一. 1. $A\bar{B}\bar{C} + B\bar{C}\bar{D} + BC + \bar{C}D$

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

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

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

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

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

$= B + \bar{C}D$

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

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

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

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

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

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

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

二.

| X | Y | Z | $(XY+Z)(Y+XZ)$ | sum of minterms | product of maxterms |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | $\bar{x}\bar{y}\bar{z}$ | $x+y+z$ |
| 0 | 0 | 1 | 0 | $\bar{x}\bar{y}z$ | $x+y+\bar{z}$ |
| 0 | 1 | 0 | 0 | $\bar{x}y\bar{z}$ | $x+\bar{y}+z$ |
| 0 | 1 | 1 | 1 | $\bar{x}yz$ | $x+\bar{y}+\bar{z}$ |
| 1 | 0 | 0 | 0 | $x\bar{y}\bar{z}$ | $\bar{x}+y+z$ |
| 1 | 0 | 1 | 1 | $x\bar{y}z$ | $\bar{x}+y+\bar{z}$ |
| 1 | 1 | 0 | 1 | $xy\bar{z}$ | $\bar{x}+\bar{y}+z$ |
| 1 | 1 | 1 | 1 | $xyz$ | $\bar{x}+\bar{y}+\bar{z}$ |

三. 1) $\overline{A+B+C} \cdot \overline{ABC}$

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

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

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

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

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

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

$= A + \bar{A}BC$

3) $\bar{A}\bar{B}D + \bar{A}\bar{C}D + BD$

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

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

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

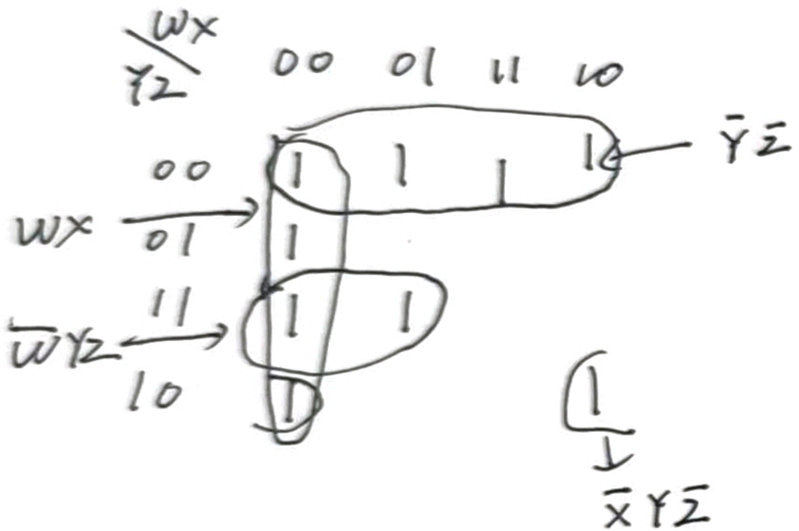
$= AD + \bar{A}B\bar{C}D + \bar{A}D$

$= \bar{A}D + AD = \bar{A}D$

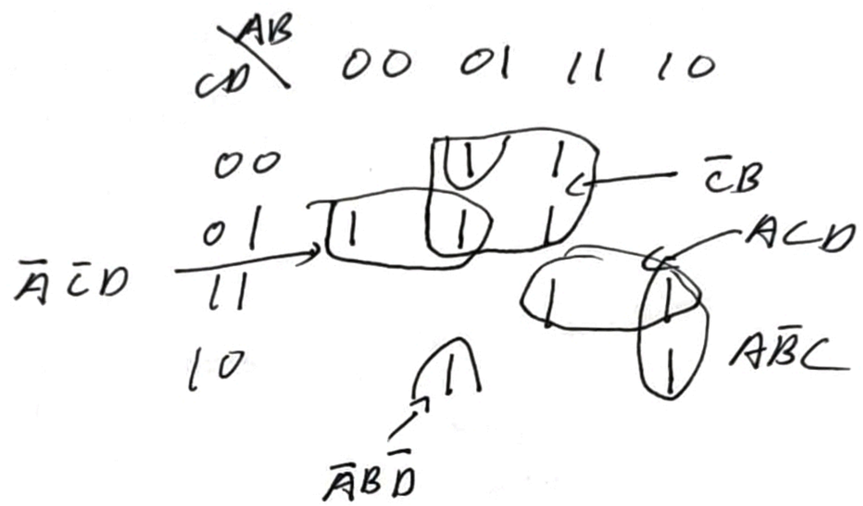
$\bar{A}+\bar{B}\bar{C}=(\bar{A}+\bar{B}+\bar{C}+\bar{D})(A+B+C+D)$

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

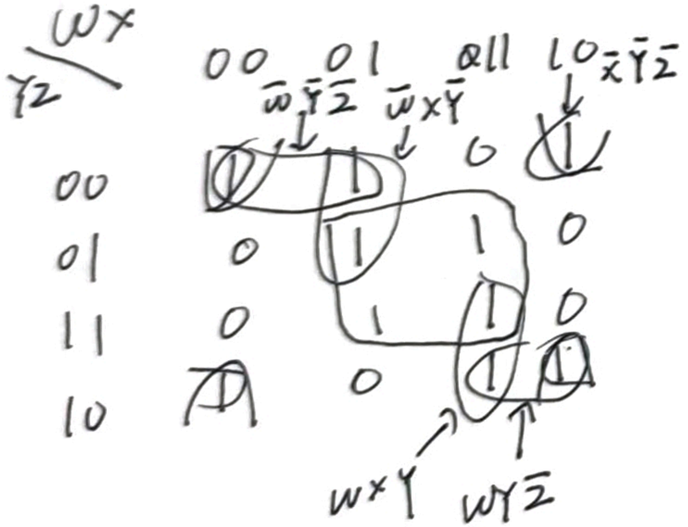
四. $F(WXYZ)=\Sigma m(0,1,2,3,4,7,8,10,12)$




$F(A,B,C,D)=\Sigma m(1,4,5,6,10,11,12,13,15)$




五.




prime implication: $\bar{W}\bar{Y}\bar{Z}$ $\bar{W}X\bar{Y}$ $WXY$ $WY\bar{Z}$ $XZ$ $\bar{X}\bar{Y}\bar{Z}$ $W\bar{X}\bar{Z}$ $Y\bar{Z}\bar{X}$

essential prime implication: $\bar{W}X\bar{Y}$ $WXY$ $XZ$ $\bar{X}\bar{Y}\bar{Z}$ $Y\bar{Z}\bar{X}$

optimized Boolean expression: $\bar{W}X\bar{Y}$ $XZ$ $WXY$ ~~$\bar{X}\bar{Y}\bar{Z}$~~ $\bar{X}\bar{Z}$