

# 第二次作业

1.20 求下列函数的最小项标准式和最大项标准式

$$(1) F = \overline{(AB + ABD)}(B + CD)$$

$$F = \overline{(AB + ABD)}(B + CD)$$

$$= (\bar{A} + \bar{B})(B + CD)$$

$$= \bar{A}B + \bar{A}CD + \bar{B}CD$$

$$= \bar{A}B(C + \bar{C})(D + \bar{D}) + \bar{A}(B + \bar{B})CD + (A + \bar{A})\bar{B}CD$$

$$= \bar{A}BCD + \bar{A}BC\bar{D} + \bar{A}B\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}\bar{B}CD + A\bar{B}CD$$

$$F = \sum m^4(3,4,5,6,7,11)$$

$$F = \prod M^4(0,1,2,8,9,10,12,13,14,15)$$

$$(2) \quad F = (\bar{A} + C)(A + B)(C + \bar{D})$$

$$F = (\bar{A} + C)(A + B)(C + \bar{D})$$

$$= AC + \bar{A}BC + BC + AC\bar{D} + \bar{A}B\bar{D} + BC\bar{D}$$

$$= AC + \bar{A}BC + AC\bar{D} + \bar{A}B\bar{D}$$

$$= AC + \bar{A}BC + \bar{A}B\bar{D}$$

$$= A(B + \bar{B})C(D + \bar{D}) + \bar{A}BC(D + \bar{D}) + \bar{A}B(C + \bar{C})\bar{D}$$

$$= ABCD + ABC\bar{D} + A\bar{B}CD + A\bar{B}C\bar{D} + \bar{A}BCD + \bar{A}BC\bar{D} + \bar{A}B\bar{C}\bar{D}$$

$$F = \sum m^4(4,6,7,10,11,14,15)$$

$$F = \prod M^4(0,1,2,3,5,8,9,12,13)$$

$$(3) \quad F = (\bar{A} \oplus B)(A \oplus \bar{B}) + B \oplus C \oplus D$$

$$F = (\bar{A} \oplus B)(A \oplus \bar{B}) + B \oplus C \oplus D$$

$$= (AB + \bar{A}\bar{B}) + BCD + \bar{B}\bar{C}\bar{D} + \bar{B}C\bar{D} + B\bar{C}\bar{D}$$

$$= AB(C + \bar{C})(D + \bar{D}) + \bar{A}\bar{B}(C + \bar{C})(D + \bar{D}) + BCD(A + \bar{A}) + (A + \bar{A})\bar{B}\bar{C}\bar{D} \\ + (A + \bar{A})\bar{B}C\bar{D} + (A + \bar{A})B\bar{C}\bar{D}$$

$$= ABCD + ABC\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + \bar{A}\bar{B}CD + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}\bar{C}\bar{D} \\ + ~~ABCD~~ + \bar{A}BCD + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D}$$

$$F = \sum m^4(0,1,2,3,4,7,9,10,12,13,14,15)$$

$$F = \prod M^4(5,6,8,11)$$

## 1.22 用卡诺图化简下列各式为最简与或式及最简或与式

(1)  $F = \sum m^4(1,4,5,6,7,9,14,15)$

$CD \backslash AB$	00	01	11	10
00		1		
01	1	1		1
11		1	1	
10		1	1	

$$F = \bar{A}B + BC + \bar{B}\bar{C}D$$

$CD \backslash AB$	00	01	11	10
00	0		0	0
01			0	
11	0			0
10	0			0

$$\bar{F} = \bar{B}\bar{D} + \bar{B}C + AB\bar{C}$$

$$F = (B + D)(B + \bar{C})(\bar{A} + \bar{B} + C)$$

$$(2) F = \prod M^3(0,1,3,4,5)$$

$C \backslash AB$	00	01	11	10
0	0			0
1	0	0		0

$$\bar{F} = \bar{B} + \bar{A}C$$

$$F = B(A + \bar{C})$$

$C \backslash AB$	00	01	11	10
0		1	1	
1			1	1

$$F = AB + B\bar{C}$$

$$(3) F = \sum m^4(1,4,5,7,12,14,15)$$

$CD \backslash AB$	00	01	11	10
00		1	1	
01	1	1		
11		1	1	
10				1

$$F = B\bar{C}\bar{D} + \bar{A}\bar{C}D + BCD + ABC$$

$$F = B\bar{C}\bar{D} + \bar{A}\bar{C}D + \bar{A}BD + ABC$$

$CD \backslash AB$	00	01	11	10
00	0			0
01			0	0
11	0			0
10	0	0		0

$$\bar{F} = \bar{B}\bar{D} + \bar{B}C + A\bar{C}D + \bar{A}C\bar{D}$$

$$F = (B + D)(B + \bar{C})(\bar{A} + C + \bar{D})(A + \bar{C} + D)$$

$$(4) F = \prod M^4(1,7,9,13,15) + d(2,4,12)$$

$CD \backslash AB$	00	01	11	10
00		d	d	
01	0		0	0
11		0	0	
10	d			

$$\bar{F} = \bar{B}\bar{C}D + A\bar{C}D + BCD$$

$$F = (B + C + \bar{D})(\bar{A} + C + \bar{D})(\bar{B} + \bar{C} + \bar{D})$$

$$F = (B + C + \bar{D})(\bar{A} + \bar{B} + \bar{D})(\bar{B} + \bar{C} + \bar{D})$$

