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HW 4  
OLD

HW 4

4.6:

$$a) F = W \cdot X \cdot Y \cdot Z \cdot (W \cdot X \cdot Y \cdot Z' + W \cdot X' \cdot Y \cdot Z + W' \cdot X \cdot Y \cdot Z + W \cdot X \cdot Y \cdot Z')$$

$$F = \{ W \cdot X \cdot Y \cdot Z \cdot W \cdot X \cdot Y \cdot Z' + W \cdot X \cdot Y \cdot Z \cdot W \cdot X' \cdot Y \cdot Z + W \cdot X \cdot Y \cdot Z \cdot W' \\ \cdot X \cdot Y \cdot Z \cdot W' + W \cdot X \cdot Y \cdot Z \cdot W \cdot X \cdot Y' \cdot Z \}$$

$$= \{ W \cdot X \cdot Y \cdot Z \cdot Z' + W \cdot X \cdot X' \cdot Y \cdot Z + W \cdot W' \cdot X \cdot Y \cdot Z + W \cdot \\ X \cdot Y' \cdot Z \} \\ = O + O + O + O$$

$\xrightarrow{O}$

$$c) F = M \cdot R \cdot P + Q \cdot O' \cdot R' + M \cdot N + O \cdot N \cdot M + Q \cdot P \cdot M \cdot O'$$

$$= MRP + QO'R + MN(1+O) + QPMO'$$

$$MRP + QO'R' + MN + QPMO'(R+R')$$

$$= MRP + QO'R(1+PM) + MN + QPMO'R$$

$$MRP + QO'R + MN + QPMO'R$$

$$MRP(1+QO') + QO'R + MN$$

$$MRP + QO'R' + MN$$

$$= \boxed{M \cdot R \cdot P + Q \cdot O' \cdot R' + M \cdot N}$$

4.7)

a)

X	Y	Z	X'·Y	X'·Y'·Z	F = X'·Y + X'·Y'·Z
0	0	0	0	0	0
0	0	1	1	1	1
0	1	0	0	1	1
0	1	1	1	0	1
1	0	0	0	0	0
1	0	1	0	0	0
1	1	0	0	0	0
1	1	1	0	0	0

X	Y	Z	X'·Y + X'·Y'·Z
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

6

c)

$w \cdot x$	$y$	$z$	$w \cdot x$	$y' + z$	$w \cdot (y' + z)$	$w \cdot x + w \cdot (y' + z)$	$w \cdot x$	$y$	$z$	$w \cdot x + w \cdot (y' + z)$
0	0	0	0	1	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	0	1	0	1	0	0	0	1	1	0
0	0	1	1	0	0	0	0	1	1	1
0	1	0	1	1	0	1	0	1	0	1
0	1	0	1	1	0	1	0	1	0	1
0	1	1	0	0	0	0	0	1	1	0
0	1	1	1	1	0	1	0	1	1	1
1	0	0	0	1	1	1	1	0	0	1
1	0	0	1	1	1	1	1	0	0	1
1	0	1	0	0	0	0	1	0	1	0
1	0	1	0	1	1	1	1	0	1	1
1	1	0	0	1	1	1	1	0	1	1
1	1	0	0	1	1	1	1	1	0	1
1	1	0	1	1	1	1	1	1	0	1
1	1	1	0	0	0	0	1	1	0	1
1	1	1	0	0	0	0	1	1	0	1
1	1	1	0	1	1	1	1	1	1	1
1	1	1	1	0	1	1	1	1	1	1



$A \cdot B + A' \cdot B' + B \cdot C + C \cdot D + C \cdot A'$

$A \cdot B$	$A \cdot B'$	$B \cdot C$	$C \cdot D$	$C \cdot A'$	$A \cdot B + B \cdot C + C \cdot D + C \cdot A'$
0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 0 0 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 0 1 0	0 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1	1 1 1 1
0 0 1 1	0 1 0 1	1 0 1 1	1 1 1 1	1 1 1 1	1 1 1 1
0 1 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 0 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 1 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
0 1 1 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1 0 0 0	1 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1 0 0 1	1 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1 0 1 0	1 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
1 0 1 1	1 1 0 0	1 0 0 0	1 0 0 0	1 0 0 0	1 0 0 0
1 1 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1 1 0 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1 1 1 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
1 1 1 1	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0

  

$A$	$B$	$C$	$D$	$A \cdot B + B \cdot C + C \cdot D + C \cdot A'$
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

4.8)

a)

$x$	$y$	$z$	$x \cdot y \cdot z$	$xyz$	$xy'z$	$x'y'z$	$x'y'z' + xyz + xy'z$
0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0
0	1	1	0	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0
1	1	0	0	0	0	0	0
1	1	1	0	0	0	0	0

