1

a

$\overline{(a+b)} + ab + c = \bar{a}\bar{b} + ab + c$

$\overline{(a+bc)} + c \cdot (b+c) = \bar{a} \cdot \overline{(bc)} + cb + cc = \bar{a} \cdot (\bar{b}+\bar{c}) + c = (\bar{a} \cdot \bar{b}) + (\bar{a} \cdot \bar{c}) + c = (\bar{a} \cdot \bar{b}) + (\bar{a}+c) \cdot (\bar{c}+c) = (\bar{a} \cdot \bar{b}) + \bar{a} + c = \bar{a} + c$

b

$a \cdot (a+b) = (a \cdot a) + (a \cdot b) = a + (a \cdot b) = a$

$(a \cdot b) + (a \cdot \bar{b}) = a \cdot (b + \bar{b}) = a$

$(a+b) \cdot (a+\bar{b}) = a + (b \cdot \bar{b}) = a$

c

a	b	$a+(\bar{a} \cdot b)$	$a+b$
0	0	0	0
0	1	1	1
1	0	1	1
1	1	1	1

✓

a	b	c	$\overline{(a \cdot c)} + (a+c) \cdot (b+c)$	$b+c$
0	0	0	1	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

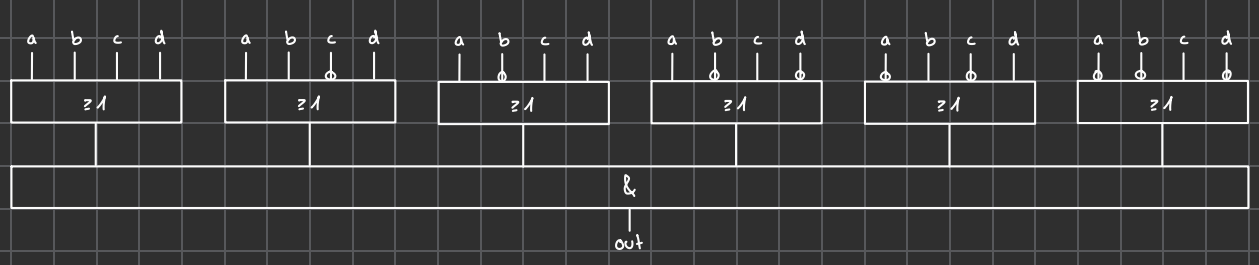
↯ ↯

2

a

$(a+b+c+d) \cdot (a+b+\bar{c}+d) \cdot (a+\bar{b}+c+d) \cdot (a+\bar{b}+c+\bar{d}) \cdot (\bar{a}+b+\bar{c}+d) \cdot (\bar{a}+\bar{b}+c+\bar{d})$

b



c

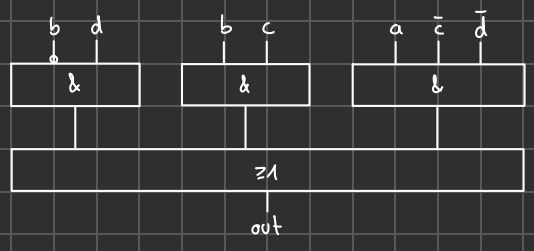
$\bar{a}bcd + \bar{a}b\bar{c}d + \bar{a}bc\bar{d} + \bar{a}bcd + ab\bar{c}d + ab\bar{c}\bar{d} + a\bar{b}cd + abc\bar{d} + abcd$

d

$= \bar{a}\bar{b}d + \bar{a}bc + ac\bar{d} + a\bar{b}d + abc$

$= \bar{b}d + bc + ac\bar{d}$

e



3

4b

cd \ ab	00	01	11	10
00	1	0	0	0
01	X	0	1	X
11	0	1	1	0
10	X	1	1	0

$= bc + ac\bar{d} + \bar{a}\bar{b}\bar{c}$

cd \ ab	00	01	11	10
00	1	0	0	0
01	X	0	1	X
11	0	1	1	0
10	X	1	1	0

$= (\bar{b}+c+d) \cdot (\bar{a}+b) \cdot (a+c+\bar{d}) \cdot (a+b+\bar{c})$

4a

$R := x_n + x_{n+1} + \cdots + x_m$

$(x_1 + R) \cdot (\bar{x}_1 + R) = x_1\bar{x}_1 + x_1R + \bar{x}_1R + RR$

$= \text{false} + R + R = R$ ✓

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