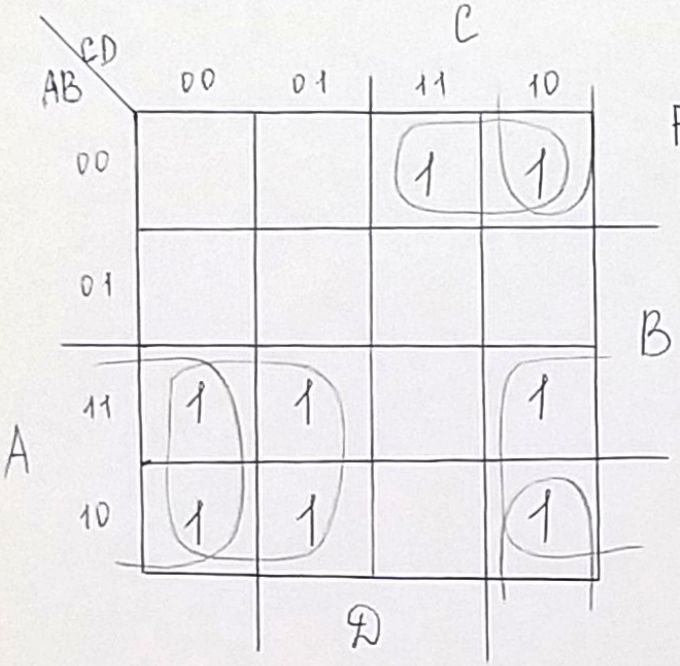
Zarema Balgabekova HW 2

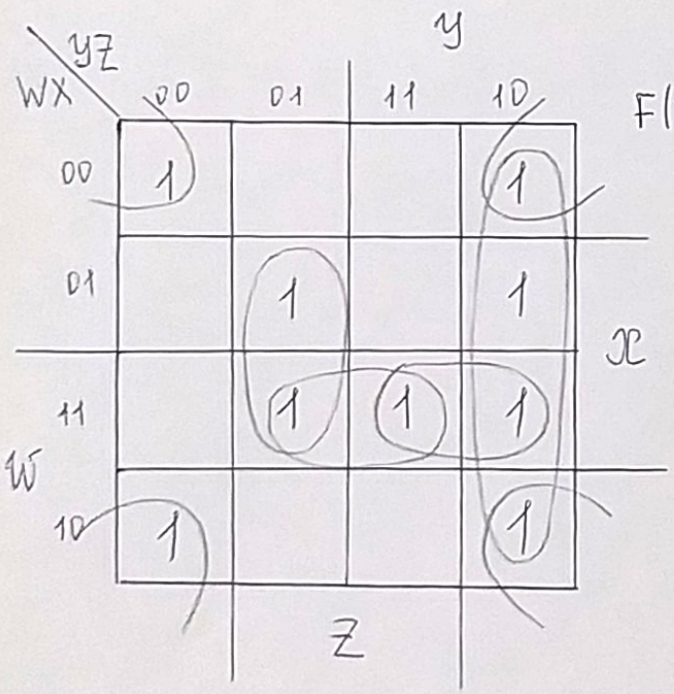
1.

a) $F(A,B,C,D) = \sum m(2,3,8,9,10,12,13,14)$



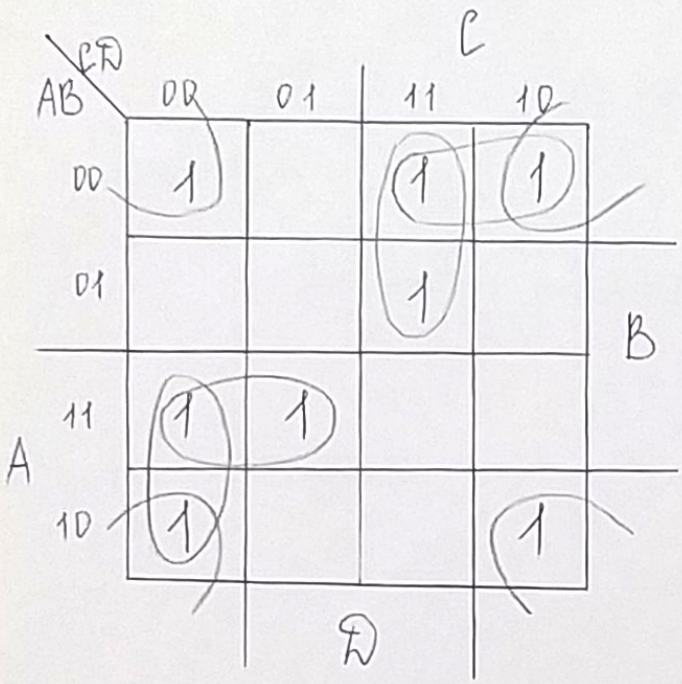
$F(A,B,C,D) = A\bar{C} + A\bar{D} + \bar{A}\bar{B}C$