$x$	$y$	$z$	$x \cdot y \cdot z$	$xyz$	$xy'z$	$x'y'z$	$x'y'z' + xyz + xy'z$
0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0
0	1	1	0	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	0	0	0	0	1
1	1	0	0	0	0	0	0
1	1	1	0	0	0	0	1

A	B	C	AB	A·B·C'	A·B·C	$A \cdot B + A \cdot B' \cdot C + A' \cdot B \cdot C$
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	0	0	1	1
1	0	0	1	0	1	1
1	0	1	0	0	0	0
1	1	0	1	0	1	1
1	1	1	1	0	1	1

A	B	C	$A \cdot B + A \cdot B' \cdot C + A' \cdot B \cdot C$
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	1

c)

X	Y	Z	$X \cdot Y \cdot Z$	$X \cdot Y \cdot Z'$	$X \cdot Y' \cdot Z$	$X \cdot Y' \cdot Z'$	$X \cdot Y \cdot Z'$	F	X	Y	Z	F
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	1	0
1	1	0	0	0	1	0	0	0	0	0	1	0
1	1	1	0	0	0	0	1	0	0	1	1	1

4.9)

a)  $F = \sum_{xy} (1,2) = [x \cdot y' + x' \cdot y] \leftarrow \text{sum}$

$$F = \sum_{xy} (1,2) = \boxed{\sum_{xy} (0,3)} = \boxed{(x+y) \cdot (x'+y')} \leftarrow \text{product}$$

b)  $F = \prod_{AB} (0,1,2)$

$$= \boxed{(A+B) \cdot (A+B') \cdot (A'+B)} \leftarrow \text{product}$$

$$= \sum_{AB} (3)$$

$$= \boxed{AB} + \text{sum}$$

$$c) F = \sum_{ABC} (1, 2, 4, 5)$$

$$= [A \cdot B' \cdot C + A' \cdot B \cdot C' + A \cdot B' \cdot C' + A \cdot B \cdot C] \text{ sum}$$

$$= \prod_{ABC} (0, 3, 6)$$

$$= [(A+B+C) \cdot (A+B'+C') \cdot (A+B+C') \cdot (A'+B'+C)] \text{ product}$$

d)

$$F = \prod_{WXY} (2, 3, 6, 7)$$

$$= [(W+x+y) \cdot (W+x'+y) \cdot (W+x+y') \cdot (W'+x+y') \cdot (W'+x+y')] \text{ sum}$$

$$F = \sum_{WXY} (1, 4, 5)$$

$$\hookrightarrow = [W \cdot x' \cdot y + W \cdot x \cdot y' + W \cdot x \cdot y'] \text{ product}$$

4.10)

$$a) F = \sum_{XYZ} (0, 3)$$

$$= [x' \cdot y' \cdot z' + x \cdot y \cdot z] \text{ sum}$$

$$= \prod_{XYZ} (1, 2, 4, 5, 6, 7)$$

$$= \left\{ \frac{(x+y+z) \cdot (x+y'+z) \cdot (x'+y+z)}{(x'+y+z') \cdot (x'+y'+z) \cdot (x'+y'+z')} \right\} \text{ product}$$

b)  $F = \prod_{ABC} (1, 2, 4)$

$$= [(A+B+C) \cdot (A+B'+C) \cdot (A'+B+C)] \text{ product}$$

$$F = \sum_{ABC} (0, 3, 5, 6, 7)$$

$$= [A' \cdot B' \cdot C' + A' \cdot B \cdot C + A \cdot B' \cdot C + A \cdot B \cdot C' + A \cdot B \cdot C] \text{ sum}$$



c)  $F = \sum_{ABCD} (1, 2, 5, 6)$

$$= \boxed{A' \cdot B' \cdot C \cdot D + A \cdot B \cdot C \cdot D' + A \cdot B \cdot C \cdot D + A' \cdot B \cdot C \cdot D'} \quad \text{sum}$$

$F = \prod_{ABCD} (0, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15)$

$$= \boxed{\left\{ (A+B+C+D) \cdot (A+B+C+D') \cdot (A+B+C+D) \cdot (A+B+C+D') \right\}} \quad \text{product}$$

d)  $F = \prod_{MNP} (0, 1, 3, 6, 7)$

$$= \boxed{\frac{(M+N+P)}{(M+N+P')} \cdot (M+N+P') \cdot (M+N'+P') \cdot (M+N+P')} \quad \text{product}$$

$F = \sum_{MNP} (2, 4, 5) = \boxed{M \cdot N \cdot P' + M \cdot N' \cdot P' + M \cdot N' \cdot P} \quad \text{sum}$