KT Blatt 1 27.04.2020

A1

a) i) $\overline{(a+b)} + (a \cdot b) + c =$

~~De-Morgan $(\bar{a} \cdot \bar{b}) + (a+b) \cdot a + c$~~

$\overset{\text{De-Morg.}}{=} (\bar{a} \cdot \bar{b}) + (a \cdot b) + c$

$=$

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

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

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

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

b) i) $(a \cdot (a+b)) \overset{\text{distr. Ges}}{=} a \cdot a + a \cdot b \overset{\text{Idem.}}{=} a + (a \cdot b)$

1. Fall $b = W$: $a + a \cdot 1 = a + a = a$
2. Fall $b = F$: $a + a \cdot 0 = a + 0 = a$ □

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

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

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

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

iii) $(a+b) \cdot (a+\bar{b}) = a + (b \cdot \bar{b}) = a + 0 = a$ □

c) i)

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

~~ii) a b c b+c (a·c)+(a·c)·(b·c)~~

ii)

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

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~~AZ~~

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

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

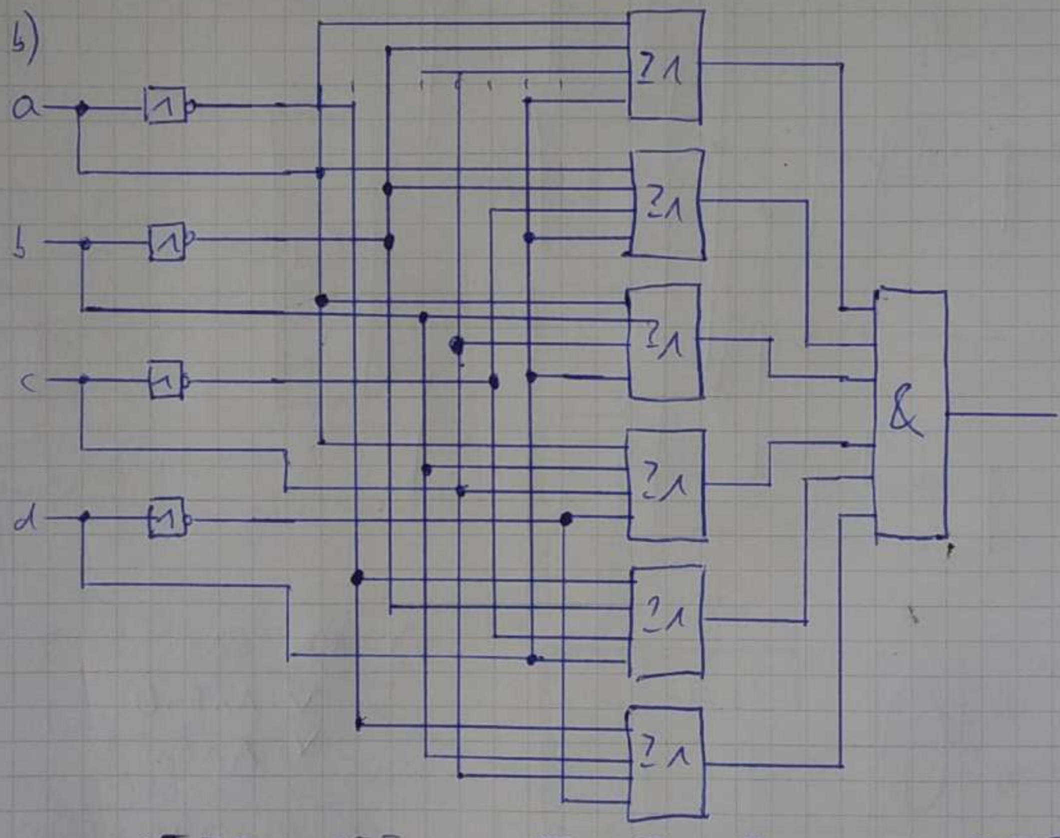
$\cancel{+ (\bar{a}\cdot \bar{b}\cdot \bar{c}\cdot d) + (\bar{a}\cdot \bar{b}\cdot \bar{c}\cdot \bar{d})}$

AZ

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

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

b)



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

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

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

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

d) $(\bar a \bar b \bar c d) + (\bar a \bar b c d) + (\bar a b c \bar d) + (\bar a b c d) + (a \bar b c \bar d) + (a \bar b \bar c \bar d) +$
$(a \bar b \bar c d) + (a \bar b c d) + (a b \bar c \bar d) + (a b c \bar d)$