B) $F(W,X,Y,Z) = \sum m(0,2,5,6,8,10,13,14,15)$



$F(W,X,Y,Z) = \bar{X}\bar{Z} + Y\bar{Z} + X\bar{Y}Z + WXZ$

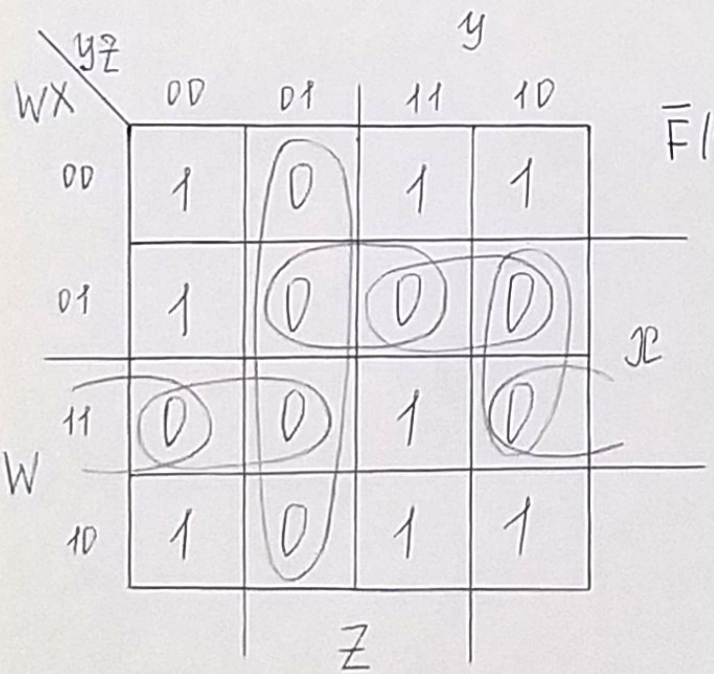
c) $F(A,B,C,D) = \sum m\,(0,2,3,7,8,10,12,13)$



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

2.

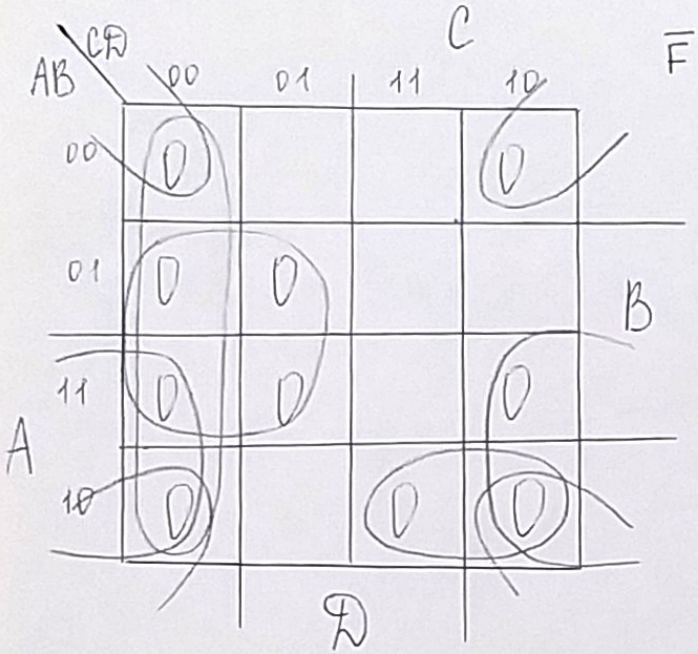
a) $F(W,X,Y,Z) = \sum m\,(0,2,3,4,8,10,11,15)$