$CD \backslash AB$	00	01	11	10
00	1	d	d	1
01		1		
11	1			1
10	d	1	1	1

$$F = \bar{D} + \bar{B}C + \bar{A}B\bar{C}$$



1. 23 用代数法或禁止逻辑法将下列函数用最少的与非门实现，并画出逻辑电路图

$$(1) F = \bar{A}\bar{B}C + AB\bar{C}$$

$$\bar{A}\bar{B}C = \overline{AC} \cdot \bar{B} \cdot C = \bar{A} \cdot \overline{BC} \cdot C = \overline{AC} \cdot \overline{BC} \cdot C$$

$$AB\bar{C} = AB\overline{AC} = AB\overline{BC} = AB \cdot \overline{AC} \cdot \overline{BC}$$

选择 $\overline{AC}$ 作为公共项

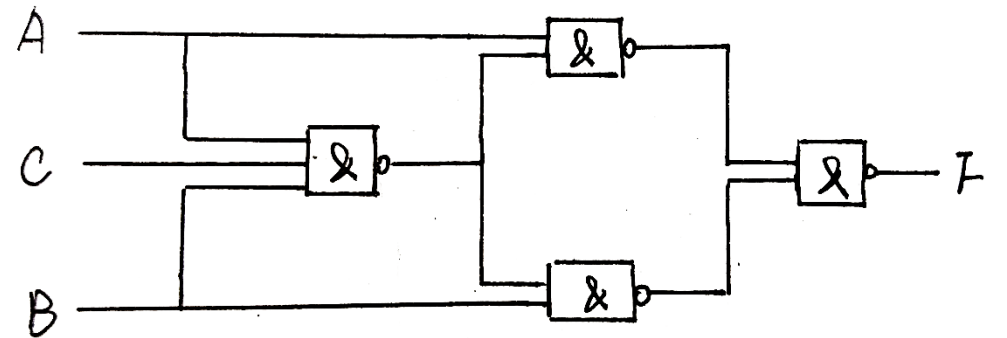
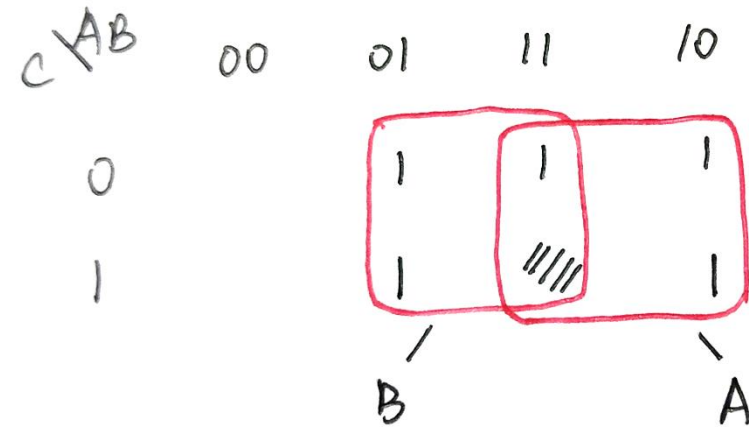
$$F = \overline{AC} \bar{B}C + AB\overline{AC} = \overline{\overline{\overline{AC} \bar{B}C} \overline{AB\overline{AC}}}$$

$$(2) F = \bar{A}B + A\bar{C} + A\bar{B}$$

$$F = (A + B)\overline{ABC}$$

$$= A \cdot \overline{ABC} + B \cdot \overline{ABC}$$

$$= \overline{\overline{A \cdot \overline{ABC} \cdot B \cdot \overline{ABC}}}$$



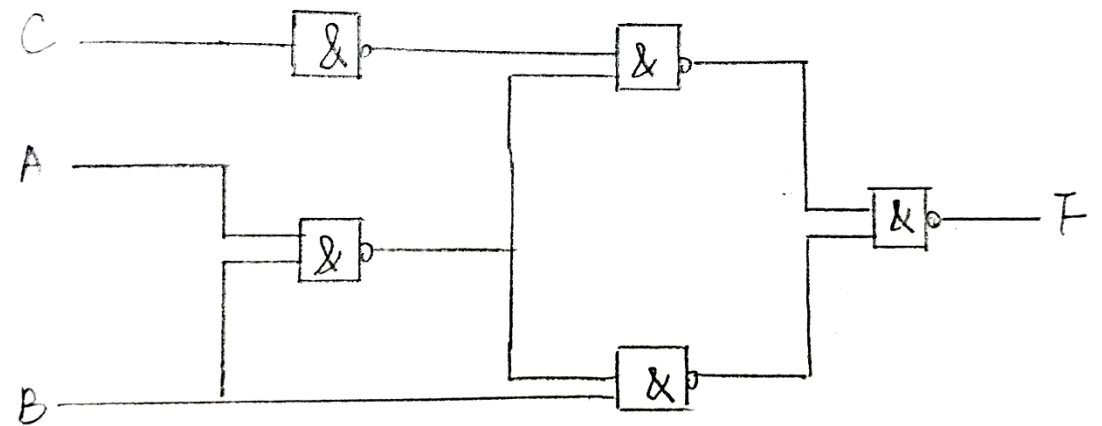
$$(3) F = \bar{A}\bar{C} + \bar{A}B + \bar{B}\bar{C}$$

$$F = (B + \bar{C})\bar{A}\bar{B}$$

$$= B \cdot \bar{A}\bar{B} + \bar{C} \cdot \bar{A}\bar{B}$$

$$= \overline{\overline{B \cdot \bar{A}\bar{B} \cdot \bar{C} \cdot \bar{A}\bar{B}}}$$

$C \backslash AB$	00	01	11	10	
0	1	1	//	1	— $\bar{C}$
1		1	//		
					B



$$(4) F = (\bar{A} + \bar{B})(AB + C)$$

$$F = C \cdot \overline{ABC}$$

$$= \overline{\overline{C \cdot \overline{ABC}}}$$

$C \backslash AB$	00	01	11	10
0				
1	1	1	///	1

— C

