CpE111 - HW#3

1.

3.7. (a) $f(x,y,z) = \sum m(0,2,4,5,7)$

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

x	y	z	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

(b) $f(w,x,y,z) = \sum m(1,3,7,8,9,14,15)$

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

$+ wxy\bar{z} + wxyz$

w	x	y	z	f
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	1

2.

3.8. (a) $f(x,y,z) = (x+\bar{y}+z)(\bar{x}+y+z)(\bar{x}+\bar{y}+\bar{z})$

$= M_2M_4M_7$

$= \prod M(2,4,7)$

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

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

$= M_0M_3M_5M_8M_9M_{10}M_{14}$

$= \prod M(0,3,5,8,9,10,14)$

3

3.14. (a) $f(x,y,z) = \bar{x}(\bar{y}+z) + \bar{z}$

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

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

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

(b) $f(x,y,z) = (x+\bar{y})(x+z)$

$= x + \bar{y}z$

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

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

4.

3.15. (a) $f(x,y,z) = (y+\bar{z})(x\bar{y}+z)$

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

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

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

(b) $f(x,y,z) = x + \bar{x}\bar{z}(y+z)$

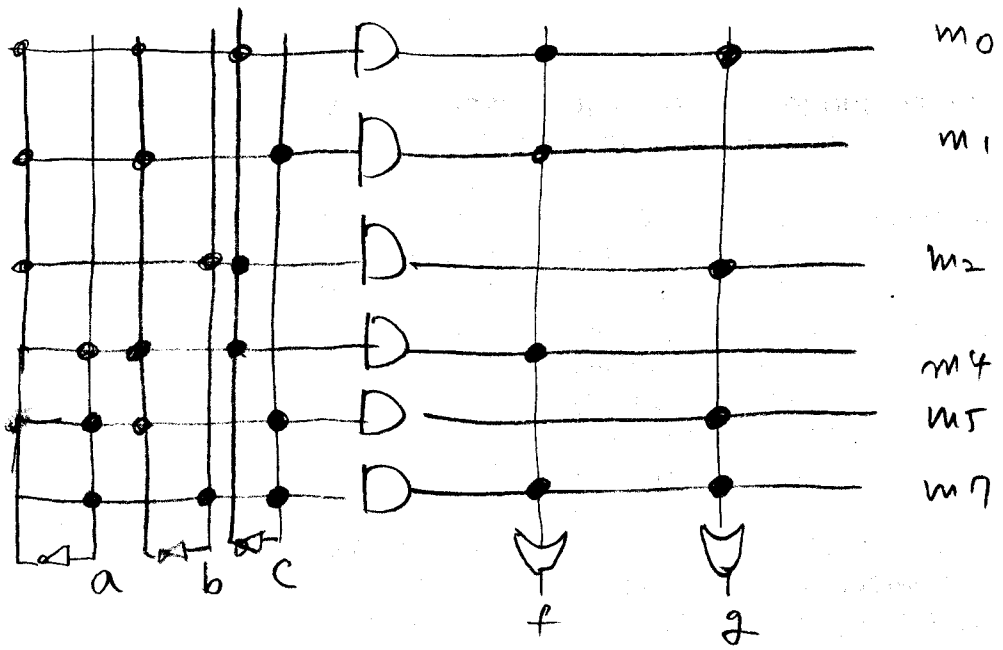
$= (x+\bar{x})(x+\bar{z})(x+y+z)$

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

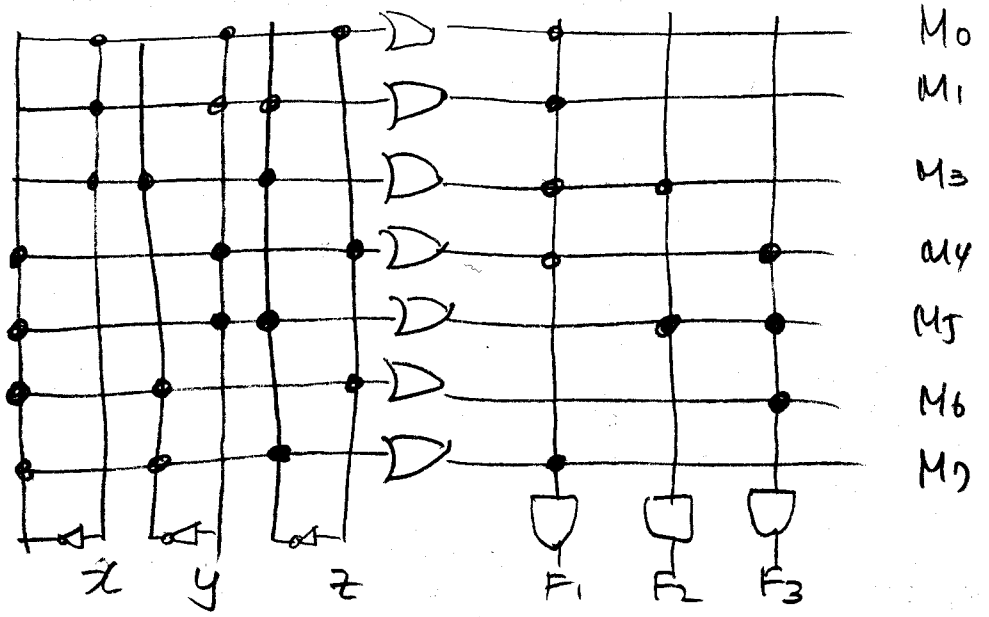
$= (x+\bar{z}+y\bar{y})(x+y+z)$

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

5.



6.

