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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

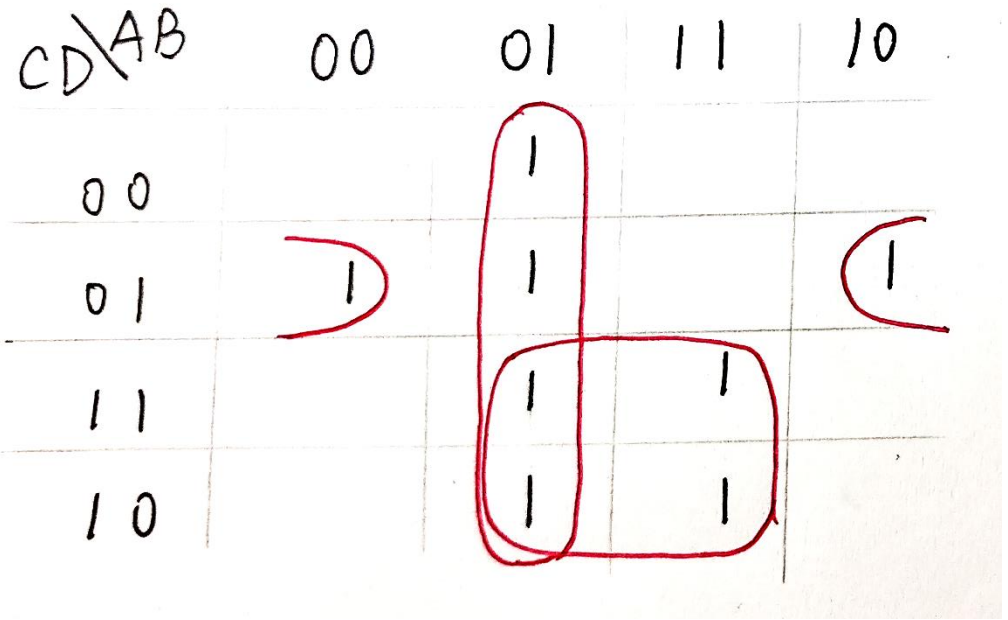
$+ \cancel{ABC\bar{D}} + \bar{A}BCD + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D}$

