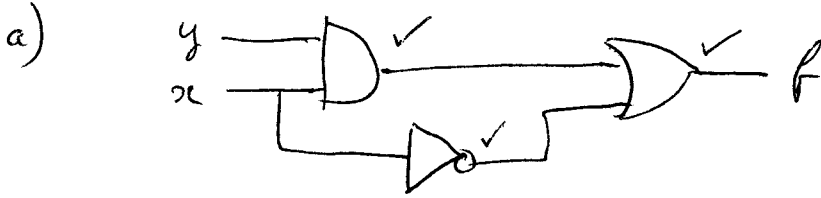


SS146-71-2002

①  $f = xy + \bar{x}$

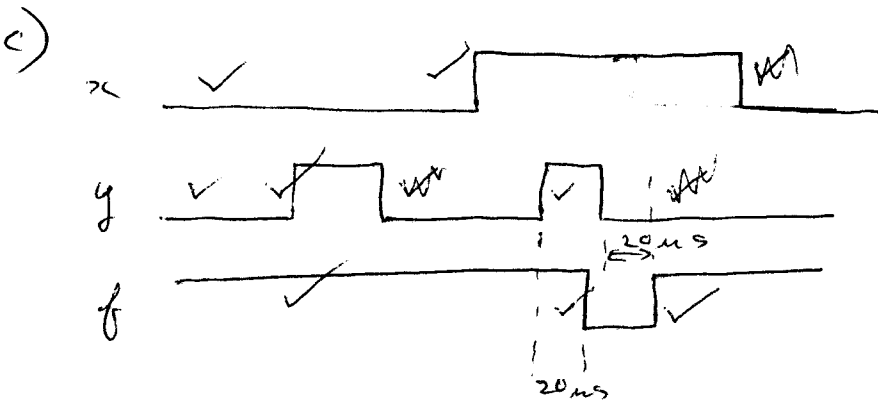


③

b) 

x	y	f	
0	0	1	✓
0	1	1	✓
1	0	0	✓
1	1	1	✓

④



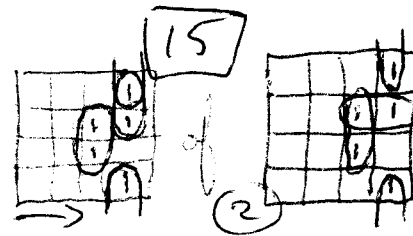
⑧

② a) 
$$f = x\bar{y}\bar{z} + xyw + x\bar{y}z\bar{w}$$

$$= x(\bar{y}\bar{z} + yw + \bar{y}z\bar{w})$$

$$= x(\bar{y}\bar{z} + yw + \bar{y}z)$$

$$= x(\bar{y}\bar{z} + yw + \bar{y}z)$$



b) 
$$f = \bar{x}\bar{y}\bar{z} + x\bar{y}z + \bar{x}y\bar{z} + x\bar{y}z$$

$$= \bar{y}\bar{z}(\bar{x} + x) + yz(\bar{x} + x)$$

$$= \bar{y}\bar{z} + yz$$

$$= \bar{z}(\bar{y} + y)$$

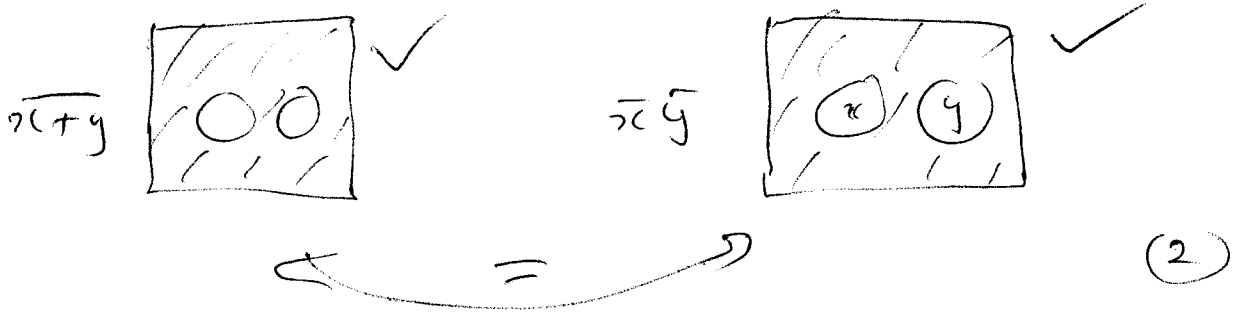
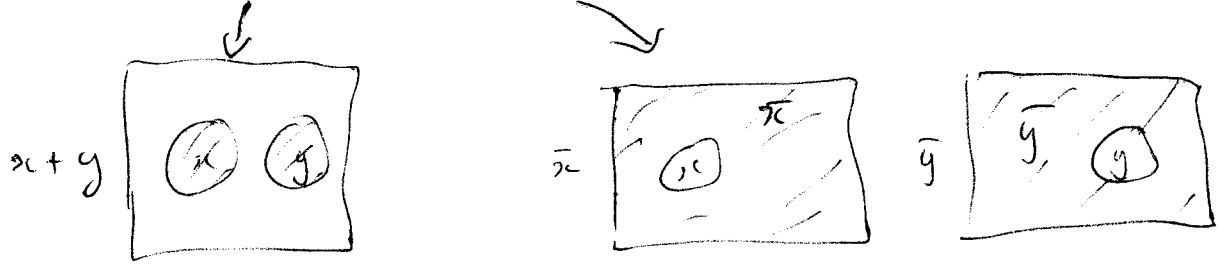
$$= \bar{z}$$

