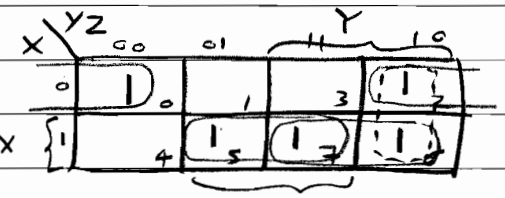
1. a. $F(X,Y,Z) = \Sigma(0,2,5,6,7)$

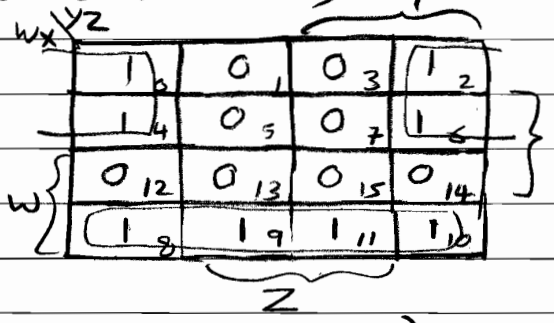


$= \bar{X}\bar{Z} + XZ + XY$

or $+ Y\bar{Z}$ ( )

b. $F(W,X,Y,Z) = \Pi(1,3,5,7,12,13,14,15)$

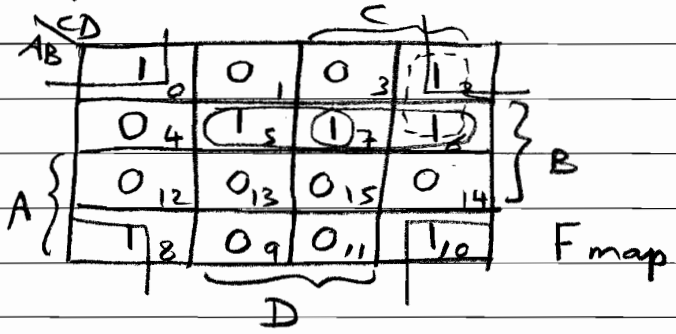
$F = \bar{W}\bar{Z} + W\bar{X}$



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

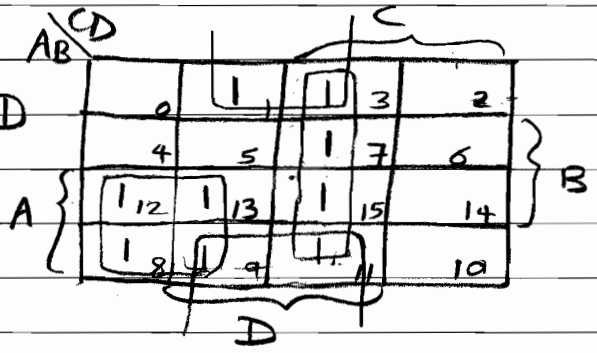
$\bar{F}(A,B,C,D) = AB\bar{D} + AD + \bar{A}\bar{B}D + \bar{A}B\bar{C}\bar{D}$

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



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

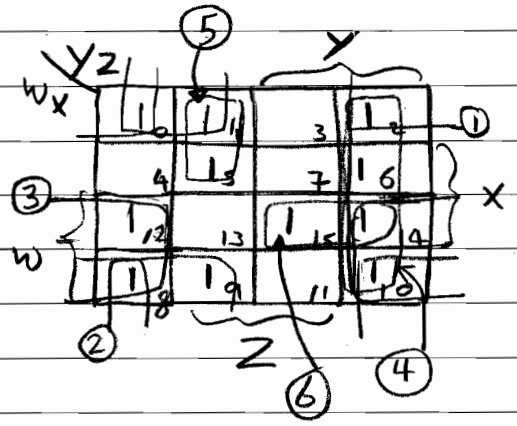
$F = CD + A\bar{C} + \bar{B}D$



$F(w,x,y,z) = \Sigma(0,1,2,5,6,8,9,10,12,14,15)$

2.

a.