$\bar{F}(W,X,Y,Z) = \bar{Y}Z + \bar{W}XY + WX\bar{Z}$

$F(W,X,Y,Z) = \bar{\bar{F}}(W,X,Y,Z) = (Y+\bar{Z})\cdot(W+\bar{X}+\bar{Y})\cdot(\bar{W}+\bar{X}+Z)$

b) $F(A,B,C,D) = \Pi_M(0,2,4,5,8,10,11,12,13,14)$

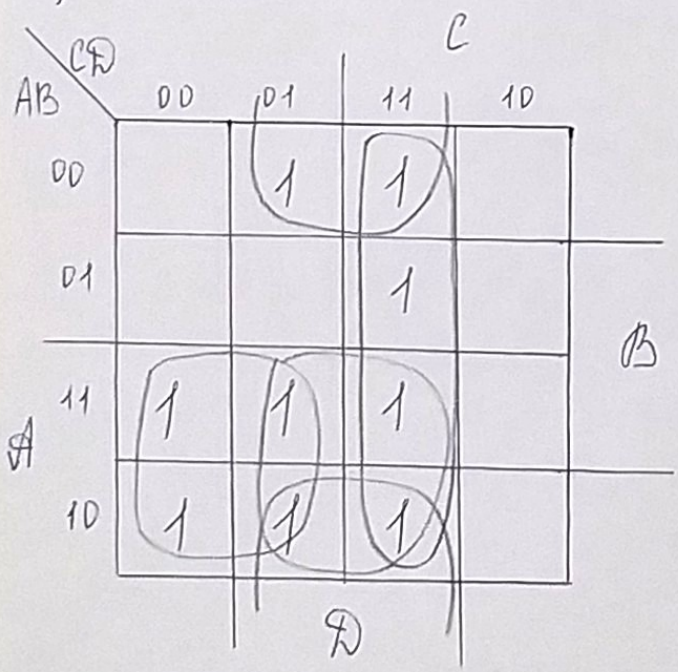


$\bar{F}(A,B,C,D) = B\bar{C} + \bar{B}\bar{D} + A\bar{D} + A\bar{B}C$

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

3.

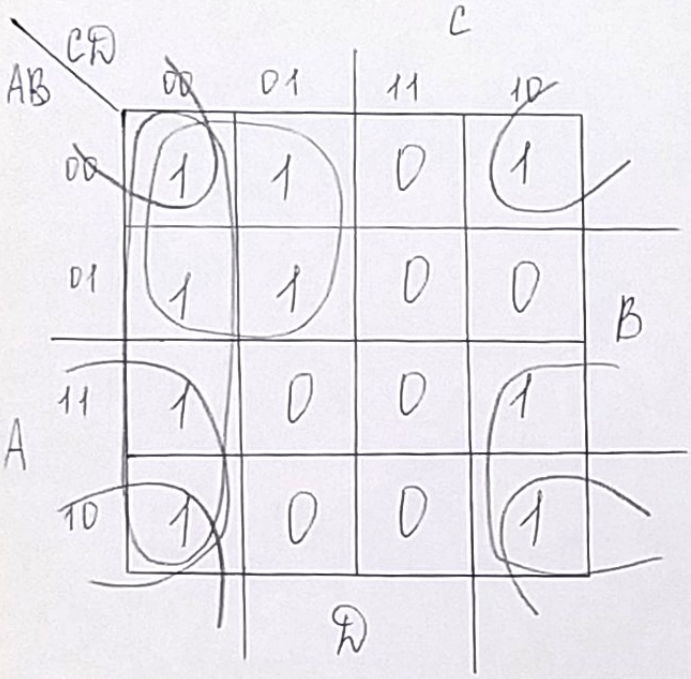
a) $A\bar{C} + \bar{B}\bar{D} + \bar{A}C\bar{D} + ABC\bar{D}$