③

⑤

③ De Morgan:

a)  $\overline{x+y} = \bar{x} \cdot \bar{y}$



b)  $\overline{xy} = \bar{x} + \bar{y}$

x	y	$\overline{xy}$	$\bar{x} + \bar{y}$
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0

②

④

3

(4) a)  $721_8 = 7 \times 8^2 + 2 \times 8^1 + 1 \times 8^0$   
 $= \underline{465}_{10} \rightarrow$

(2)

b)

$1000 \div 2$	$= 500$	res $\emptyset$
$500 \div 2$	$= 250$	" "
$250 \div 2$	$= 125$	" "
$125 \div 2$	$= 62$	res 1
$62 \div 2$	$= 31$	res $\emptyset$
$31 \div 2$	$= 15$	res 1
$15 \div 2$	$= 7$	res 1
$7 \div 2$	$= 3$	res 1
$3 \div 2$	$= 1$	res 1
$1 \div 2$	$= 0$	res 1

(2)

Ans =  $1111101000_2$

By elbea  
 tel metoo  
 $1\frac{1}{2}$  en  
 res te antu  
 $\frac{1}{2}$

c)

$129 \div 2$	$= 64$	res 1
$64 \div 2$	$= 32$	res $\emptyset$
$32 \div 2$	$= 16$	res $\emptyset$
$16 \div 2$	$= 8$	res $\emptyset$
$8 \div 2$	$= 4$	res $\emptyset$
$4 \div 2$	$= 2$	res $\emptyset$
$2 \div 2$	$= 1$	res $\emptyset$
$1 \div 2$	$= 0$	res 1

(2)

$129_{10} = 10000001_2$

$= 1000/0001$

$= \underline{816} \rightarrow$

(2)

d)  $0EF3_{16} = \underline{0000/1110/1111/0011}_2$

(2)

$= 3837_{10}$

8

4

5) a)  $f(x, y, z) = \sum m(0, 3, 6, 7)$

SOP

		y			
	z	00	01	11	10
x	0	1		1	
	1			1	1
		3			

✓✓  
PI = EP I

		y			
	z	00	01	11	10
x	0	1		1	
	1		1	1	

$f = \bar{x}\bar{y}\bar{z} + yz + xy$  ✓ →

POS

		y			
	z	00	01	11	10
x	0		0		0
	1	0	0		
		3			

PI = EP I

[C]

$\bar{f} = x\bar{y} + \bar{y}z + \bar{x}y\bar{z}$  ✓

$f = (\bar{x} + y)(y + \bar{z})(x + \bar{y} + z)$  ✓ →

6) b)  $f(a, b, c, d) = \sum m(0, 2, 6, 8, 10, 12, 14, 15)$

SOP

		c			
	d	00	01	11	10
a	0	1			1
	1			1	
		b			

✓✓  
PI = EP I

[D]

