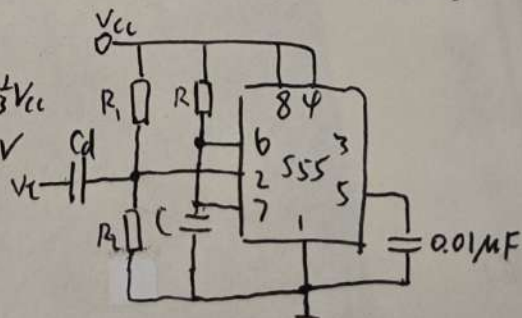
触发信号 (V_i 低电平) 来之前应使 2 端电压高于 $\frac{1}{3} V_{CC}$
 取 $R_1 = 22 k\Omega, R_2 = 18 k\Omega$, 分压后 2 端电压 $6.75V > 5V$

取 $C = 100 \mu F$, 由于 $t_w = 1.1RC = 1 \sim 10 s$

故 $R_{min} = \frac{t_{wmin}}{1.1C} = 9.1 k\Omega$

$R_{max} = \frac{t_{wmax}}{1.1C} = 91 k\Omega$

可选 $8.2 k\Omega$ 电阻和 $100 k\Omega$ 电位器串联作为 R .

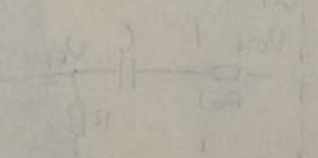
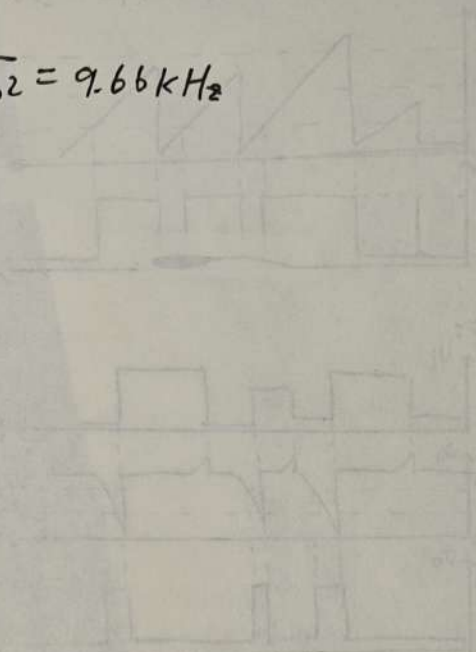


T7-25 解: 左边555接成了施密特触发电路, 右边555接成了多谐振荡电路

当S闭合后, C开始从0充电, $V_{T+} = \frac{2}{3}V_{CC}$ 后, G_1 输出高电平, 多谐振荡电路开始振荡

延迟时间: $T_D = RC \ln \frac{V_{CC}}{V_{CC} - V_{T+}} = 11s$

振荡频率 $f = \frac{1}{(R_1 + 2R_2)C_1} = 9.66kHz$



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T8.2 解: 图中 $I = \frac{V_{REF}}{R}$, 则由“虚短”“虚断”

$$V_o = -R_i I = -R \left(\frac{I}{2} d_3 + \frac{I}{4} d_2 + \frac{I}{8} d_1 + \frac{I}{16} d_0 \right) = -\frac{V_{REF}}{2^4} (2^3 d_3 + 2^2 d_2 + 2^1 d_1 + 2^0 d_0)$$

$$= \frac{1}{2} (2^3 d_3 + 2^2 d_2 + 2^1 d_1 + 2^0 d_0) V$$

故 $d_3=1$ 时 $V_o=4V$, $d_2=1$ 时 $V_o=2V$, $d_1=1$ 时 $V_o=1V$, $d_0=1$ 时 $V_o=0.5V$

T8.4 解: $V_o = -\frac{V_{REF}}{2^n} D_n = \left(\frac{10}{2^{10}} D_n\right) V$

全0时, $V_o=0$, 全1时, $V_o=10 \times \frac{2^{10}-1}{2^{10}} \approx 9.999V$ 故范围是 $0 \sim 9.999V$

若要将输出电压变化范围缩小一半, 可 ① V_{REF} 降为半

② 将反馈电阻 R 换为 $\frac{R}{2}$

T8.5 解: 74LS161 为十六进制计数器, 输出 Q_3, Q_2, Q_1, Q_0 从 0000 到 1111 循环

$\Rightarrow d_3 d_2 d_1 d_0$ 从 0000 到 1111 循环

由 $V_o = -\frac{V_{REF}}{2^n} D_n = \frac{10}{2^{10}} D_n$ 知 0001 时 $V_o = \frac{10}{2^{10}} \times 64 = 0.625V$

