

$$T_{y_i} = UE_4$$

A1)

a) $n = m + r$ $r = 4$ Bits

0 1 2 3 4
~~1 2 3 4~~
 $2^4 - 1 = 15 = n$ $m = 11$

r ... Kontrollbits
 m ... Datenbits
 n ... Gesamtlänge

b) 2^1 2^2 2^3
 C₁ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
 p₁ p₂ p₃ p₄

man muss sich die Paritätsbit Stelle
 dann denken

$C_1 = p_1 = C_3 \oplus C_5 \oplus C_7 \oplus C_9 \oplus C_{11} \oplus C_{13} \oplus C_{15}$

jedes 2. Bit
 2 auslassen -

$C_2 = p_2 = C_3 \oplus C_6 \oplus C_9 \oplus C_{10} \oplus C_{11} \oplus C_{14} \oplus C_{15}$

2 nehmen - 2 auslassen...

$C_4 = p_3 = C_5 \oplus C_6 \oplus C_7 \oplus C_{12} \oplus C_{13} \oplus C_{14} \oplus C_{15}$

4 auslassen - 4 nehmen - ...

$C_8 = p_4 = C_9 \oplus C_{10} \oplus C_{11} \oplus C_{12} \oplus C_{13} \oplus C_{14} \oplus C_{15}$

8 auslassen - 8 nehmen - ...

c) $1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10\ 11\ 12\ 13\ 14\ 15$
 p₀ p₁ p₂ p₃ d₁ d₂ d₃ d₄ p₄ d₅ d₆ d₇ d₈ d₉ d₁₀ d₁₁
 0 0 0 1 0 1 0 0 1 0 1 0 1 0 1
 1 1 1 1 1 1 1 1

d) $1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10\ 11\ 12\ 13\ 14\ 15$
 p₀ p₁ p₂ p₃
 0 0 0 1 0 1 0 1 1 0 1 0
 1 1 1 1

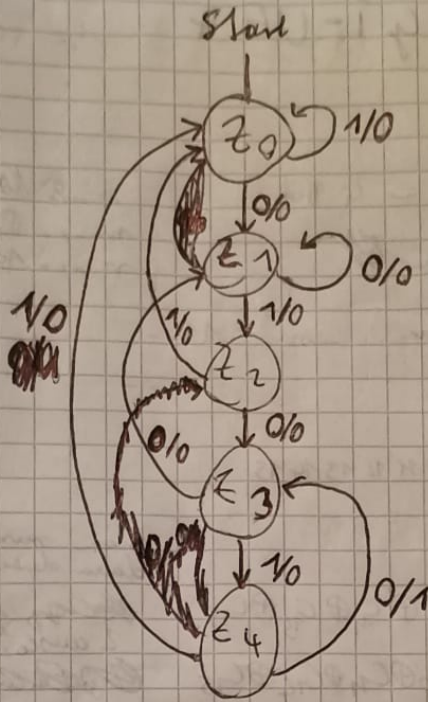
$p_0 = 0 \oplus 0 \oplus 0 \oplus 1 \oplus 1 = 0 = 0 \checkmark$
 $p_1 = 0 \oplus 1 \oplus 0 \oplus 1 \oplus 0 = 0 = 0 \checkmark$
 $p_2 = 0 \oplus 1 \oplus 0 \oplus 0 \oplus 1 = 0 \checkmark$
 $p_3 = 1 \oplus 0 \oplus 1 \oplus 0 = 0 \neq 1 \times$

p_0 und p_1 decken die Daten zwei und drei vierfachte ab
 also kommt nur das dritte Mal als falsches Bit in Frage

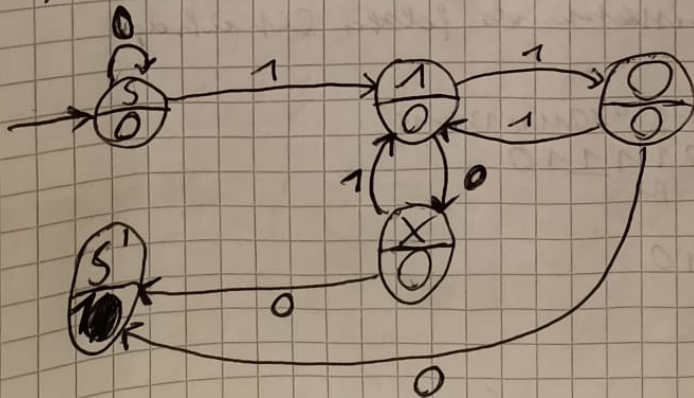
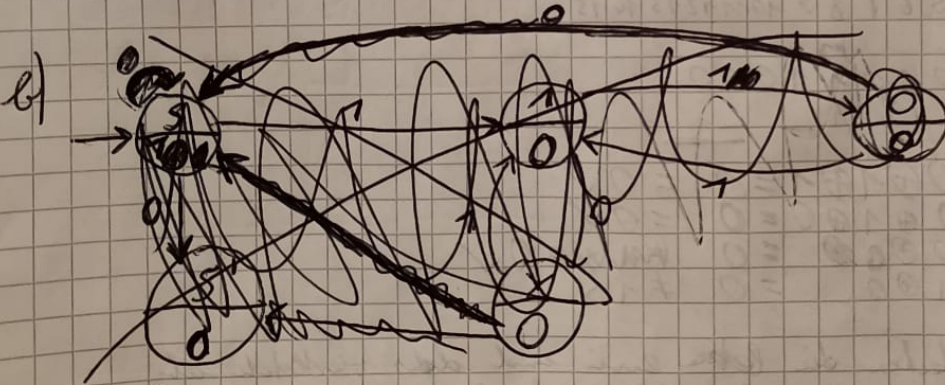
Korrektur $1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10\ 11\ 12\ 13\ 14\ 15$
 0 0 0 1 0 1 0 1 1 1 1 0
 p₀ p₁ p₂ p₃

