

CPE 111

HW#3

1. a) $f = \sum m(0, 1, 3, 5, 6)$

b) $f = \sum m(1, 2, 4, 6, 7, 11, 12, 13, 15)$

2. a) $f = \prod M(2, 4, 7)$

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

3

(a) $f(x, y, z) = \prod M(0, 1, 2, 5, 7)$

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

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

(b) $f(w, x, y, z) = \prod M(0, 3, 6, 7, 9, 10, 12, 13, 15)$

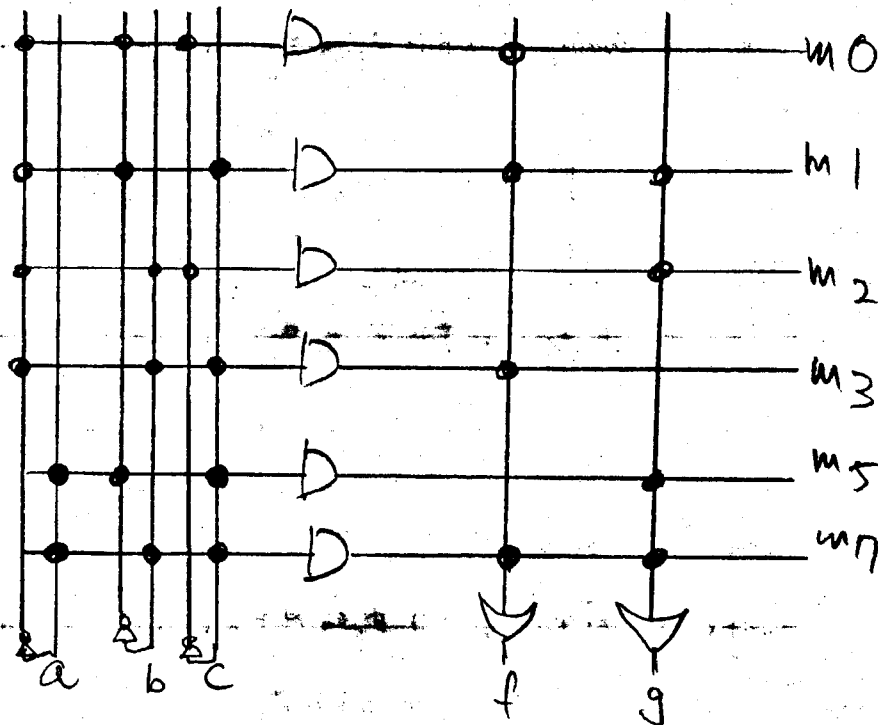
$= (w+x+y+z)(w+x+\bar{y}+\bar{z})(w+\bar{x}+\bar{y}+z)(w+\bar{x}+\bar{y}+\bar{z})$
 $\cdot (\bar{w}+x+y+\bar{z})(\bar{w}+x+\bar{y}+z)(\bar{w}+\bar{x}+y+z)$
 $\cdot (\bar{w}+\bar{x}+y+\bar{z})(\bar{w}+\bar{x}+\bar{y}+z)$

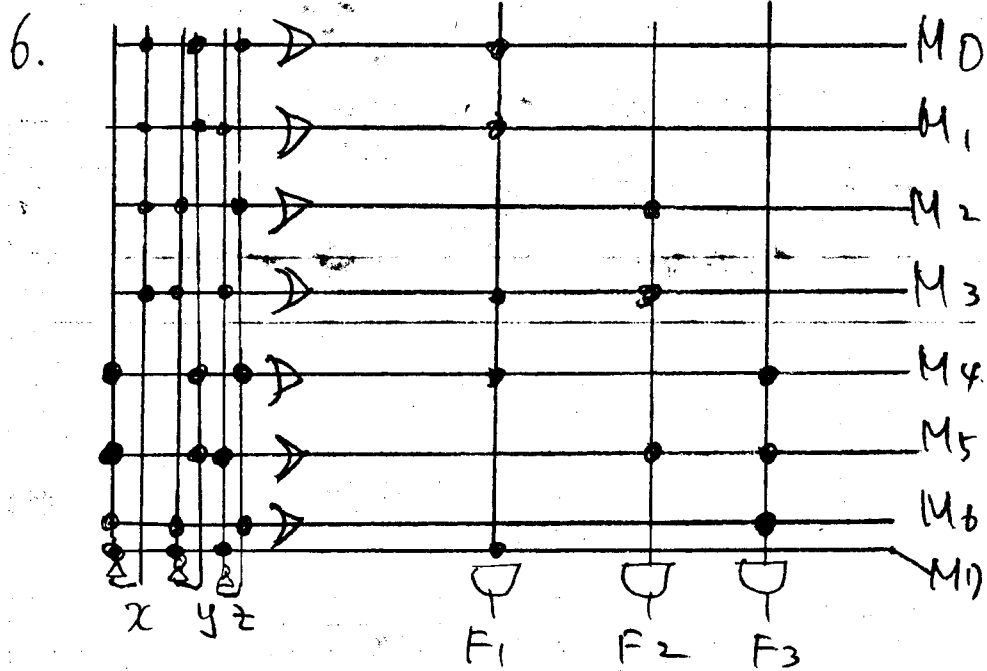
w	x	y	z	f
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