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

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

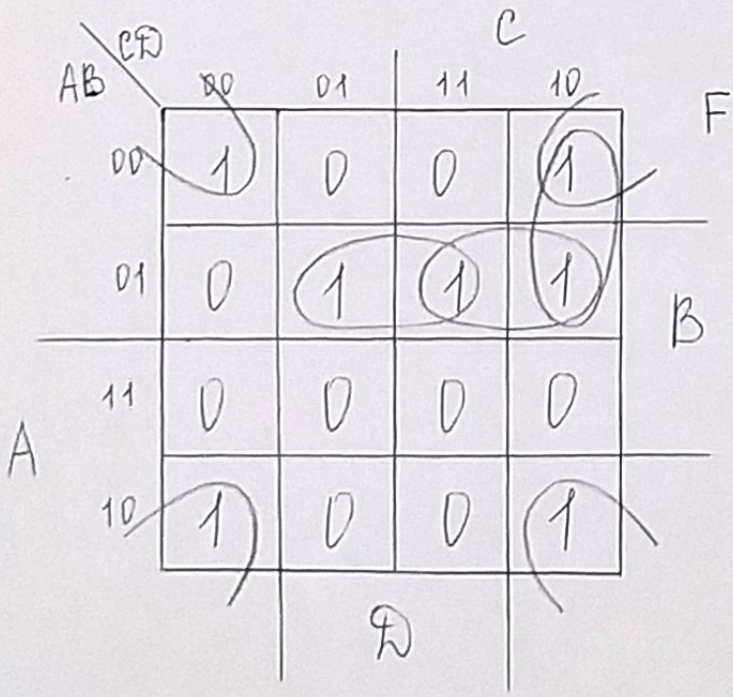
$\bar{F}(A,B,C,D) = AB\bar{D} + \bar{A}BC + A\bar{B}\bar{D} + \bar{B}C\bar{D}$



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

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

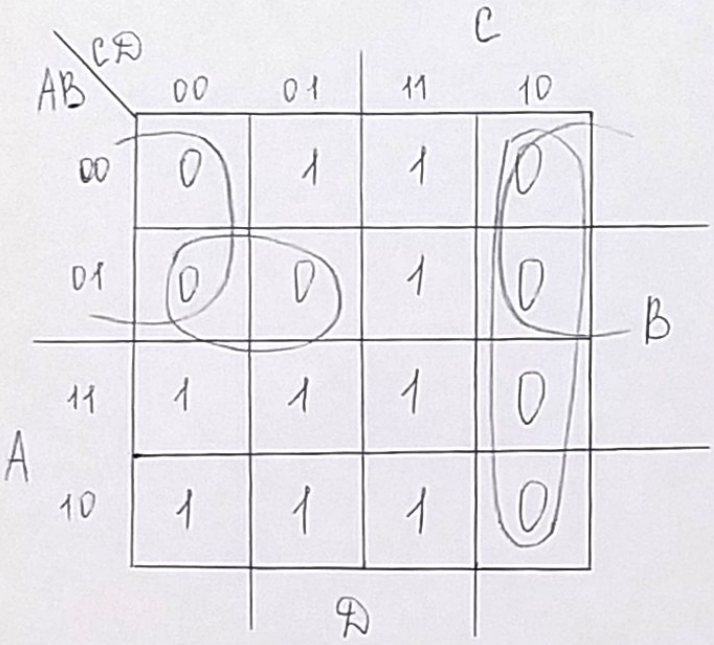
$\bar{F}(A,B,C,D) = AB\bar{D} + A\bar{D} + \bar{A}\bar{B}\bar{D} + \bar{A}B\bar{C}\bar{D}$



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

4 The K-maps from Exercise 3

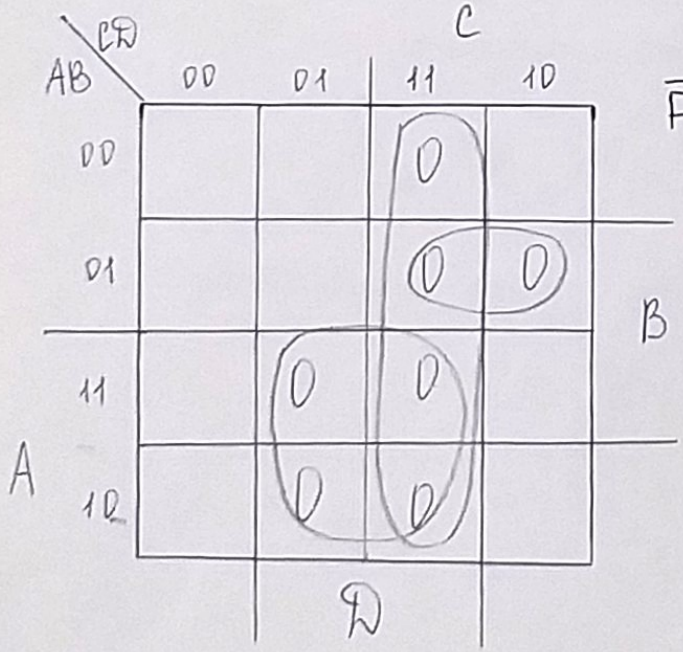
a) $A\bar{C} + \bar{B}D + \bar{A}CD + ABCD$