Decodiert \rightarrow ~~00101110~~
 00101110

A2)



- A30) Mealy Automat ? wahr
 vollständig-deterministisch? wahr
 endlich? wahr
 unendlich lange Eingabe verarbeitet? wahr
 vier Eingänge u. ein Ausgang? falsch
 Bei Start 0 Ausgabe? wahr
 In Zustand \times '1' \rightarrow '0'? wahr
 Nach Start '0' \rightarrow Zustand 1? falsch



A4) $m = (n \bmod 3) + 1$

$Der = (1er \bmod 3) + 1$

$3 \times 1 \Rightarrow 1 \times 0$ 1110

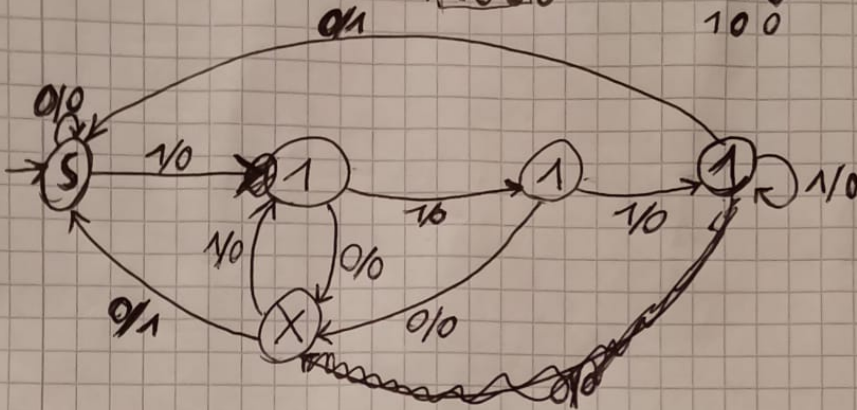
$2 \times 1 \Rightarrow 3 \times 0$

$1 \times 1 \Rightarrow 2 \times 0$ 100

1110
 100
~~11000~~

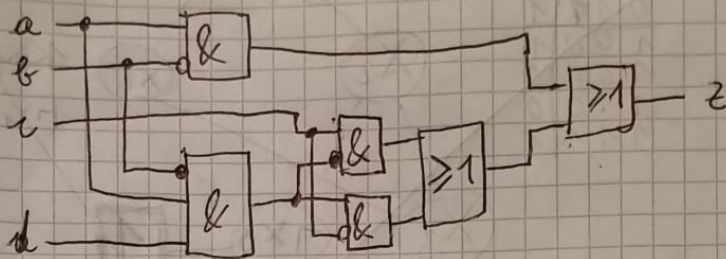
$na = (n \bmod 2) + 1$

110
 100



A2) a) $(a \& b) \oplus (b \& c) \oplus (c \& d)$

a	b	c	d	\oplus
0	0	0	0	0
1	0	0	0	0
0	1	0	0	1
1	1	0	0	0
0	0	1	0	1
1	0	1	0	0
0	1	1	0	1
1	1	1	0	0
0	0	0	1	0
1	0	0	1	0
0	1	0	1	1
1	1	0	1	0
0	0	1	1	0
1	0	1	1	0
0	1	1	1	1
1	1	1	1	0