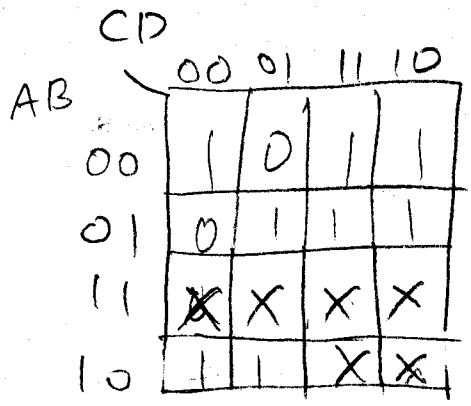


7. a. 435 ⇒ 0100 0011 0101

13 ⇒ 0001 0011

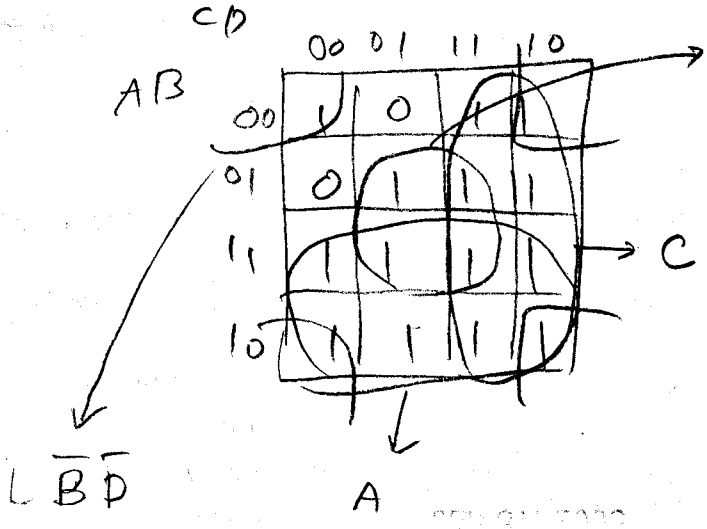
2029 ⇒ 0010 0000 0010 1001

8. Kmap for a.



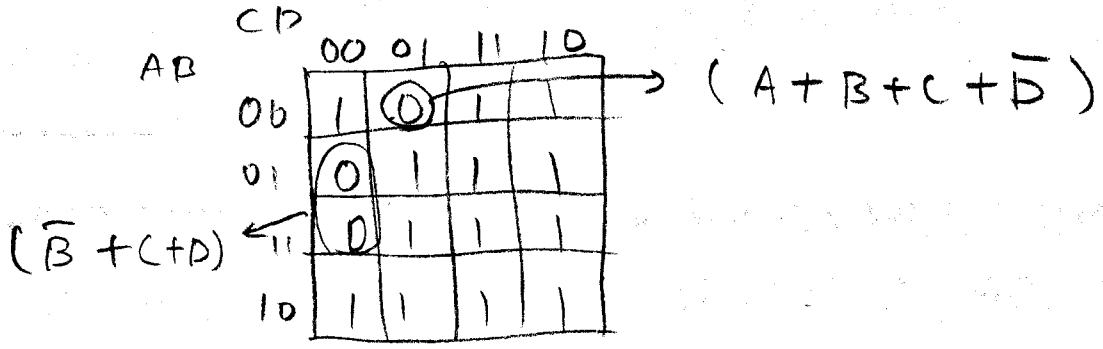
※ note: X means "Don't care"
so, we can assign 1s & 0s properly to make mSOP & mPOS simpler.
The main goal is to make the smallest # of groups while maximizing the # of 1s in each group.