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

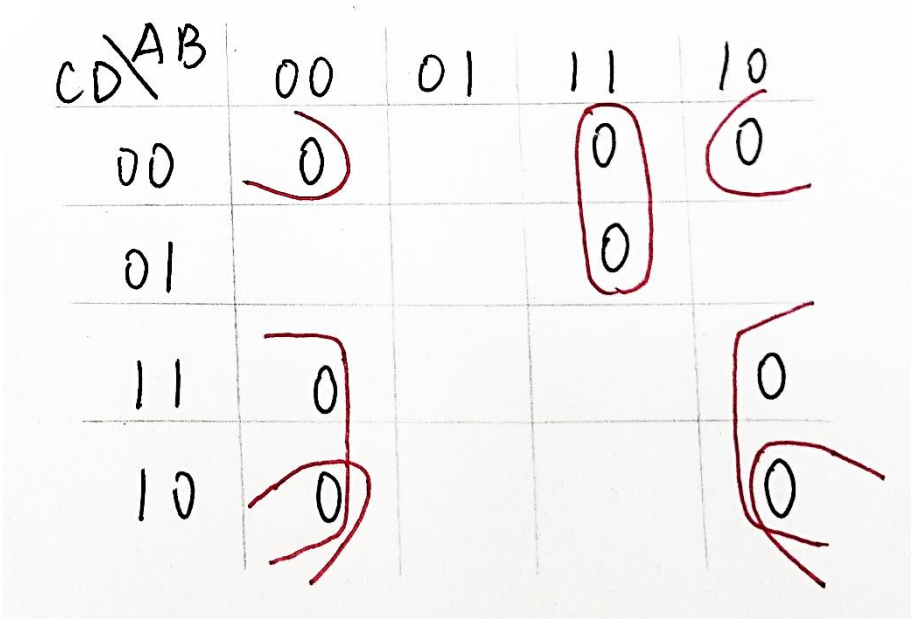
$F = \prod M^4(5,6,8,11)$

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



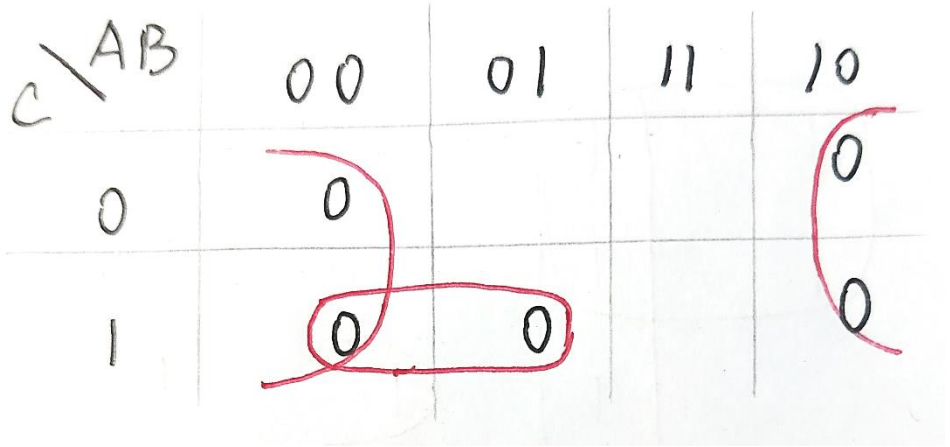
$$F = \bar{A}B + BC + B\bar{C}D$$



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

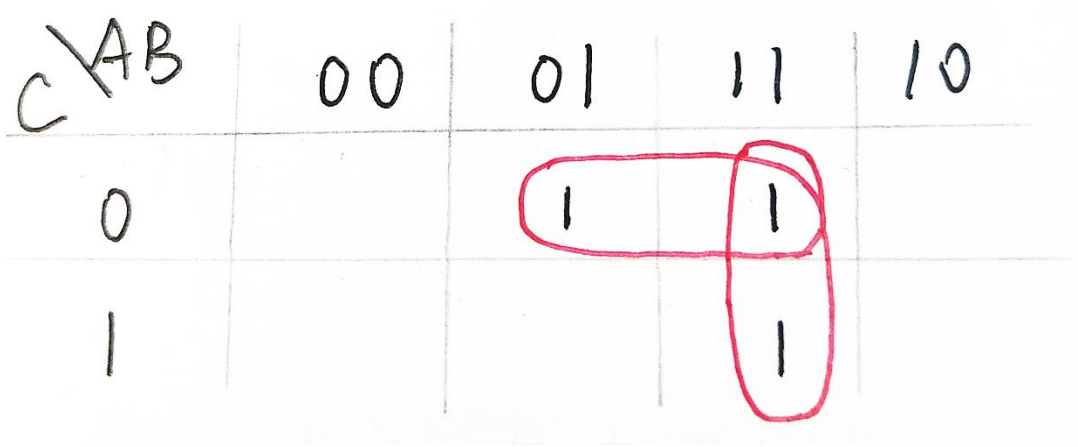
$$F = (B + D)(B + \bar{C})(\bar{A} + \bar{B} + C)$$