$f = \bar{b}\bar{d} + a\bar{d} + c\bar{d} + abc$  ✓ →

✓  
L

(5) b)  $f(a, b, c, d) = \sum m(0, 2, 6, 8, 10, 12, 14, 15)$

POS

		c			
	ab \ cd	00	01	11	10
a	00		0	0	
	01	0	0	0	
	11		0		
	10		0	0	

PI'e + EPI'e

$$\bar{f} = \bar{b}d + \bar{c}d + \bar{a}d + \bar{a}b\bar{c}$$

$$f = \underline{(b + \bar{d})(c + \bar{d})(a + \bar{d})(a + \bar{b} + c)} \rightarrow$$

c) SOP  $f(a, b, c, d) = \sum m(0, 1, 2, 7, 8) + d(4, 9, 10)$

		c			
	ab \ cd	00	01	11	10
a	00	1	1		1
	01	d		1	
	11				
	10	1	d		d

✓✓

PI'e + EPI'e

$$f = \underline{\bar{b}\bar{d} + \bar{b}\bar{c} + \bar{a}bcd} \rightarrow$$

POS

		c			
	ab \ cd	00	01	11	10
a	00			0	
	01	0	0	0	0
	11	0	0	0	0
	10		d	0	d

PI'e

		c			
	ab \ cd	00	01	11	10
a	00			0	
	01	0	0		0
	11	0	0	0	0
	10		d	0	d

EPI'o

elsta PI

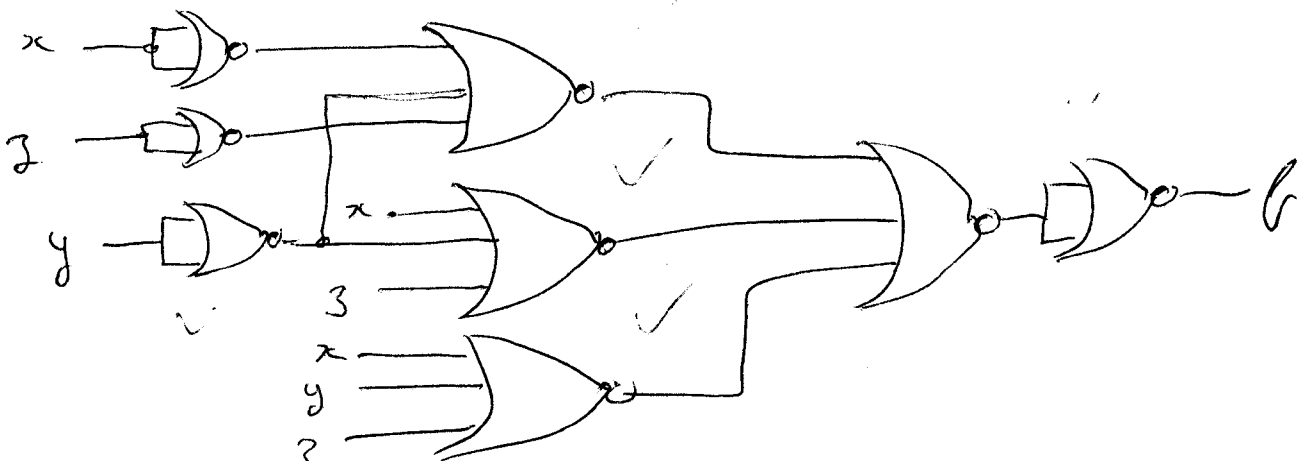
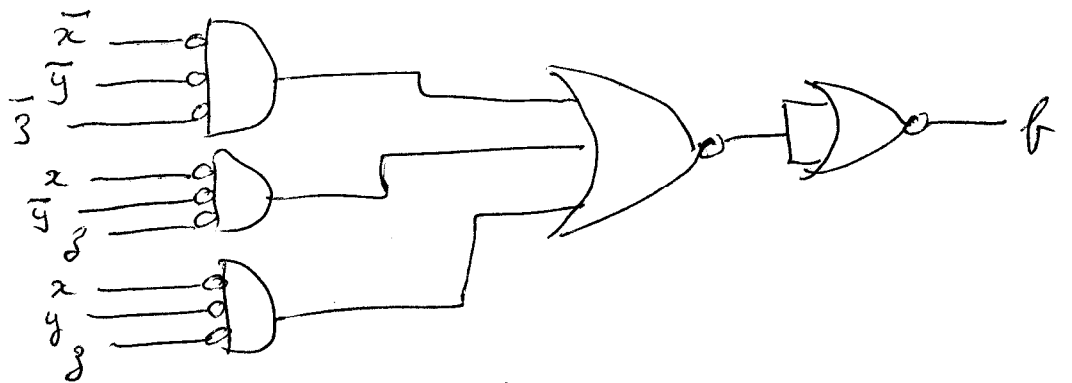
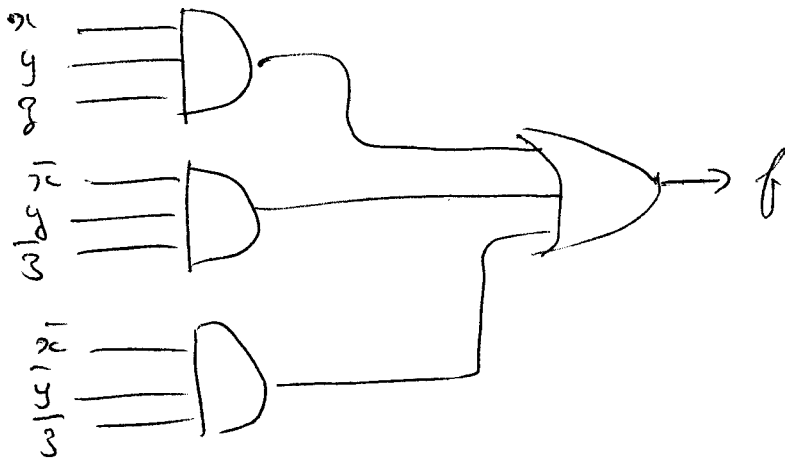
6.

