2023HW03 逻辑函数化简OK!

1、用代数法求下列逻辑函数的最简与或式：

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

参考解答：

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

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

$$=\overline{AB}C=\bar{A}C+\bar{B}C$$

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

参考解答：

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

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

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

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

(3) $F=\overline{\bar{A}\bar{C}\bar{D}+BC+A\bar{C}\bar{D}}$

参考解答：

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

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

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

2、用图解法求下列逻辑函数的最简与或式：

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

参考解答：

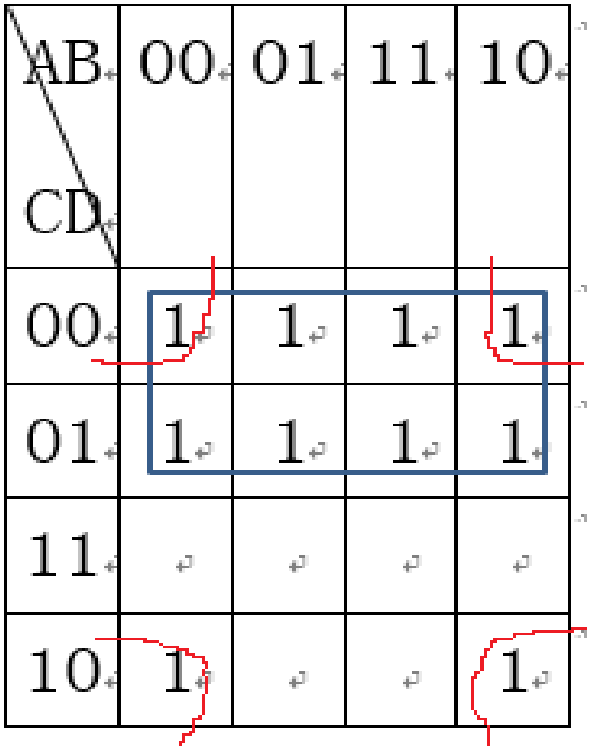
$F = \bar{A}\bar{B} + \bar{C}D + \bar{A}\bar{C} + BD$

AB / CD	00	01	11	10
00	1	1		
01	1	1	1	1
11	1	1	1	
10	1			

(2)F(A，B，C，D)=∑m(0，1，2，4，5，8，9，10，12，13)

参考解答：

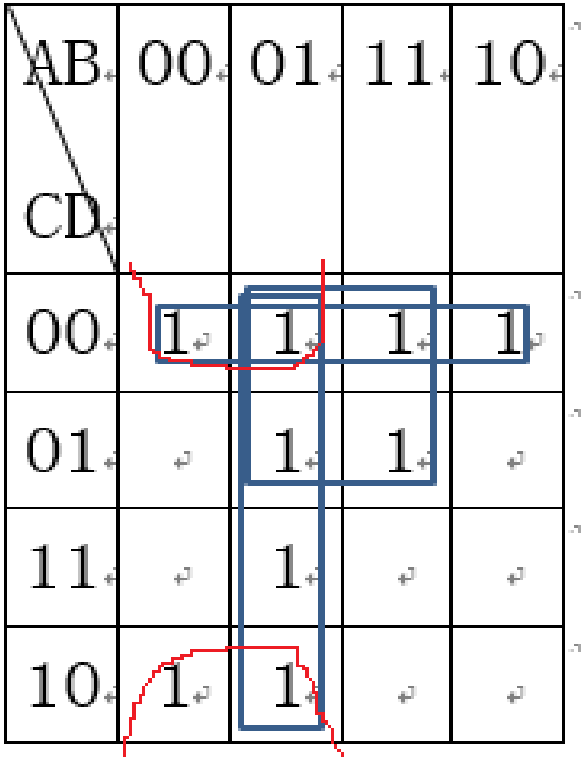
$$F=\bar{C}+\bar{B}\bar{D}$$



(3)F(A，B，C，D)=∏M(1，3，9，10，11，14，15)

参考解答：

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



AB / CD	00	01	11	10
00	1	1	1	1
01		1	1	
11		1		
10	1	1		

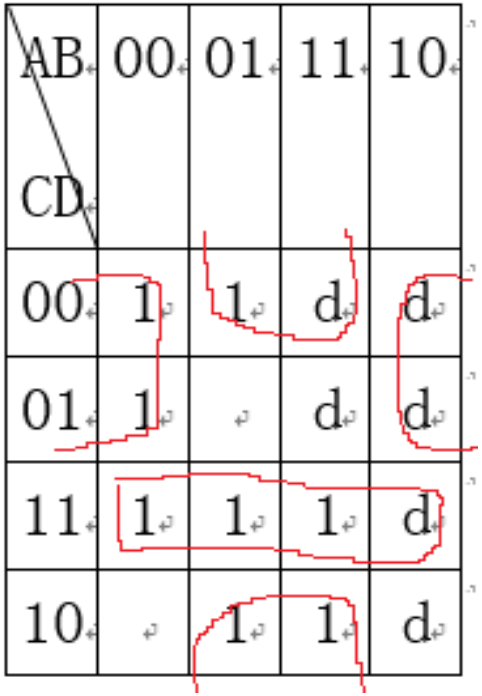
(4)F(A，B，C，D)=∑m(0，1，3，4，6，7，14，15)

+∑d(8，9，10，11，12，13)