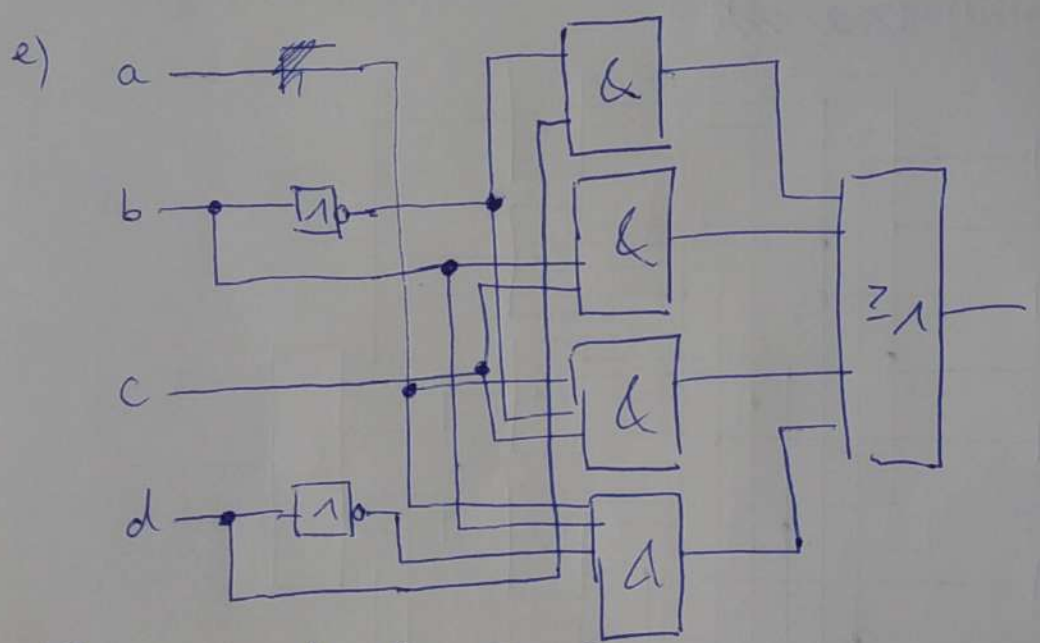
$= (\bar a \bar b d)\cdot\underbrace{(c+\bar c)}_{=1} + (\bar a b c)\cdot\underbrace{(d+\bar d)}_{=1} + (a \bar b \bar c)\cdot\underbrace{(d+\bar d)}_{=1} + (a \bar b d)\cdot\underbrace{(c+\bar c)}_{=1}$
$+ (a b \bar d)\cdot\underbrace{(c+\bar c)}_{=1} + (a b c)\cdot\underbrace{(d+\bar d)}_{=1}$

$= \bar a \bar b d + \bar a b c + a \bar b \bar c + a \bar b d + a b \bar d + a b c$

$= (\bar b d)\cdot\underbrace{(\bar a + a)}_{=1} + (b \cdot c)\cdot\underbrace{(\bar a + a)}_{=1} + a \bar b \bar c + a b \bar d$

$= \bar b d + b c + a \bar b \bar c + a b \bar d$

e)



A3

	A	A	$\bar A$	$\bar A$	
B	1	1	1	1	C
B	1				$\bar C$
$\bar B$	X		1	X	$\bar C$
$\bar B$			X		C
	D	$\bar D$	$\bar D$	D	

$\Rightarrow (B \wedge C)$
$\vee (A \wedge B \wedge D)$
$\vee (\bar A \wedge \bar B \wedge \bar C)$

A4

a) $M_1 = \bigvee_{i=1}^{j-1} a x_i \vee x_j \vee \bigvee_{i=j+1}^{n} a x_i := x_j \vee R$

$M_2 = \bigvee_{i=1}^{j-1} a x_i \vee \overline{x_j} \vee \bigvee_{i=j+1}^{n} a x_i := \overline{x_j} \vee R$

Maxterm

mit $a x_i = x_i$ oder $\overline{x_i}$

$M_1 \wedge M_2 = (x_j \vee R) \wedge (\overline{x_j} \vee R) =$

$\cancel{= \overline{(x_j \wedge x_j)} \vee R}$

$= \underbrace{(x_j \wedge \overline{x_j})}_{=0} \vee R = \boxed{R}$

konjunktiv verknüpft

b)

A3

	A	A	$\bar{A}$	$\bar{A}$	
B	1	X		1	D
B	1			1	$\bar{D}$
$\bar{B}$			1	X	$\bar{D}$
$\bar{B}$		X	X		D
	C	$\bar{C}$	$\bar{C}$	C	