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



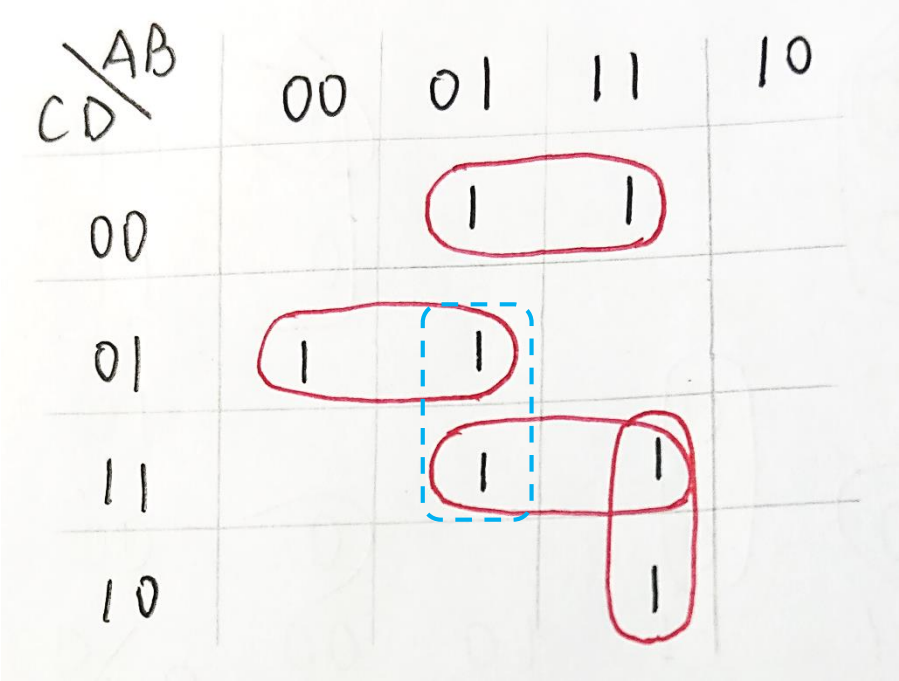
$$\bar{F} = \bar{B} + \bar{A}C$$

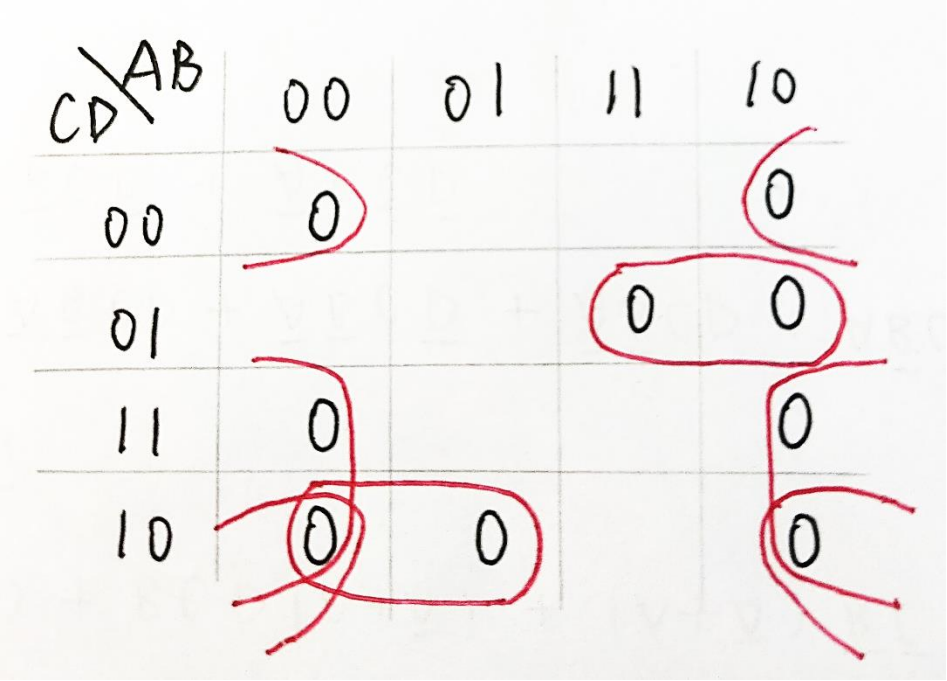
$$F = B(A + \bar{C})$$



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

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





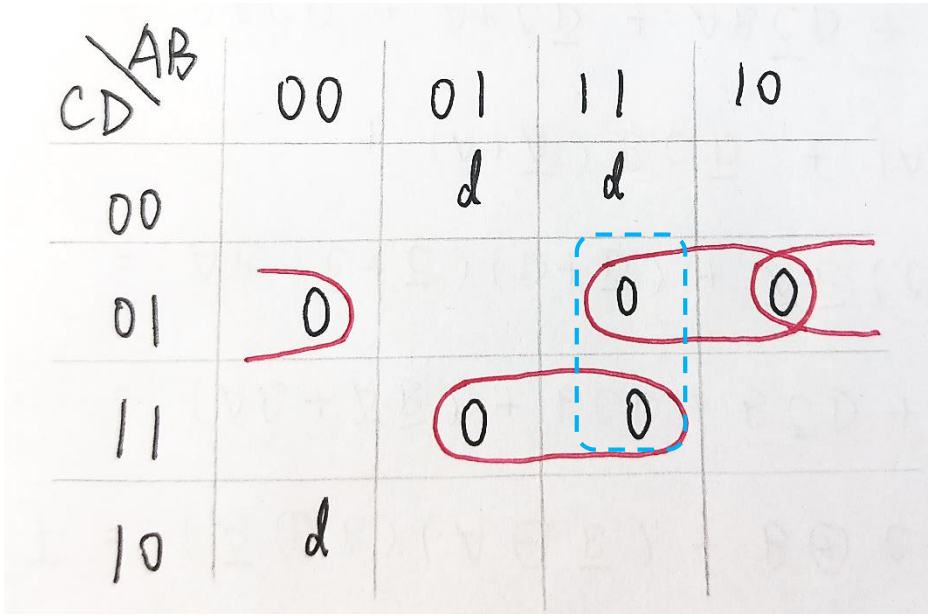
$F = B\bar{C}\bar{D} + \bar{A}\bar{C}D + BCD + ABC$

