A3

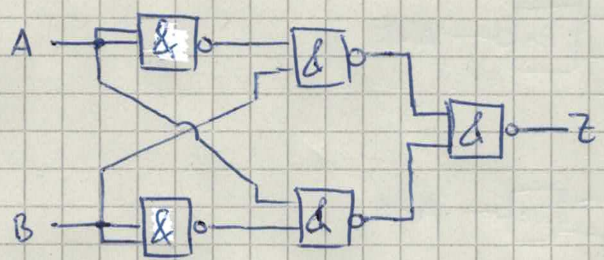
a) i) $Z = (A \wedge \neg B) \vee (\neg A \wedge B)$

	A	$\bar{A}$
B	0	1
$\bar{B}$	1	0

nicht mehr zu vereinfachen

ii) $Z = \neg\neg Z = \overline{\overline{Z}} = \overline{\overline{(A \wedge \bar{B}) \vee (\bar{A} \wedge B}} = \overline{\overline{(A \wedge \bar{B})} \wedge \overline{(\bar{A} \wedge B)}}$

$\bar{A} = \overline{A \wedge A} = \text{NAND}(A, A)$



b) i)

A	B	S	Ü
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

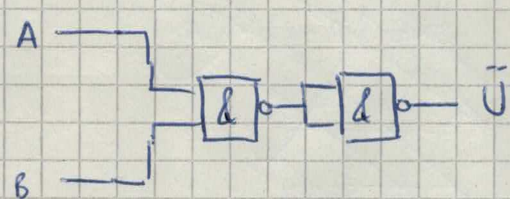
$S = (\bar{A} \wedge B) \vee (A \wedge \bar{B})$

$\ddot{U} = A \wedge B$

ii) AND, XOR

iii) $S = \overline{\overline{S}} = \overline{\overline{(\bar{A} \wedge B)} \wedge \overline{(A \wedge \bar{B})}}$ analog zu a) ii)

$\ddot{U} = \overline{\overline{A \wedge B}}$ [redacted]



c) i)

A	B	C	S	Ü
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$\oplus$: XOR

$S = (\bar{A} \wedge \bar{B} \wedge C) \vee (\bar{A} \wedge B \wedge \bar{C}) \vee (A \wedge \bar{B} \wedge \bar{C}) \vee (A \wedge B \wedge C$

$= \bar{A} \wedge [(\bar{B} \wedge C) \vee (B \wedge \bar{C})] \vee A \wedge [(\bar{B} \wedge \bar{C}) \vee (B \wedge C)]$

$= \bar{A} \wedge (B \oplus C) \vee A \wedge \overline{B \oplus C}$

$= A \oplus B \oplus C$

$\ddot{U} = (\bar{A} \wedge B \wedge C) \vee (A \wedge \bar{B} \wedge C) \vee (A \wedge B \wedge \bar{C}) \vee (A \wedge B \wedge C)$

[redacted]

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

$\Rightarrow \ddot{U} = (A \wedge B) \vee (B \wedge C) \vee (A \wedge C)$

ii) $\ddot{U} = (A \wedge B) \vee (A \wedge C) \vee (B \wedge C)$

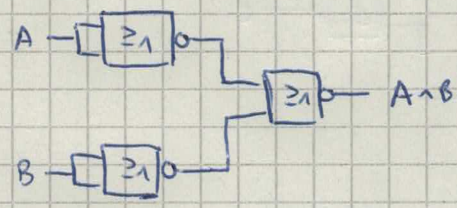
$S = A \oplus B \oplus C$

$A \wedge B = \overline{\overline{A \wedge B}} = \overline{\bar{A} \vee \bar{B}} = NOR(\bar{A}, \bar{B})$

$\bar{A} = \overline{A \vee A} = NOR(A, A)$

$OR(A,B) =$

$AND(A,B) =$



$XOR(A,B) = (\bar{A} \wedge B) \vee (A \wedge \bar{B})$ [redacted]

d) i) NOT

ii) Bijektive Abbildung n-bit auf n-bit

Bsp.: CNOT, Toffoli

CNOT:

I_1	I_2	O_1	O_2
0	0	0	0
0	1	0	1
1	0	1	1
1	1	1	0

Toffoli: flippt 3ten Bit wenn ersten beiden gesetzt