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

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

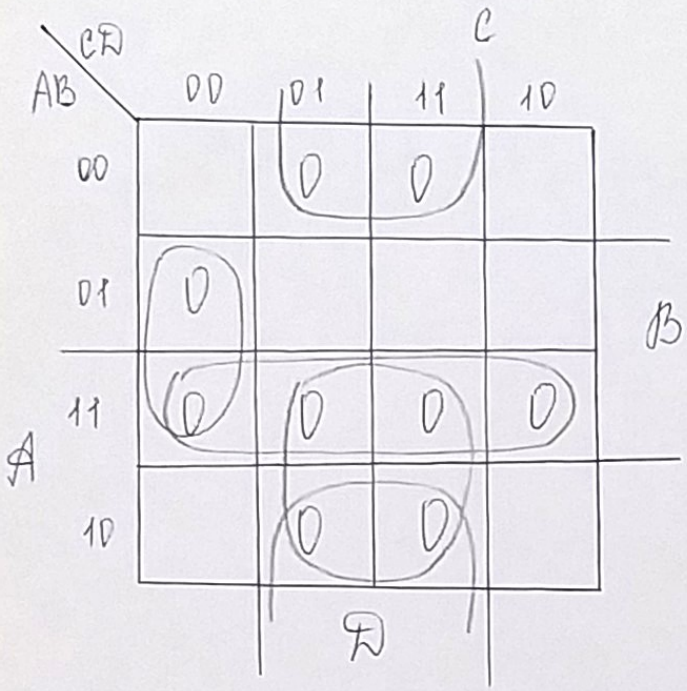
B) $(\bar{A}+\bar{B}+\bar{D})(A+\bar{B}+\bar{C})(\bar{A}+B+\bar{D})(B+\bar{C}+\bar{D})$



