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

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

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

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

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

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

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

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

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

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

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

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

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

2、用图解法求下列逻辑函数的最简与或式:

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

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

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

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

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(3) F(A, B, C, D) = $\prod M(1, 3, 9, 10, 11, 14, 15)$

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

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(4) F(A, B, C, D) =
$$\sum m(0, 1, 3, 4, 6, 7, 14, 15)$$

+ $\sum d(8, 9, 10, 11, 12, 13)$

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

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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)
$$F = \overline{A}\overline{C} + \overline{A}BC + A\overline{B}\overline{C} + A\overline{B}CD$$

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

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

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(2) F(A, B, C) =
$$\sum m(0, 1, 2, 4, 6)$$

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

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(3) F(A, B, C, D) = $\prod M(5, 7, 13, 15)$

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

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

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

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

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

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