参考解答：

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

AB / CD	00	01	11	10
00	1	1	d	d
01	1		d	d
11	1	1	1	d
10		1	1	d



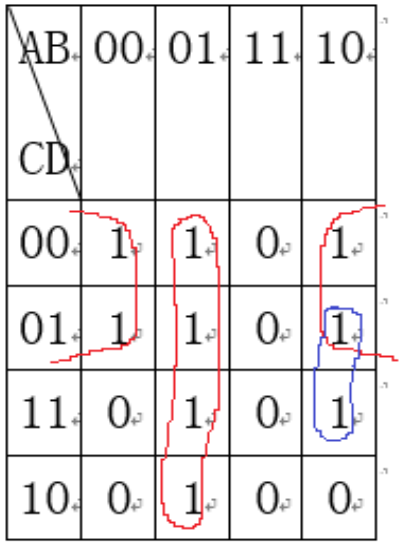
3、用图解法求下列逻辑函数的最简与或式和最简或与式：

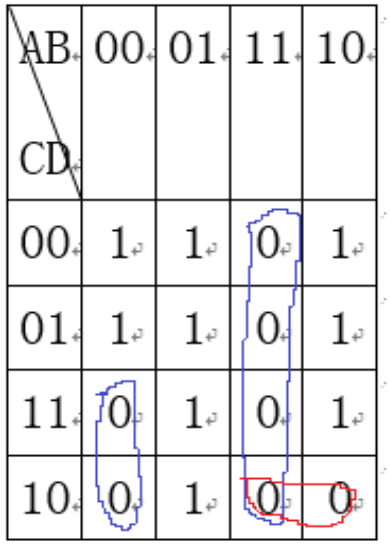
(1) $F=\bar{A}\bar{C}+\bar{A}BC+A\bar{B}\bar{C}+A\bar{B}CD$

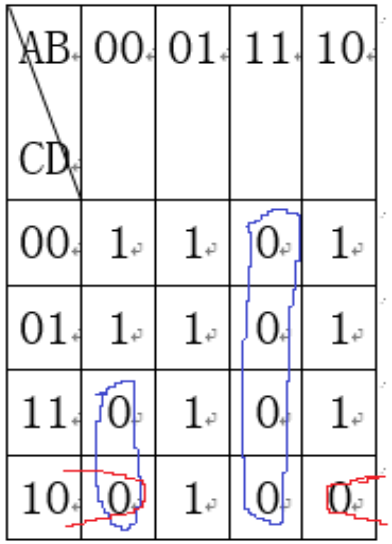
参考解答：

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

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



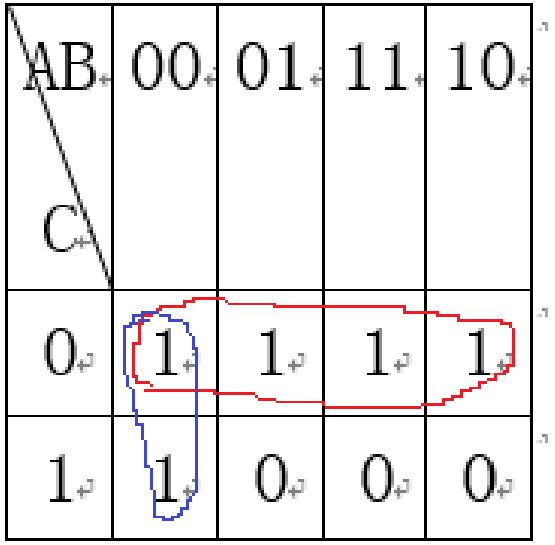




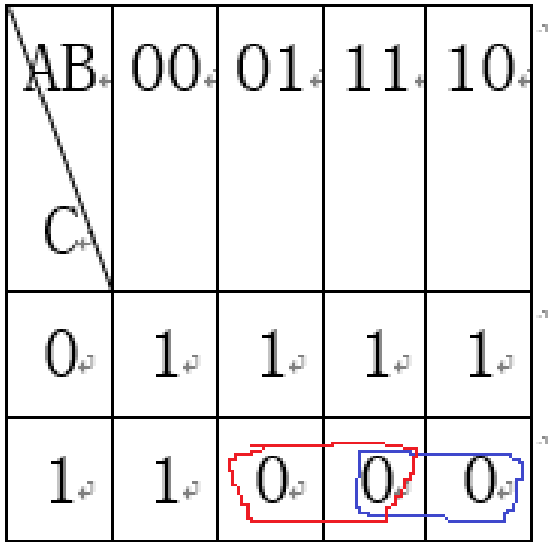
(2)F(A，B，C)=∑m(0，1，2，4，6)

参考解答：

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



AB / C	00	01	11	10
0	1	1	1	1
1	1	0	0	0



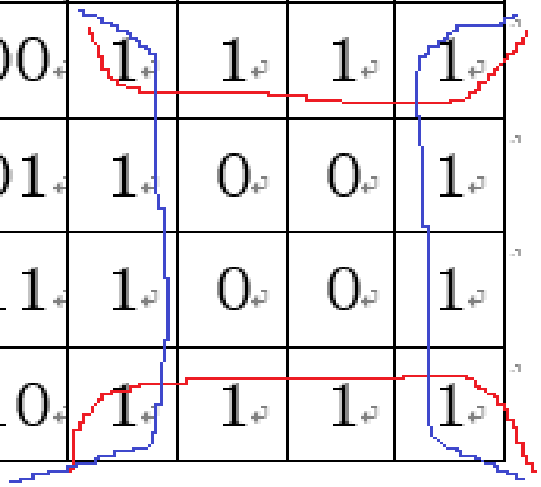
AB / C	00	01	11	10
0	1	1	1	1
1	1	0	0	0

(3)F(A，B，C，D)=∏M(5，7，13，15)

参考解答:

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

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



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

(4)F(A，B，C，D)=∑m(0，1，2，9，12)+∑d(4，6，10，11)

参考解答：

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

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

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