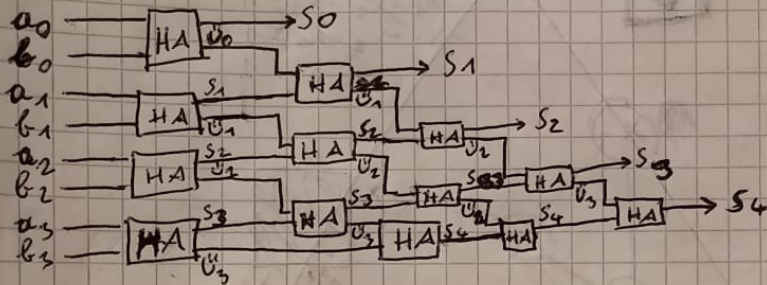


$3 + -2 = 1$
 $11 \oplus 10 = 00$

$3 + 2$
 $111 + 101$

$a_3 a_2 a_1 a_0$
 1101 13
 1111 15
 1111 15

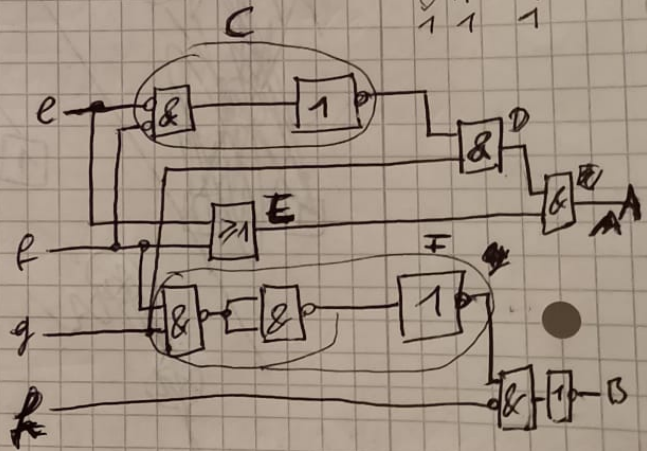
b)



00 0
 01 1
 11 1

A8)

e	f	g	h	A	B	C	D	E	F
0	0	0	0	0	0	0	0	0	1
0	0	0	1	0	1	0	0	0	1
0	0	1	0	0	0	0	0	0	1
0	0	1	1	0	1	0	0	0	1
0	1	0	0	0	0	1	0	1	1
0	1	0	1	0	1	1	0	1	1
0	1	1	0	1	1	1	1	0	
0	1	1	1	1	1	1	1	0	
1	0	0	0	0	0	1	0	1	1
1	0	0	1	0	1	1	0	1	1
1	0	1	0	1	0	1	1	1	1
1	0	1	1	1	1	1	1	1	1
1	1	0	0	0	0	1	0	1	1
1	1	0	1	0	1	1	0	1	1
1	1	1	0	1	1	1	1	0	
1	1	1	1	1	1	1	1	0	

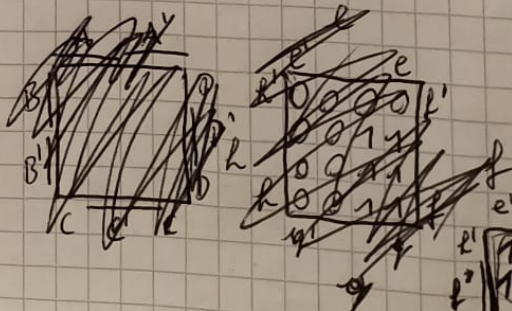


1
 0 1 0

b)

e'	e	e'
f'	1	0
f	1	0
g	1	0
g'	1	0

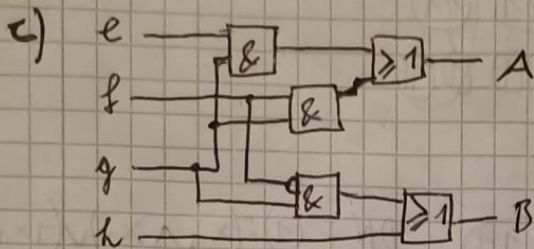
e'	e	e'
f'	4	2
f	8	6
g	16	5
g'	3	9



e'	e	e'
f'	1	1
f	1	1
g	1	0
g'	0	0

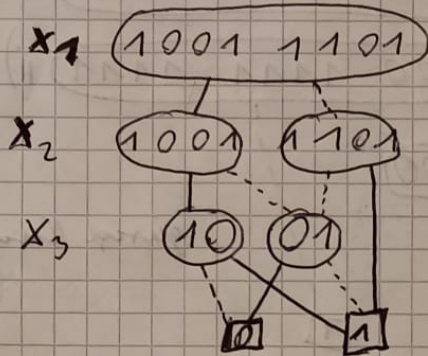
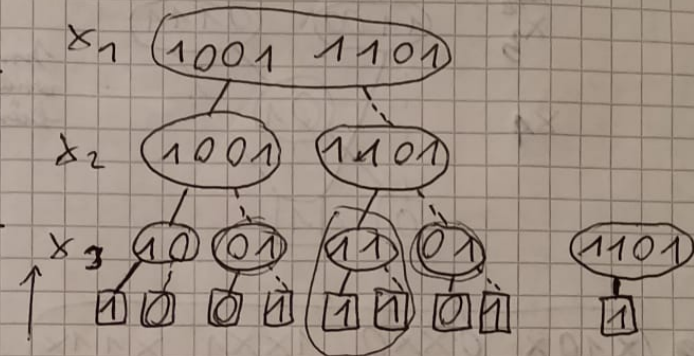
A: DNF $(e \wedge g) \vee (f \wedge g)$
 KNF $g' \wedge (g \vee f')$