(0s in case of mPOS).

If we assign 1s to Xs...



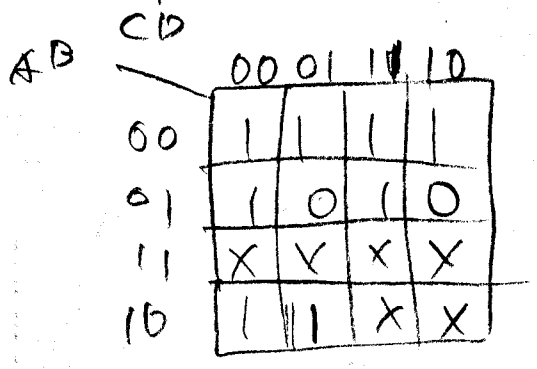
So, $a = \bar{B}\bar{D} + A + C + BD$ in mSOP.

If we assign 0 for ABCD = 1100 & 1s for the other cells

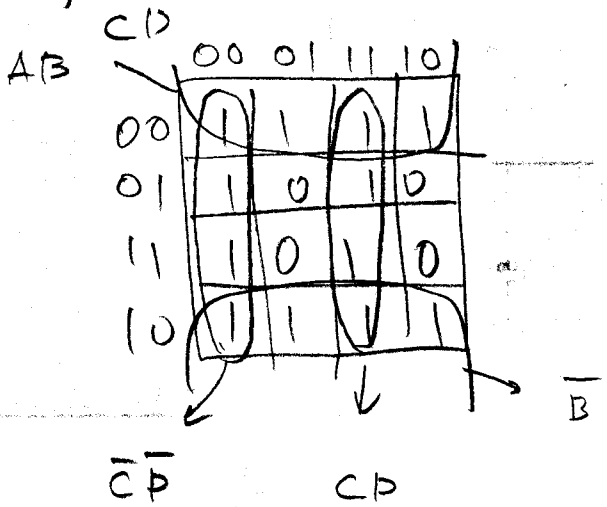


So, $a = (\bar{B}+C+D) \cdot (A+B+C+\bar{D})$ in mSOP.

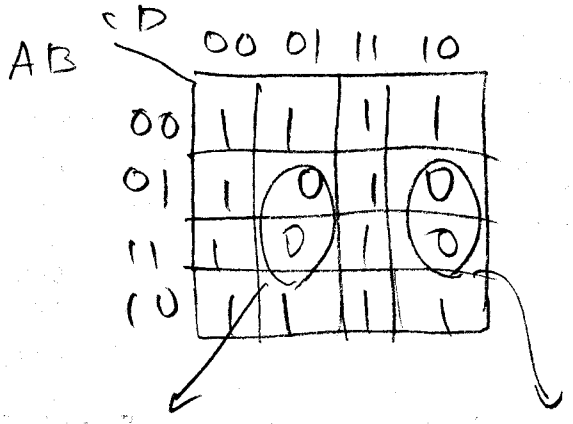
k-map for b.



Assuming 1s & 0s to Xs.