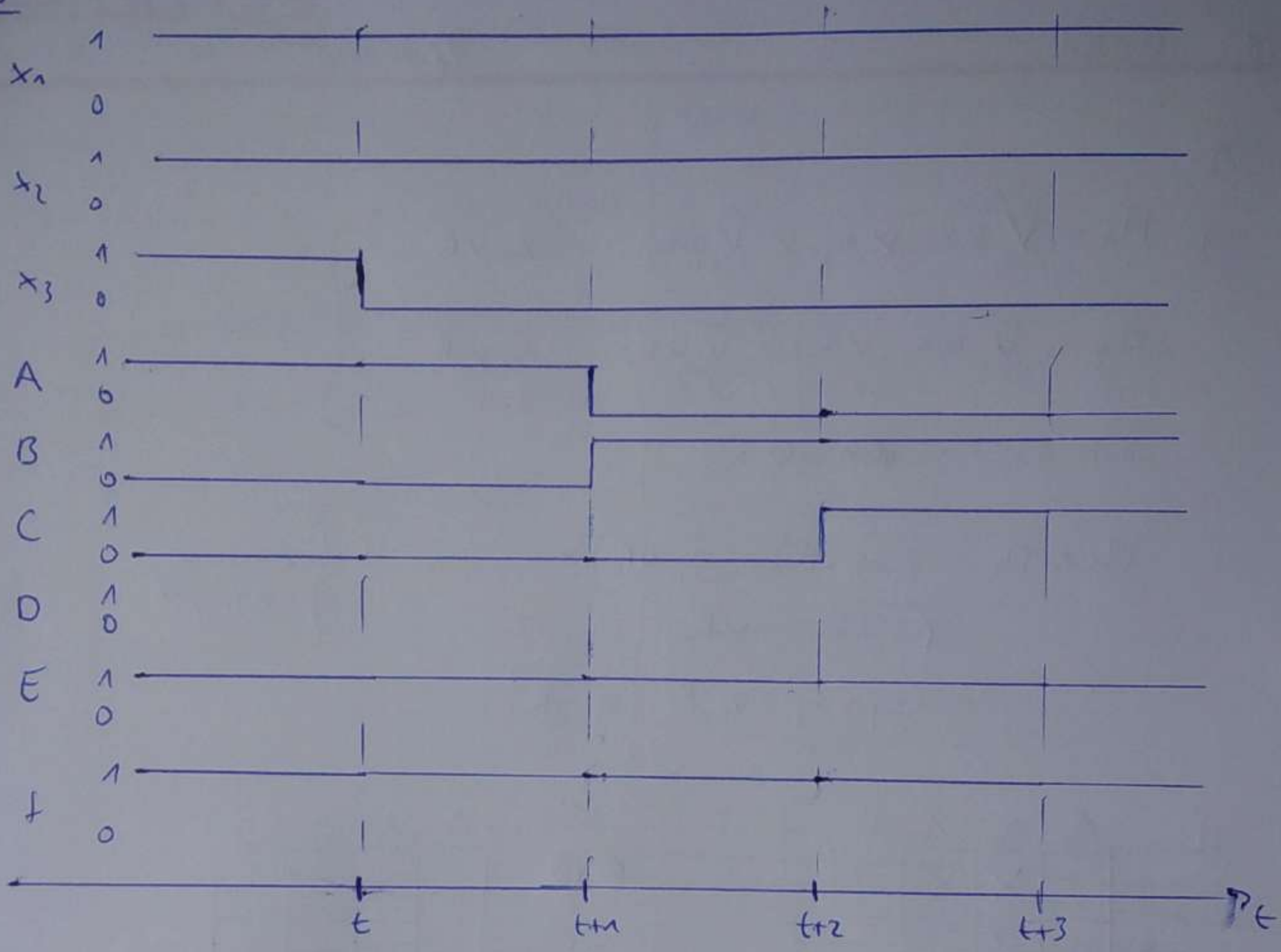
$\Rightarrow (B \wedge C) \vee (A \wedge \bar{C} \wedge D) \vee (\bar{A} \wedge \bar{B} \wedge \bar{D})$

A4 b)

	A	A	$\bar{A}$	$\bar{A}$	
B		X	0	0	D
B	X	0	0	X	$\bar{D}$
$\bar{B}$	0				$\bar{D}$
$\bar{B}$	0			0	D
	C	$\bar{C}$	$\bar{C}$	C	

$\Rightarrow (\bar{A} \vee B) \wedge (B \vee \bar{D}) \wedge$
$(A \vee \bar{B} \vee C) \wedge (\bar{B} \vee C \vee D)$

A5



f ist konstant auf 1, da durch das Gatter E mindestens ein Eingang von Gatter D 1 ist und somit f 1 ist.