

1. RHS $(x+y)(x+z)$

12a (xz) $xx + xz + yx + yz$

7a, 10a $x + xz + xy + yz$

13a (xz) $x + yz$ Done.

3. LHS $(x+y)(x+\bar{y})$

12a (xz) $xx + x\bar{y} + yx + y\bar{y}$

7a, 10a, 8a $x + x\bar{y} + xy + 0$

14a, 6b $x + x$

8b x

Done.

4. LHS $xy + yz + \bar{x}z$

6a, 8b $xy + (x+\bar{x})yz + \bar{x}z$

12a $xy + xyz + \bar{x}yz + \bar{x}z$

13a (xz) $xy + \bar{x}z$

Done.

6. LHS: $x + yz$

14a $(xy + x\bar{y}) + (xyz + \bar{x}yz)$

14a (xz) $(x\bar{y}z + xy\bar{z}) + (x\bar{y}z + x\bar{y}\bar{z}) + (xyz + \bar{x}yz)$

7b $xyz + xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + \bar{x}yz = \sum m(3, 4, 5, 6, 7)$

RHS: $(x+y)(x+z)$

12a (xz) $xx + xz + yx + yz$

7a, 14a(3) $x + (xyz + x\bar{y}z) + (x\bar{y}z + xy\bar{z}) + (xyz + \bar{x}yz)$

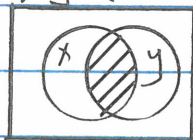
14a, 7b(2) $(x\bar{y}\bar{z} + x\bar{y}z + xy\bar{z} + xyz) + x\bar{y}z + x\bar{y}\bar{z} + xy\bar{z} + \bar{x}yz$

7b(3) $x\bar{y}\bar{z} + x\bar{y}z + xy\bar{z} + xyz + \bar{x}yz = \sum m(3, 4, 5, 6, 7)$

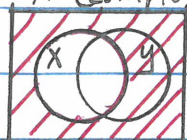
2. (Done in lecture)

$$\overline{X \cdot Y} = \overline{X} + \overline{Y}$$

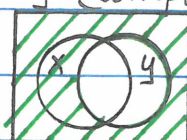
$X \cdot Y$ (intersection)



$\overline{X}$ (complement)



$\overline{Y}$ (complement)



$\overline{X \cdot Y}$ (complement)

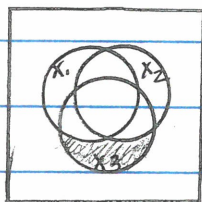


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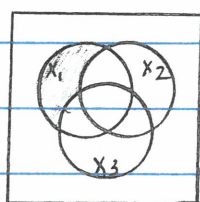
$\overline{X} + \overline{Y}$ (union)



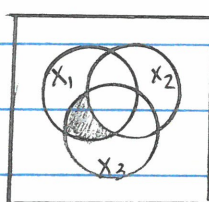
5. $\overline{X_1} \cdot \overline{X_2} \cdot X_3$



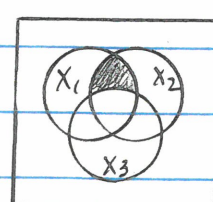
$X_1 \cdot \overline{X_2} \cdot \overline{X_3}$



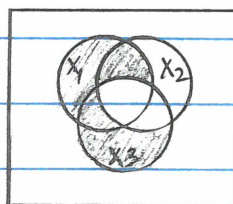
$X_1 \cdot \overline{X_2} \cdot X_3$



$X_1 \cdot X_2 \cdot \overline{X_3}$



$$\overline{X_1} \cdot \overline{X_2} \cdot X_3 + X_1 \cdot \overline{X_2} \cdot \overline{X_3} + X_1 \cdot \overline{X_2} \cdot X_3 + X_1 \cdot X_2 \cdot \overline{X_3}$$



7.

X_1	X_2	X_3	$X_1 \bar{X}_3$	$X_2 X_3$	$\bar{X}_2 \bar{X}_3$	LHS
0	0	0	0	0	1	1
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	0	1	0	1
1	0	0	1	0	0	0
1	0	1	1	0	0	0
1	1	0	0	0	0	0
1	1	1	0	1	0	1

same

X_1	X_2	X_3	$(X_1 + \bar{X}_2 + X_3)$	$(X_1 + X_2 + \bar{X}_3)$	$(\bar{X}_1 + X_2 + \bar{X}_3)$	RHS
0	0	0	0	0	1	1
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	1	1	0	1
1	0	0	1	0	0	0
1	0	1	1	0	0	0
1	1	0	1	1	1	1
1	1	1	1	1	1	1

8.

Row	X_1	X_2	X_3	$f = X_1 + X_2 + X_3$
0	0	0	0	0
1	0	0	1	1
2	0	1	0	1
3	0	1	1	1
4	1	0	0	1
5	1	0	1	1
6	1	1	0	1
7	1	1	1	1

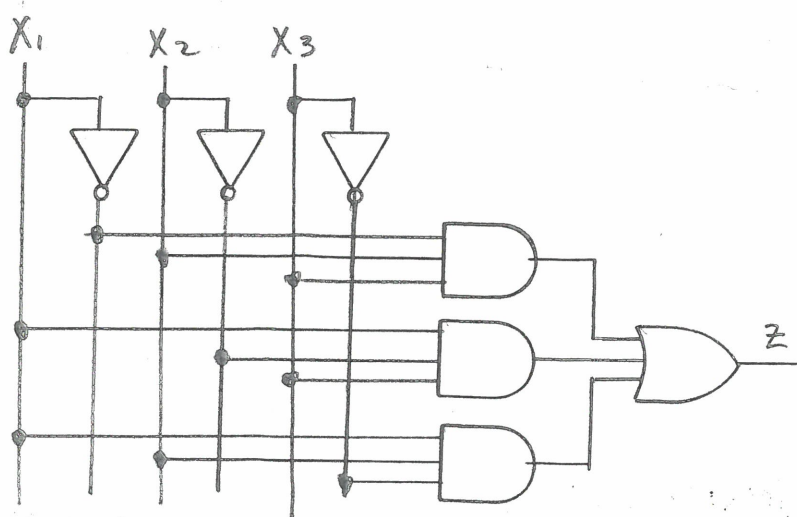
These are indeed rows (minterms) 1-7.