B: DNF $h \vee (g \wedge f')$
 KNF $(f' \vee h') \wedge (f' \vee h')$



AS) a)

x_1	x_2	x_3	
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1



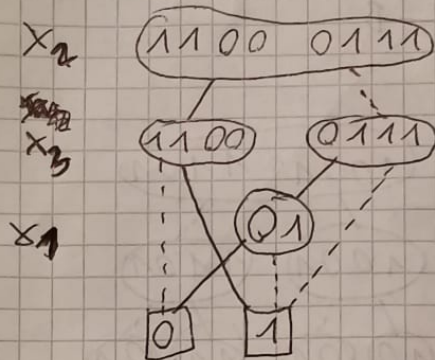
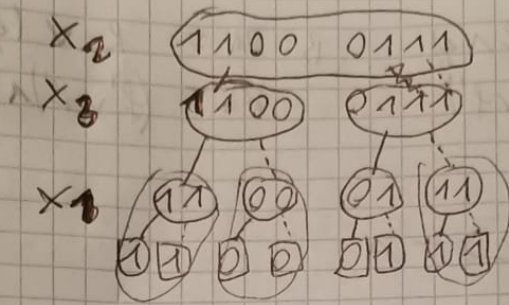
DNF(1)
 $(\neg x_1 \wedge \neg x_2) \vee (\neg x_2 \wedge x_3) \vee (x_1 \wedge x_2 \wedge x_3) \vee (x_1 \wedge \neg x_2 \wedge \neg x_3)$
 KNF(0)
 $(x_1 \vee x_2 \vee \neg x_3) \wedge (x_1 \vee \neg x_2 \vee x_3) \wedge (\neg x_1 \vee \neg x_2 \vee x_3)$

x_1	x_2	x_3	123	132	312	321	231	213
0	0	0	1	1	1	1	1	1
0	0	1	1	0	0	1	1	1
0	1	0	0	1	1	0	1	1
0	1	1	1	1	0	0	0	0
1	0	0	1	1	1	1	0	0
1	0	1	0	0	1	0	0	1
1	1	0	0	0	0	1	1	0
1	1	1	1	1	1	1	1	1

123	1101	1001
231	1110	0011
213	1110	0101
123	1001	1101
231	1100	0111
213	1010	0111

If 1 then
 If 2 then 3
 else 1
 else
 If 2 then 3
 else 1

231



$DNF(1) = (x_1 \wedge x_2) \vee (\neg x_1 \wedge \neg x_2) \vee (\neg x_1 \wedge x_2 \wedge \neg x_3)$

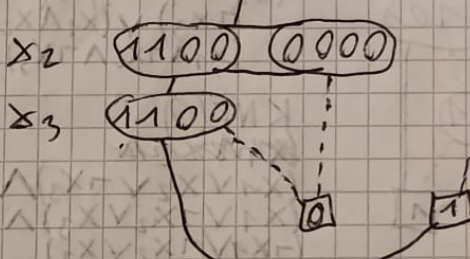
Im Vergleich der Form ist zu sehen Rechenfolge um ein Glied kürzer

A6) $x_1 0x \quad 0xx0 \quad 1xx1 \quad x11x$

i) $DNF(1) = (x_1 \wedge x_2 \wedge x_3) \vee \neg x_1$

$x_1 1100 \quad 0000 \quad 1111 \quad 1111$

ii) $KNF(0) = (x_1 \vee \neg x_2) \wedge (x_1 \vee x_2 \vee \neg x_3)$



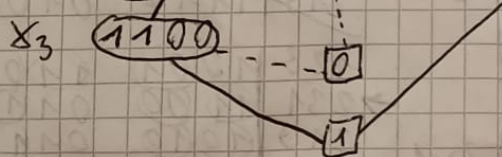
günstige Karnaugh

i) $x_1 x10x \quad 0xx0 \quad 1xx1 \quad x11x$

i) $DNF(1) = (x_1 \wedge x_2) \vee (x_1 \wedge x_2 \wedge x_3)$

$x_2 x10x \quad 0000 \quad 1111$

ii) $KNF(0) = (x_1 \vee x_2) \wedge (x_1 \vee x_2 \vee \neg x_3)$



schlechte Karnaugh