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

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

c) $(\bar{A}+\bar{B}+D)\,(\bar{A}+\bar{D})\cdot(A+B+\bar{D})\;(A+\bar{B}+C+D)$

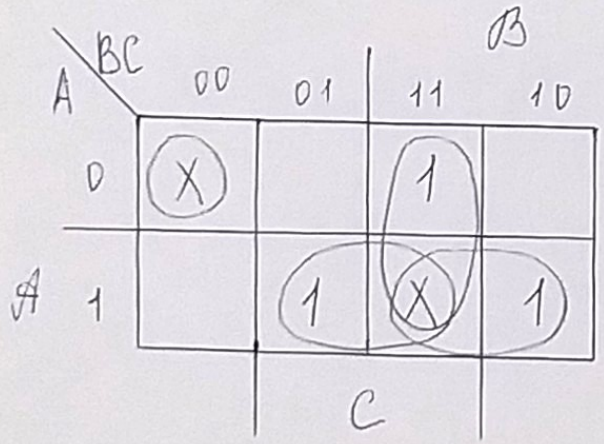


$\bar{F}(A,B,C,D) = AB + \bar{B}D + B\bar{C}\bar{D}$

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

5

a) $F(A,B,C) = \Sigma m(3,5,6)\,,\; d(A,B,C) = \Sigma m(0,7)$



prime implicants

$\bar{A}\bar{B}\bar{C}$, AC, AB, BC

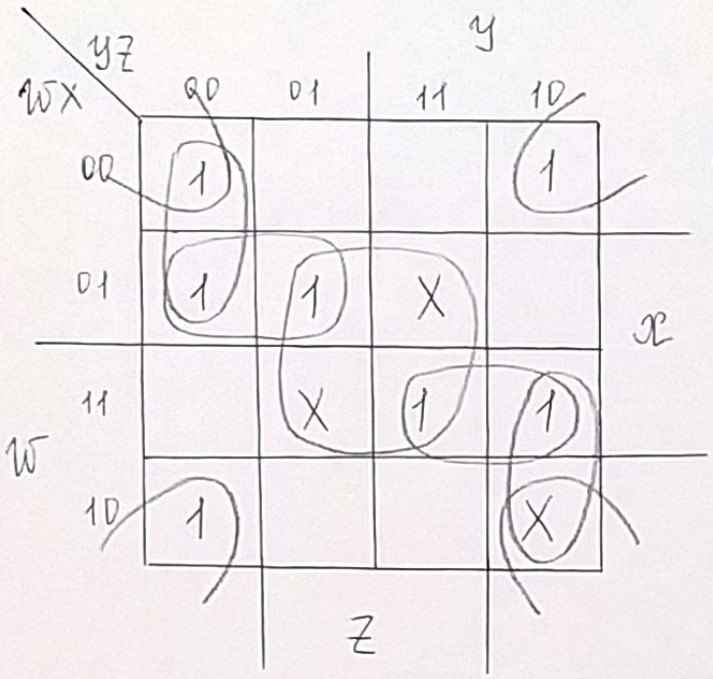
essential prime implicants

AC, AB, BC

$F(A,B,C) = AB + AC + BC$

b) $F(W, X, Y, Z) = \sum m(0, 2, 4, 5, 8, 14, 15)$

$d(W, X, Y, Z) = \sum m(7, 10, 13)$



prime implicants

$\bar{X}\bar{Z}, XZ, \bar{W}\bar{Y}\bar{Z}, \bar{W}X\bar{Y}, WXY, WY\bar{Z}$

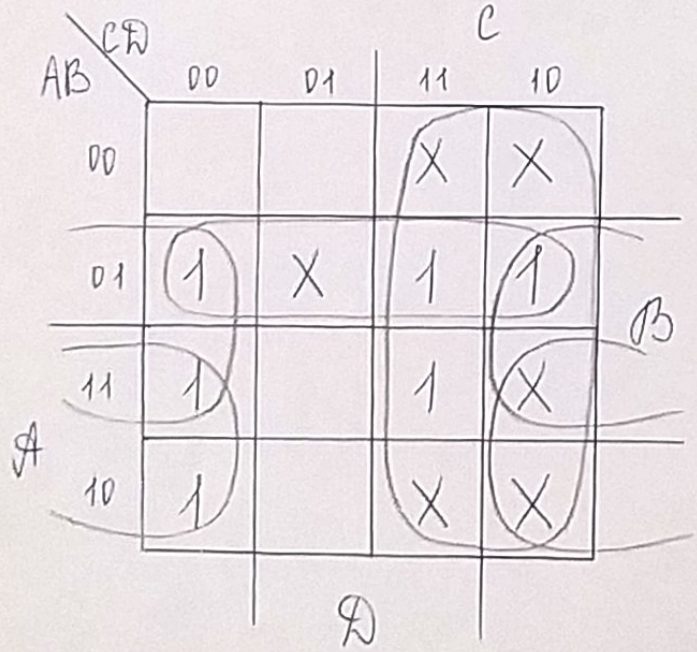
essential prime implicants

$\bar{X}\bar{Z}$

$F(W, X, Y, Z) = \bar{X}\bar{Z} + \bar{W}X\bar{Y} + WXY$

c) $F(A, B, C, D) = \sum m(4, 6, 7, 8, 12, 15)$

$d(A, B, C, D) = \sum m(2, 3, 5, 10, 11, 14)$



prime implicants

$C, A\bar{D}, \bar{A}B, B\bar{D}$

essential prime implicants

$C, A\bar{D}$

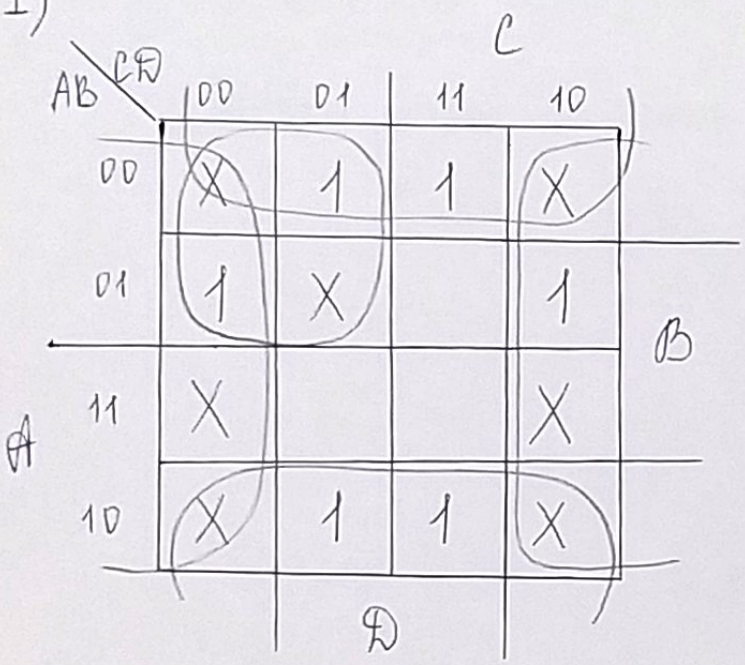
$F(A, B, C, D) = C + A\bar{D} + \bar{A}B$