9. a)

X_1	X_2	X_3	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

$$b). Z = \bar{X}_1 X_2 X_3 + X_1 \bar{X}_2 X_3 + X_1 X_2 \bar{X}_3$$

c)



d) 4 gates

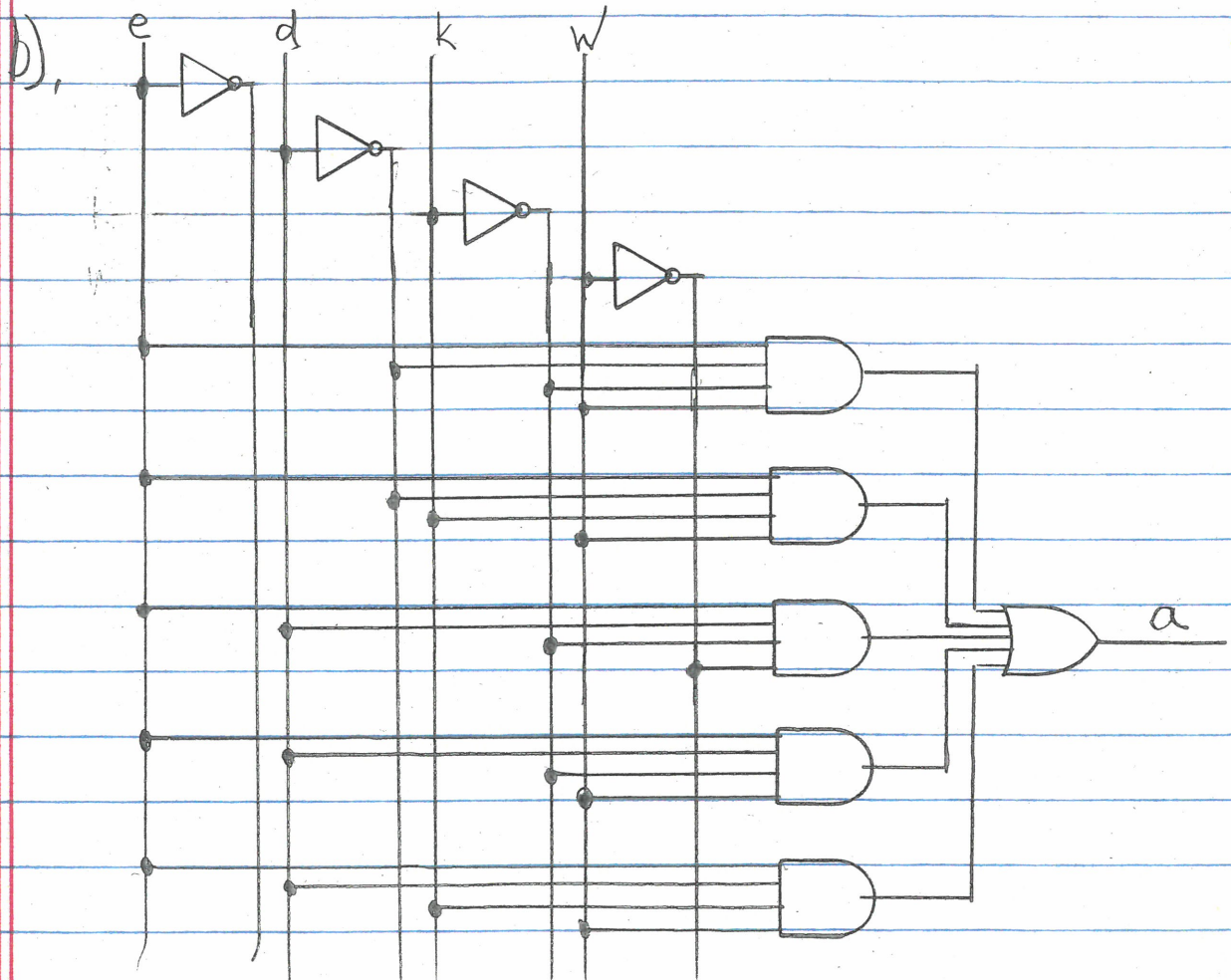
$$(3)(3)+3 = 12 \text{ inputs}$$

$$\text{Cost} = 4 + 12 = 16$$

$$\text{Cost} = (1+2)M+1$$

$$\text{CSOP} = (5)(3)+1 = 16$$

10. a) $a = e\bar{d}\bar{k}w + e\bar{d}kw + ed\bar{k}\bar{w} + ed\bar{k}w + edkw$



c) $Cost_{CSOP} = (l+2)(m) + 1 = (4+2)(5) + 1 = \underline{\underline{31}}$

Cost for implementation of Problem 12 of HW1:

$3 \text{ gates} + 6 \text{ inputs} = \underline{\underline{9}}$ (do not count NOT gate)