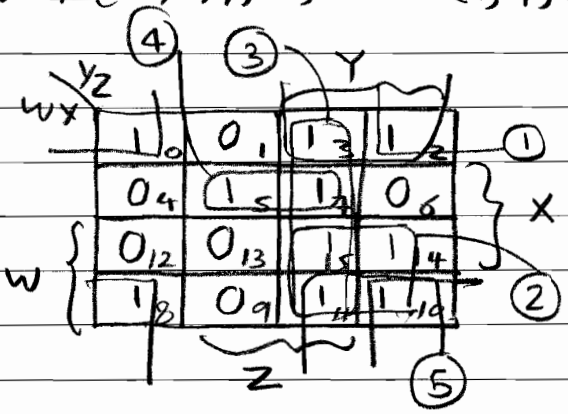


List of all possible PIs: Essential?

①	$\bar{x}\bar{z}$	
②	$\bar{x}\bar{y}$	yes
③	$w\bar{z}$	yes
④	$y\bar{z}$	yes
⑤	$\bar{w}\bar{y}z$	yes
⑥	wyx	yes

$F = \bar{x}\bar{y} + w\bar{z} + y\bar{z} + \bar{w}\bar{y}z + wyx$

b. $F(w,x,y,z) = \Pi(1,4,6,9,12,13)$

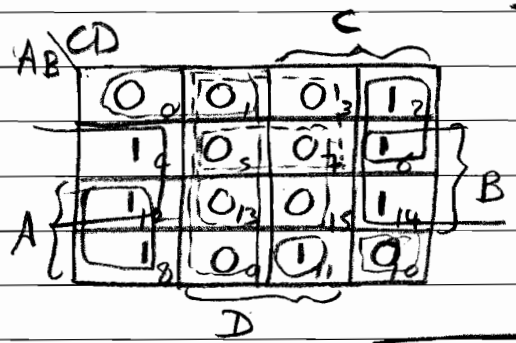


Essential?

①	$\bar{x}\bar{z}$	yes
②	wy	yes
③	yz	
④	$\bar{w}xz$	yes
⑤	$y\bar{x}$	

$F(w,x,y,z) = x\bar{z} + yw + \bar{w}xz + y\bar{x}$
$\quad + yz$

3. a. $F(A,B,C,D) = \Pi(0,1,3,5,7,9,10,13,15)$



SOP:

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

POS:

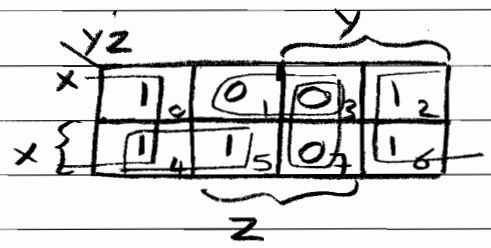
$\bar{F} = \bar{C}D + \bar{A}D + BD + \bar{A}\bar{B}\bar{C} + A\bar{B}C\bar{D}$

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

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

3, contd.

(b) $F(x,y,z) = xz' + y'z' + yz' + xy'$



SOP

$F = \bar{z} + x\bar{y}$ — ①

POS

$\bar{F} = \bar{x}z + yz$

$F = \overline{\bar{F}} = \overline{\bar{x}z + yz}$

$= (x + \bar{z})(\bar{y} + \bar{z})$ — ②

Checking equivalence of ① & ②:

From 2: $F = (x + \bar{z})(\bar{y} + \bar{z})$

$= x\bar{y} + x\bar{z} + \bar{y}\bar{z} + \bar{z}$

$= x\bar{y} + \bar{z}(1 + x + \bar{y})$ ($1 + x + \bar{y} = 1$)

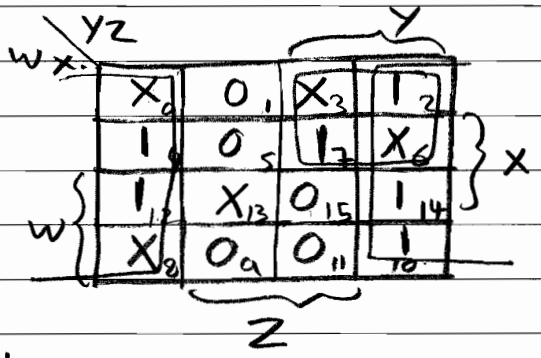
$= x\bar{y} + \bar{z}$

$= ①$ ✓

4. a.