6

a) $F(A,B,C,D) = \Sigma m(1,3,4,6,9,11)$

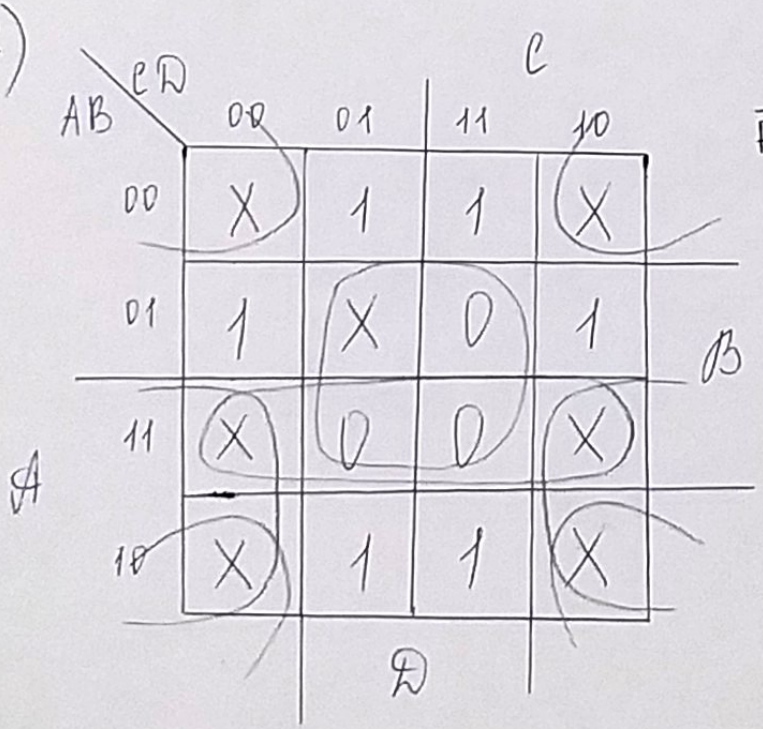
$d(A,B,C,D) = \Sigma m(0,2,5,8,10,12,14)$

1)



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

2)