$$\begin{aligned}
 4. \quad a) \quad f(x, y, z) &= (y + \bar{z})(x\bar{y} + z) \\
 &= (y + \bar{z})(x + z)(\bar{y} + z) \\
 &= (x\bar{x} + y + \bar{z})(y\bar{y} + x + \bar{z})(x\bar{x} + \bar{y} + z) \\
 &= (x + y + \bar{z})(\bar{x} + y + \bar{z})(x + \bar{y} + z)(\bar{x} + \bar{y} + z)
 \end{aligned}$$

$$\begin{aligned}
 b) \quad f(x, y, z) &= x + \bar{x}\bar{z}(y + z) \quad \downarrow \text{distributive law to distribute } x \text{ to } \bar{x}, \bar{z} \text{ and } (y + z) \\
 &= (x + \bar{x})(x + \bar{z})(x + y + z) \\
 &= (x + \bar{z})(x + y + z) \\
 &= (x + y\bar{y} + \bar{z})(x + y + z) \\
 &= (x + y + \bar{z})(x + \bar{y} + \bar{z})(x + y + z)
 \end{aligned}$$

5.



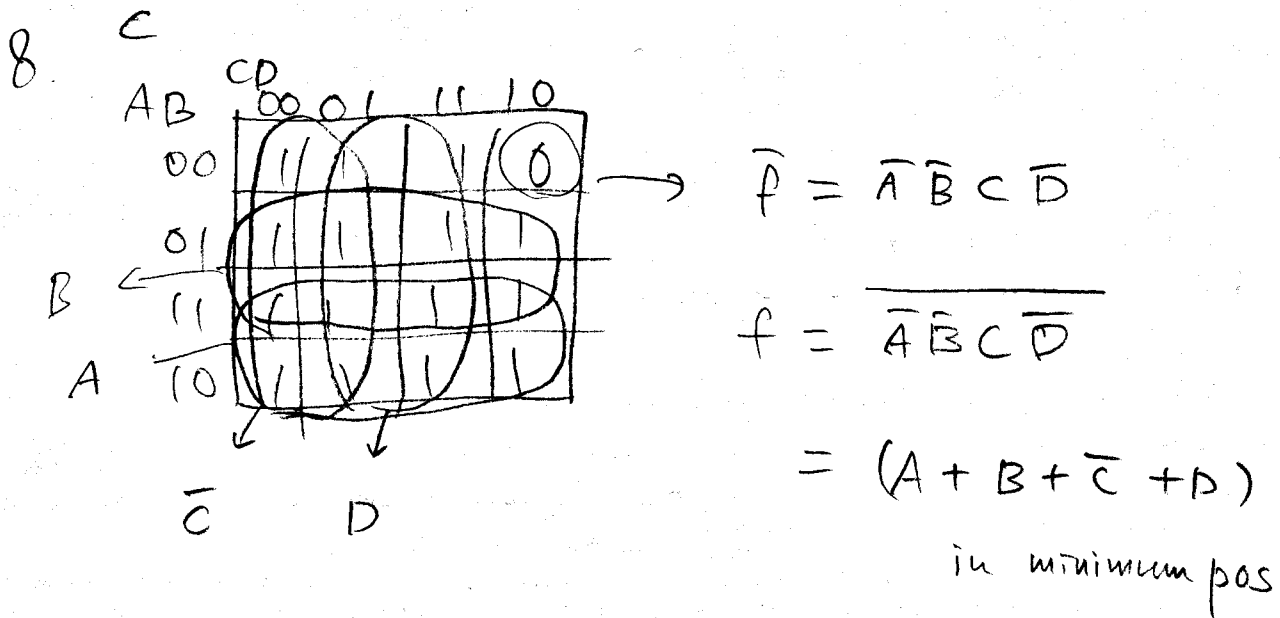


7.

