数字电路基础　第三周作业：张悦老师

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作业内容：2.1-(2,6,7)；2.15-(2,5,8,9)；2.20-(c,d)；2.10-(2,4)；2.11-(4,5)；2.18-(6,7)；2.18-(8)；2.19-(2,5)；2.2-(2,3)；2.12-(1,3)；2.13-(2,3) 2.22-(1,4)

Problem 2.1

SubProblem 2

表 1: 2.1.2

A	0	1
$A \oplus 1$	1	0

SubProblem 6

表 2: 2.1.6

A	B	C	$A(B \oplus C)$	$AB \oplus AC$
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	1	1
1	1	0	1	1
1	1	1	0	0

SubProblem 7

Problem 2.15

SubProblem 2

表 3: 2.1.7

A	B	$(A \oplus B)'$	$A \oplus B \oplus 1$
0	0	1	1
0	1	0	0
1	0	0	0
1	1	1	1

$$\begin{aligned} Y &= AB'C + A' + B + C' \\ &= B'C + A' + B + C' \\ &= C + A' + B + C' \\ &= 1 \end{aligned}$$

SubProblem 5

$$\begin{aligned} Y &= AB'(A'CD + (AD + B'C')')(A' + B) \\ &= (AB'A'CD + AB'((A' + D')(B + C))) \\ &\qquad (A' + B) \\ &= AB'D'(B + C)(A' + B) \\ &= AB'CD'(A' + B) \\ &= 0 \end{aligned}$$

SubProblem 8

$$
\begin{aligned}
Y &= A + (B + C')'(A + B' + C)(A + B + C) \\
&= A + (B'C)(A + B' + C)(A + B + C) \\
&= A + (B'C)(A + AB' + AC + \\
&\qquad AB + BC + AC + B'C + C) \\
&= A + (B'C)(A + BC + B'C + C) \\
&= A + B'C(A + C) \\
&= A + AB'C + B'C \\
&= A + B'C
\end{aligned}
$$

SubProblem 9

$$
\begin{aligned}
Y &= BC' + ABC'E + B'(A'D' + AD)' \\
&\qquad + B(AD' + A'D) \\
&= BC' + B'(A + D)(A' + D') \\
&\qquad + B(AD' + A'D) \\
&= BC' + B'(A'D + AD') + B(AD' + A'D) \\
&= BC' + AD' + A'D
\end{aligned}
$$

Problem 2.20

SubProblem c

$$
\begin{aligned}
Y_1 &= ((AB')'(AD'C)')' \\
&= ((A' + B)(A' + C' + D))' \\
&= (A' + A'B + A'C' + BC' + A'D + BD)' \\
&= (A' + BC' + BD)' \\
&= A(BC')'(BD)' \\
&= A(B' + C)(B' + D') \\
&= (AB' + ACD') \\
&= \sum m(8, 9, 10, 11, 14)
\end{aligned}
$$

$$
\begin{aligned}
Y_2 &= ((AB')'(AC'D')'(A'C'D)'(ACD)')' \\
&= (AB') + (AC'D') + (A'C'D) + (ACD) \\
&= \sum m(1, 5, 8, 9, 10, 11, 12, 15)
\end{aligned}
$$

SubProblem d

$$
\begin{aligned}
Y_1 &= (AB) + (C(A \oplus B)) \\
&= AB + C(A'B + AB') \\
&= AB + A'BC + AB'C \\
&= \sum m(3, 5, 6, 7)
\end{aligned}
$$

$$
Y_2 = A \oplus B \oplus C
$$

(真值为 1 时，输入为 001 111 101 011)

$$
= \sum m(1, 3, 5, 7)
$$

Problem 2.10 实际上还是求与或形式

SubProblem 2

$$
\begin{aligned}
Y &= ABC'D + BCD + A'D \\
&= \sum m(1, 3, 5, 7, 9, 15)
\end{aligned}
$$

SubProblem 4

$$
\begin{aligned}
Y &= AB + ((BC)'(C' + D'))' \\
&= AB + (BC + CD) \\
&= \sum m(3, 6, 7, 11, 12, 13, 14, 15)
\end{aligned}
$$

Problem 2.11

SubProblem 4

$$
\begin{aligned}
Y &= BCD' + C + A'D \\
&= C + A'D \\
&= \prod M(0, 4, 8, 9, 12, 13)
\end{aligned}
$$

SubProblem 5

$$
Y = \prod M(0, 3, 5)
$$

Problem 2.18

SubProblem 6

即在输入为 000, 001, 010, 101, 110, 111 时结果为 1 。建立卡诺图，如**图 1**，结果为 $A'B' + AC + BC'$

SubProblem 7

即在输入为 0000, 0001, 0010, 0101, 1000, 1001, 1010, 1100, 1110 时结果为 1，建立卡诺

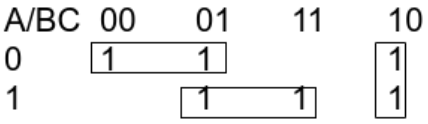

图 1: 2.18.6 卡诺图

图如**图 2**，结果为 $B'C' + AC'D' + A'C'D + ACD' + B'CD'$ 。

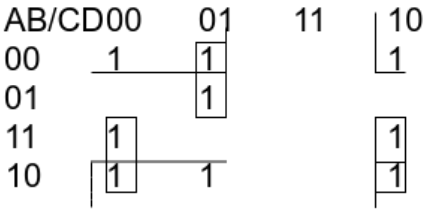

图 2: 2.18.7 卡诺图

SubProblem 8

即在输入为001, 100, 111时结果为1 , 建立卡诺图如**图 3** , 结果为 $A'B'C + AB'C' + ABC$。

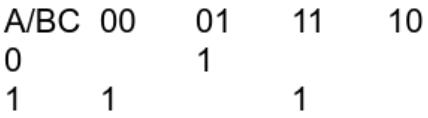

图 3: 2.18.8 卡诺图

Problem 2.19

SubProblem 2

$$\begin{aligned} Y &= A'(CD' + C'D) + BC'D + AC'D \\ &\quad + A'CD' \\ &= A'CD' + C'D \end{aligned}$$

SubProblem 5

$$\begin{aligned} Y &= (AB'C'D + AC'DE + B'DE' + \\ &\quad AC'D'E)' \\ &= (AB'C'D + B'DE' + AC'E)' \\ &= (AC'(B'D + E) + B'DE)' \\ &= ((AC')' + (B'D)'E')((B'D)' + E') \\ &= (A' + C)(B + D') + (A' + C)E' \\ &\quad + (B + D')E' \\ &= A'B + A'D' + A'E' + BC + BE' \\ &\quad + CD' + CE' + D'E' \end{aligned}$$