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

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

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

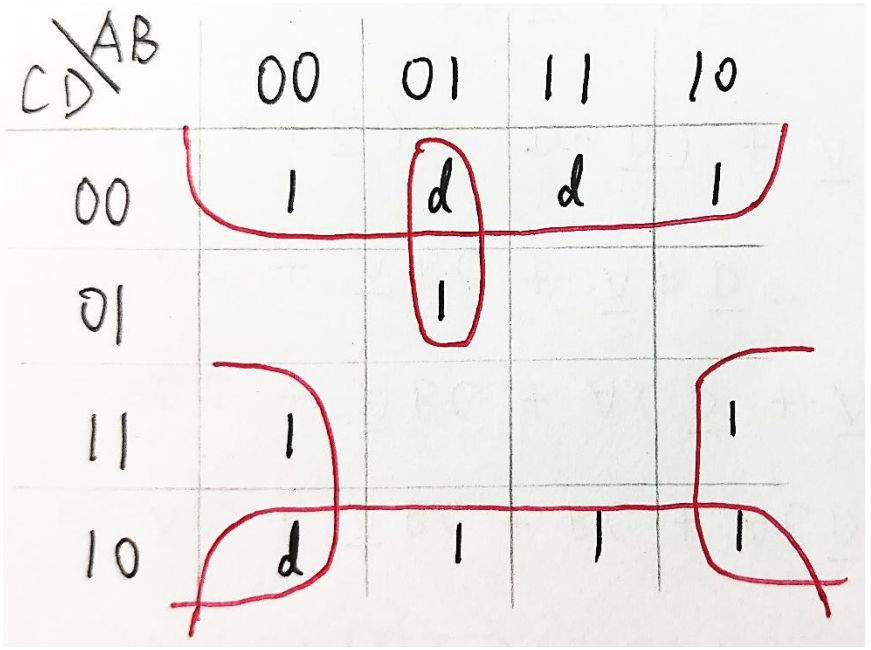
(4) $F = \prod M^4(1,7,9,13,15) + d(2,4,12)$



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

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

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



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

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

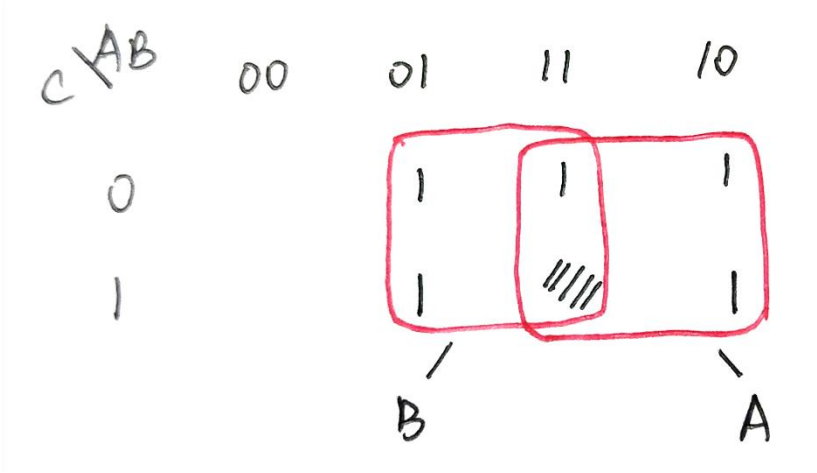
$$F = \overline{AC}\,\bar{B}C + AB\overline{AC} = \overline{\overline{AC}\bar{B}C}\;\overline{AB\overline{AC}}$$