4 2 5 1 7 2 0 3 9

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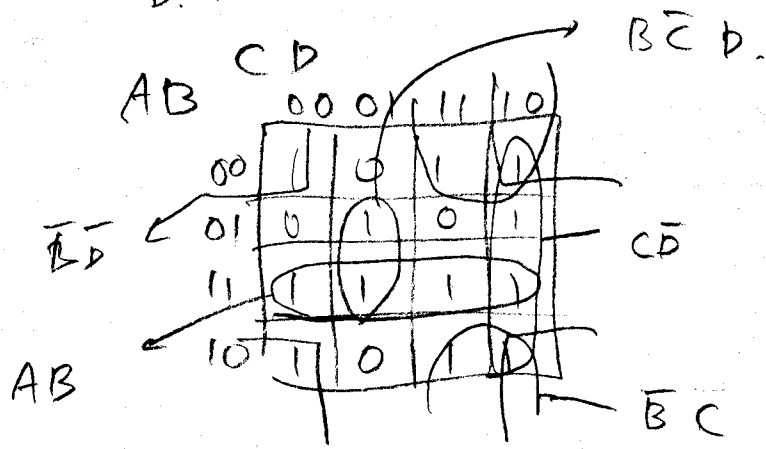
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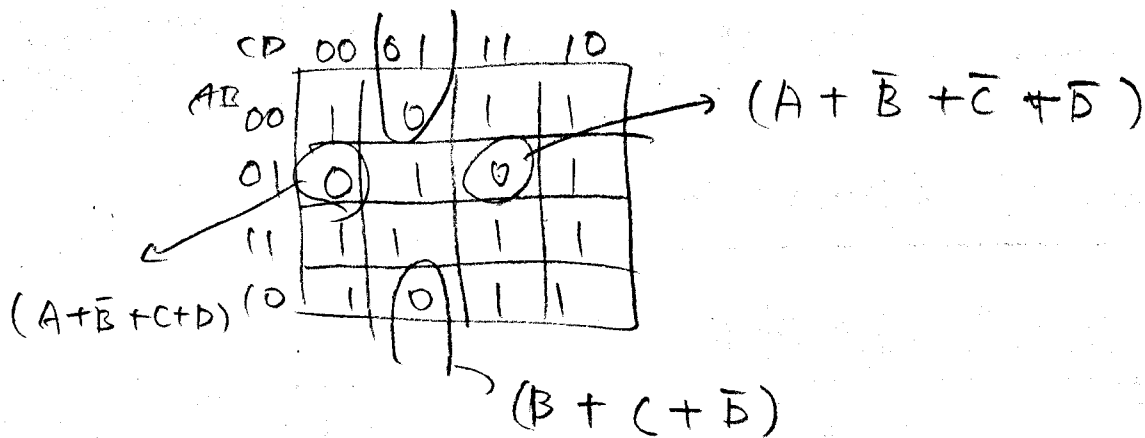
$f = A + B + \bar{C} + D$

in minimum sop

D.

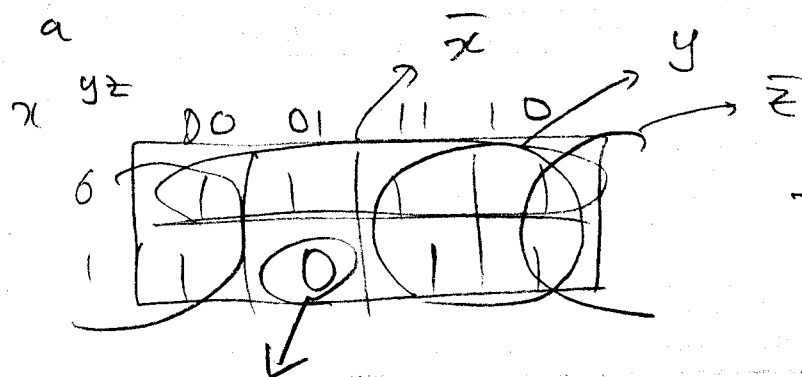


$$f = \bar{B}\bar{D} + AB + \bar{B}C + C\bar{D} + B\bar{C}D \text{ in minimum sop}$$