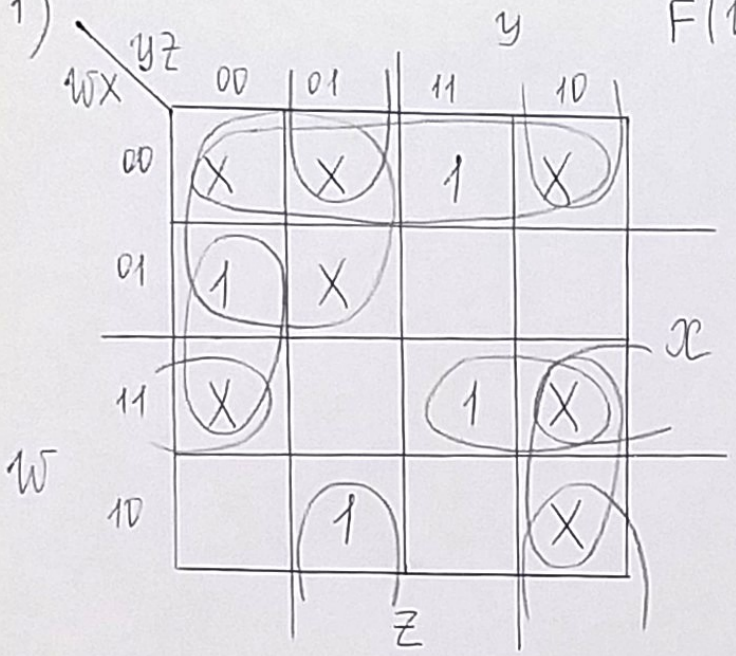
$\overline{F}(A,B,C,D) = BD$

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

b) $F(w, x, y, z) = \sum m(3, 4, 9, 15)$

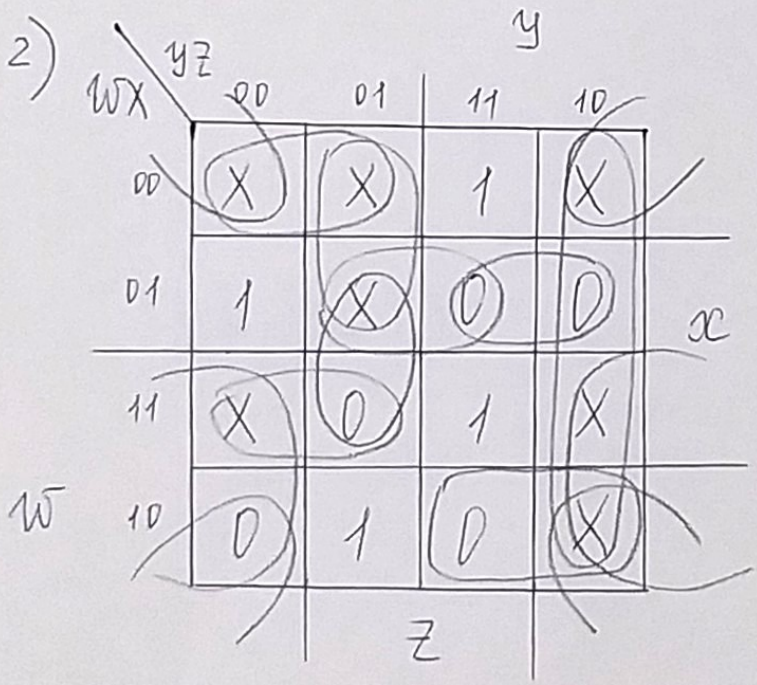
$d(w, x, y, z) = \sum m(0, 1, 2, 5, 10, 12, 14)$

1)



$F(w, x, y, z) = \bar{w}\bar{x} + \bar{w}\bar{y} + wxy + \bar{x}\bar{y}z$

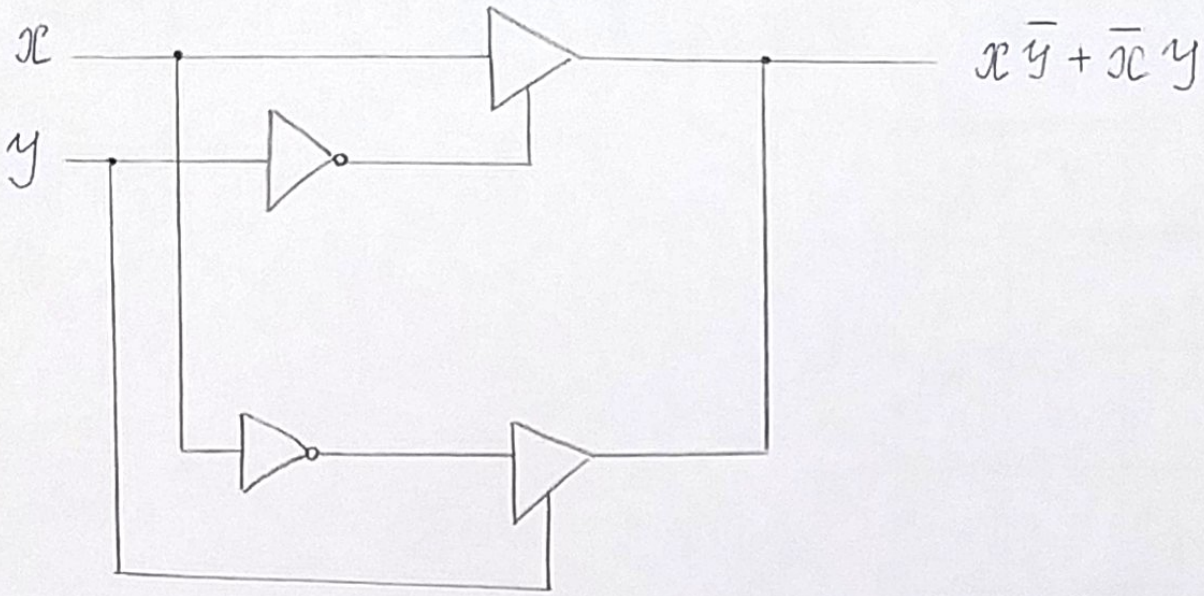
2)



$\bar{F}(w, x, y, z) = w\bar{x}y + \bar{w}xy + \bar{x}\bar{z} + x\bar{y}z$

$F(w, x, y, z) = \bar{\bar{F}}(w, x, y, z) = (\bar{w} + x + \bar{y})(w + \bar{x} + \bar{y})(x + z)(\bar{x} + y + \bar{z})$

7. $x \oplus y = x\bar{y} + \bar{x}y$



8. $H = \bar{x}y + xz$