$F(w,x,y,z) = \Sigma(2,4,7,10,12,14)$,

$d = (0,3,6,8,13)$



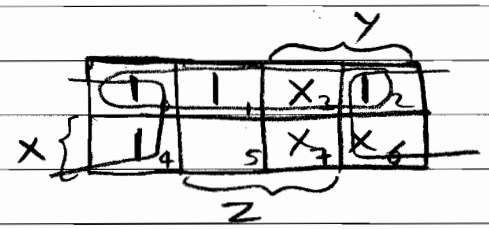
$F = \bar{z} + \bar{w}y$

wxyz	Implemented F
(13) 1101	0
(8) 1000	1

b.

$F(x,y,z) = \Sigma(0,1,2,4)$, $d(x,y,z) = y(z + x)$

$= yx + yz$

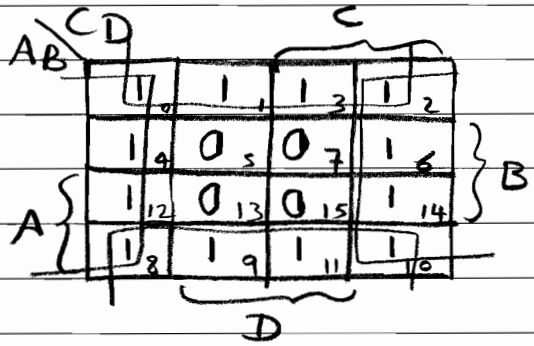


$F = \bar{x} + \bar{z}$

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

$= M_{0101} \cdot M_{0111} \cdot M_{1101} \cdot M_{1111}$

$= \Pi(5,7,13,15)$



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

6. $\bar{w}x(\bar{z}+\bar{y}z) + x(w+\bar{w}yz)$

(i) $= \bar{w}x[\bar{z}+z\bar{y}] + x[w+\bar{w}yz]$

$= \bar{w}x[(\bar{z}+z)(\bar{z}+\bar{y}) + x[(w+\bar{w})(w+yz)]$

$= \bar{w}x\bar{z} + \bar{w}x\bar{y} + xw + xyz$

$= \bar{w}x\bar{z} + x[w+\bar{w}\bar{y}] + xyz$

$= \bar{w}x\bar{z} + x[(w+\bar{w})(w+\bar{y})] + xyz$

$= \bar{w}x\bar{z} + xw + x\bar{y} + xyz$

$= xw + x\bar{w}\bar{z} + x\bar{y} + xyz$

$= x[w+\bar{w}\bar{z}] + x[\bar{y}+yz]$

$= x[(w+\bar{w})(w+\bar{z})] + x[(\bar{y}+y)(\bar{y}+z)]$

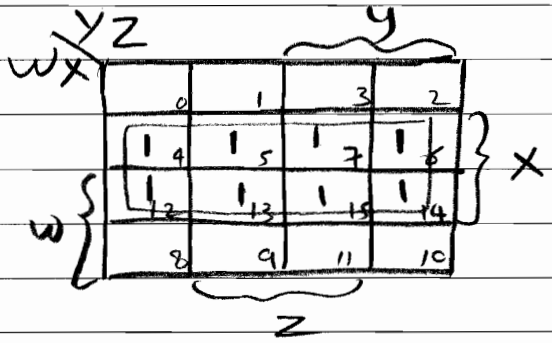
$= x[w+\bar{z}] + x[\bar{y}+z]$

$= x[w+\bar{y}+\bar{z}+z]$

$= x$

(ii) $\bar{w}x(\bar{z}+\bar{y}z) + x(w+\bar{w}yz)$

$= \bar{w}x\bar{z} + \bar{w}x\bar{y}z + wx + \bar{w}xyz$



$= x$ ✓