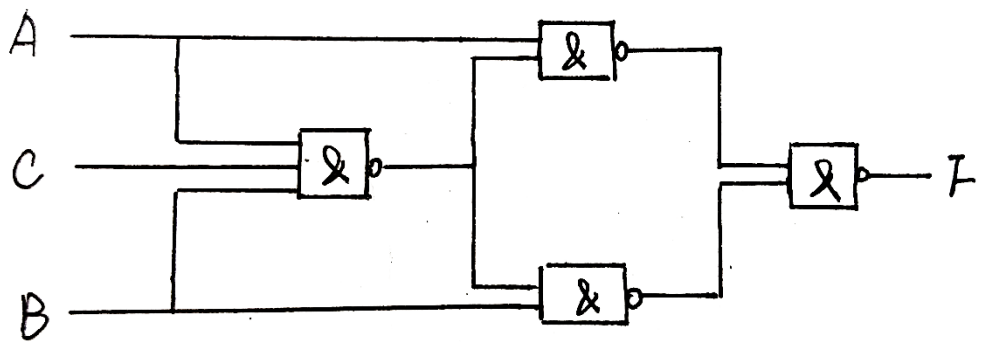
（2）$F = \bar{A}B + A\bar{C} + A\bar{B}$

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

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

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



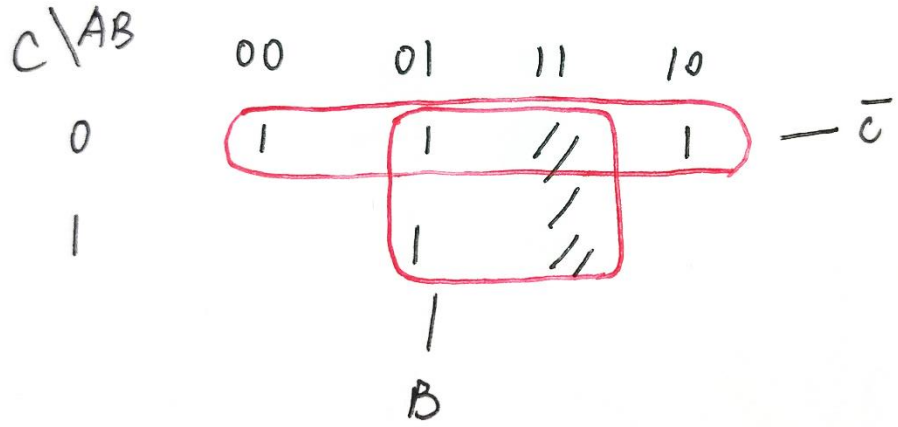


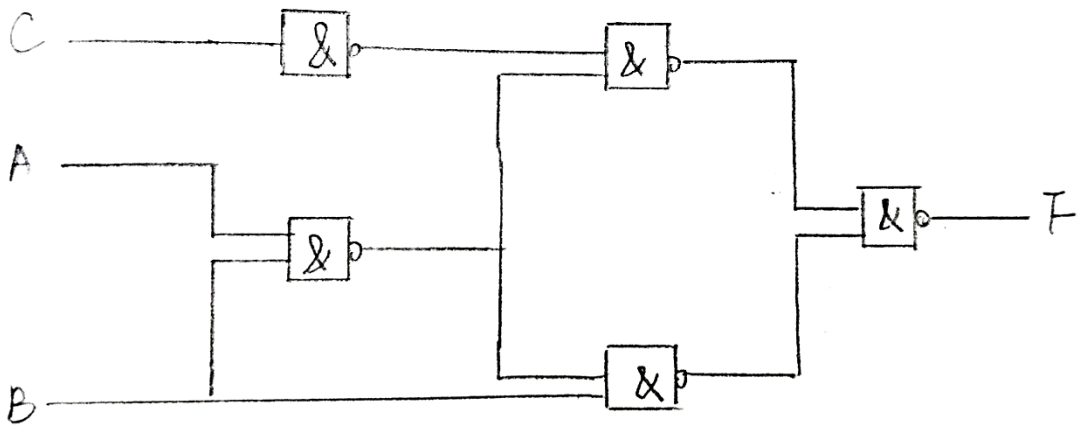
（3）$F = \bar{A}\bar{C} + \bar{A}B + \bar{B}\bar{C}$

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

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

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





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

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

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