$Q_3 Q_2 Q_1 Q_0$	V_o / V
0 0 0 0	0
0 0 0 1	0.625
0 0 1 0	1.25
0 0 1 1	1.875
⋮	⋮
1 1 1 1	9.375

$\Delta V_o = \frac{10}{2^{10}} \times 64 = 0.625V$
 增量为 $\Delta V_o = 0.625V$

T8.11 解: 由 $V_o = -\frac{V_{REF}}{2^{10}} D = -\frac{V_c}{2^{10}} D$ 知 $A_v = \frac{V_o}{V_c} = -\frac{D}{2^{10}}$, 下对 D 进行讨论

D 为全0时 $A_v=0$, D 为全1时, $A_v = -\frac{2^{10}-1}{2^{10}} \approx -0.999$

故 A_v 的范围是 $-0.999 \sim 0$

T8.15 解: 量化单位 $\Delta = \frac{2}{2^4-1} V_{REF} = \frac{2}{511} V_{REF}$ 最大量化误差为 $\frac{1}{2} \Delta = \frac{1}{511} V_{REF}$

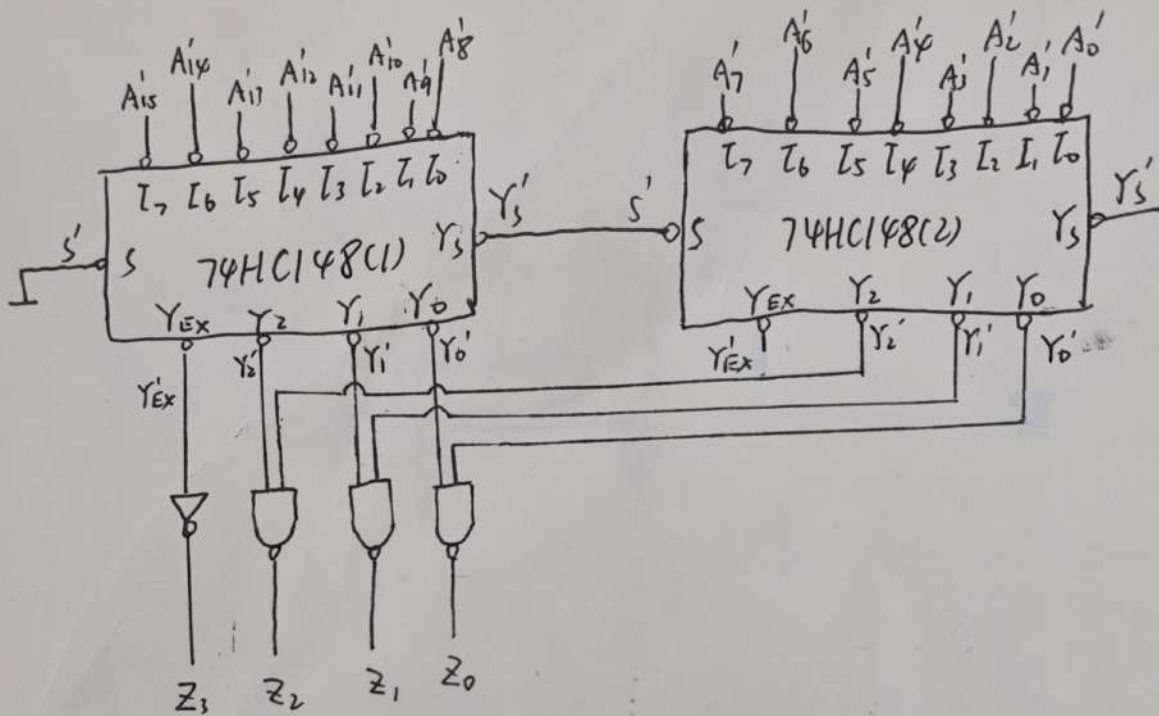
ΔV_{REF} 在最高位上引起的误差最大, $\Delta V_{REF} \cdot \frac{509}{511} < \frac{1}{511} V_{REF} \Rightarrow \left| \frac{\Delta V_{REF}}{V_{REF}} \right| < 0.2\%$
 最大的比较电平

T8.16 解: 输出10位 \Rightarrow 完成一次转换需 12 个时钟信号周期

$$t = \frac{1}{1MHz} \times 12 = 12\mu s$$

比较电平: $0, \frac{1}{511} V_{REF}, \frac{2}{511} V_{REF}, \dots, \frac{509}{511} V_{REF}$

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A高:转 低:停 B:高:正 低:反

正3s 停2s 反4s 停3s

解: 需十进制计数器, 采用同步置数法, 当 $Q_3 Q_2 Q_1 Q_0 = 1011$ 时译出 $LD = 0$ (1分)