$b = \bar{B} + \bar{C}\bar{D} + CD$ in mSOP.

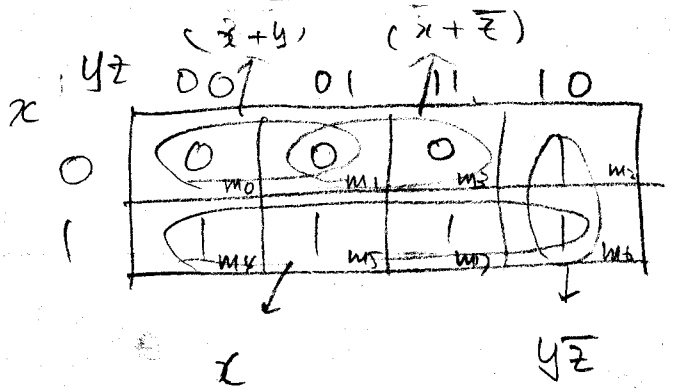


$b = (\bar{B} + C + \bar{D}) \cdot (\bar{B} + \bar{C} + D)$ in mPOS

(★) note! The optimal allocation of 1s & 0s in Xs is sometimes very complex task so, software tools are usually used in practice.

⇒ Sub optimal solutions will be considered as correct in this course.

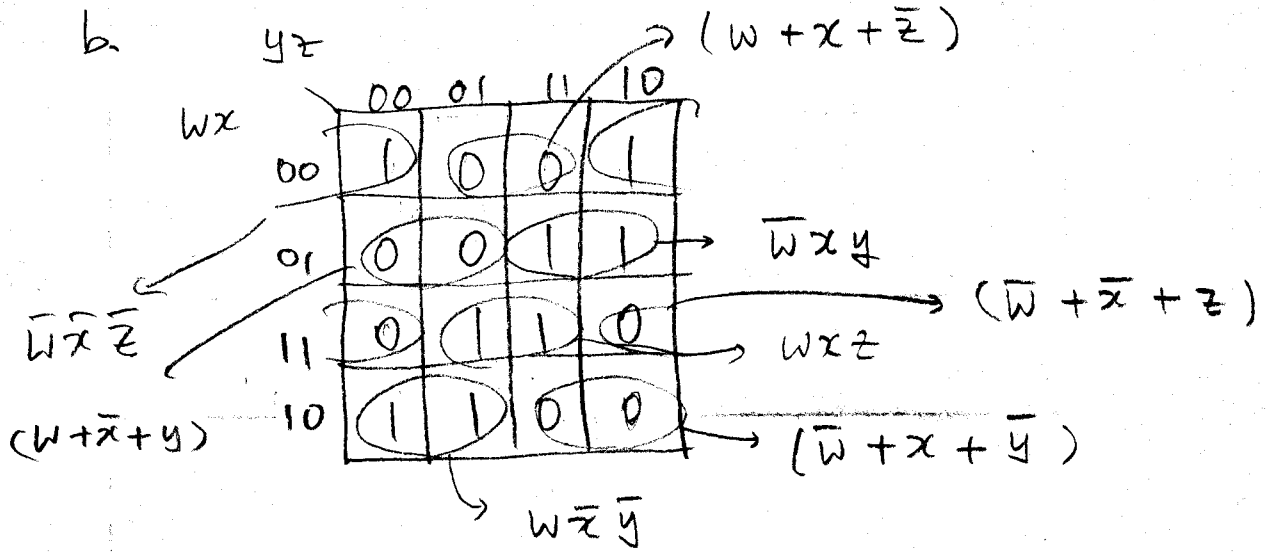
9 a.



$f = x + y\bar{z}$ in msop

$f = (x+y)\cdot(x+\bar{z})$ in mPOS.

b.



$f = \bar{w}\bar{x}\bar{z} + \bar{w}xy + wxz + w\bar{z}\bar{y}$ in msop

$f = (w+x+\bar{z})\cdot(w+\bar{z}+y)\cdot(\bar{w}+\bar{x}+z)\cdot(\bar{w}+x+\bar{y})$ in mPOS.