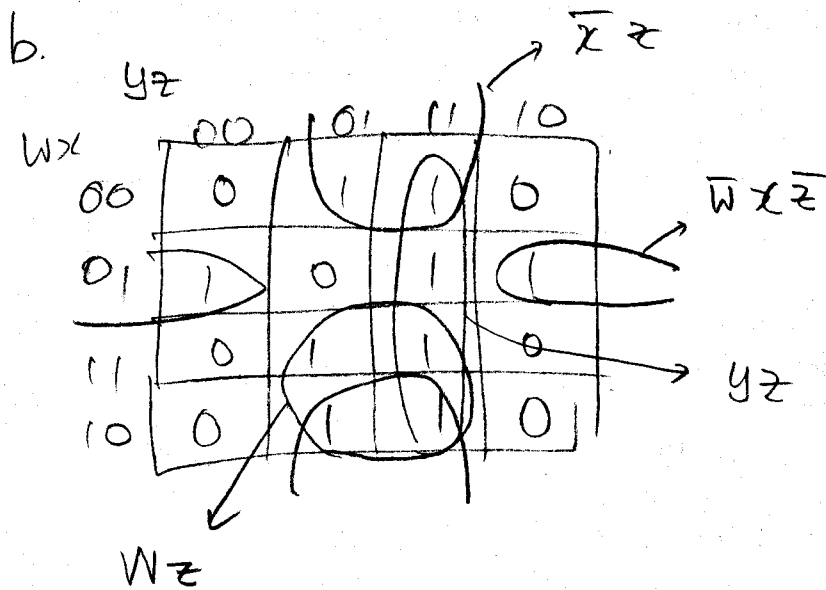
$$f = (A + \bar{B} + C + D)(A + \bar{B} + \bar{C} + \bar{D})(B + C + D) \text{ in minimum pos.}$$

9. a

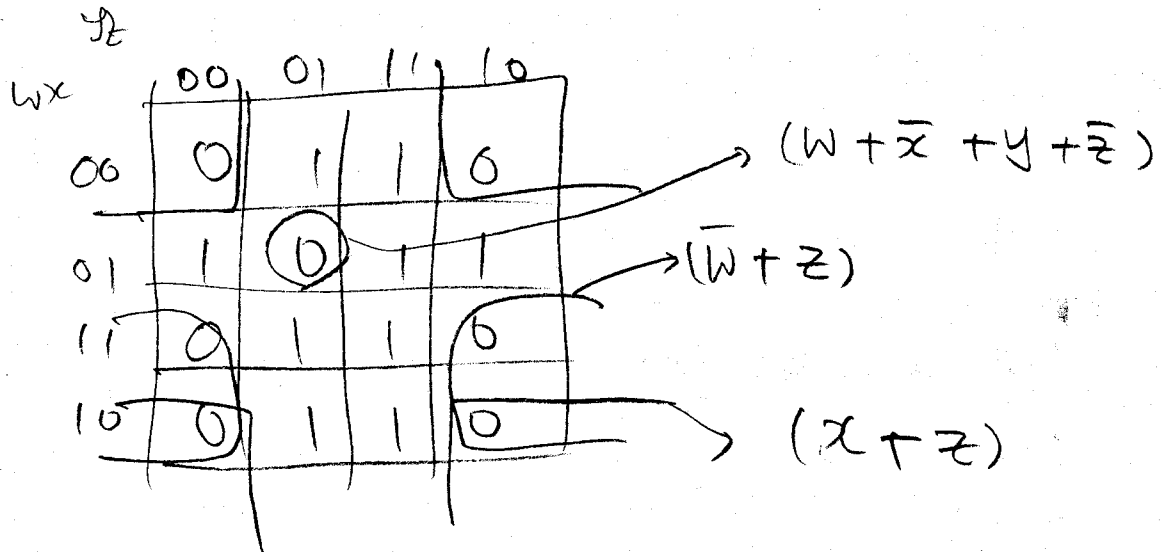


$$f = \bar{x} + y + \bar{z} \text{ in minimum sop}$$

$$f = (\bar{x} + y + \bar{z}) \text{ in minimum pos.}$$



$$f = wz + yz + \bar{w}x\bar{z} + \bar{x}z \quad \text{in minimum sop.}$$



$$f = (w + \bar{x} + y + \bar{z})(\bar{w} + z)(x + z) \quad \text{in minimum pos.}$$