$$\bar{f} = b\bar{d} + b\bar{c} + \bar{b}cd + ab$$

$\text{of } + ac$

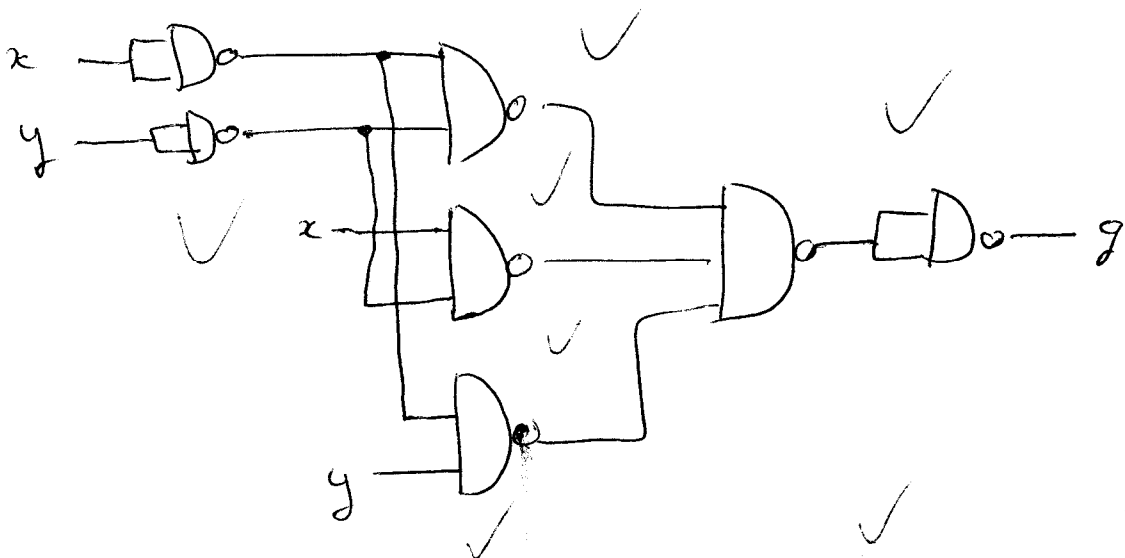
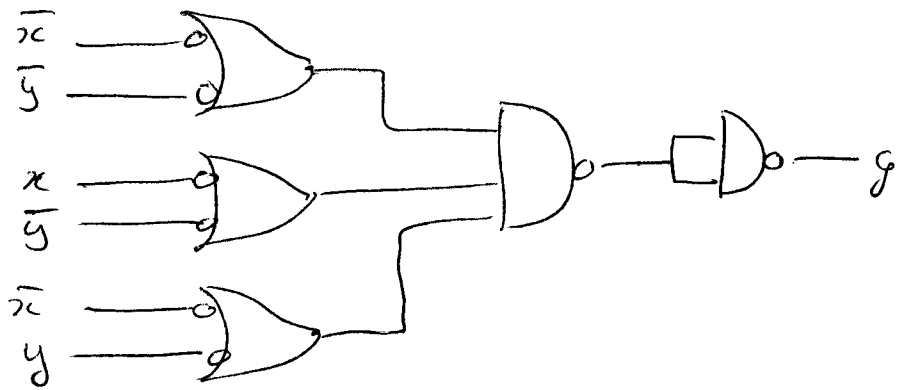
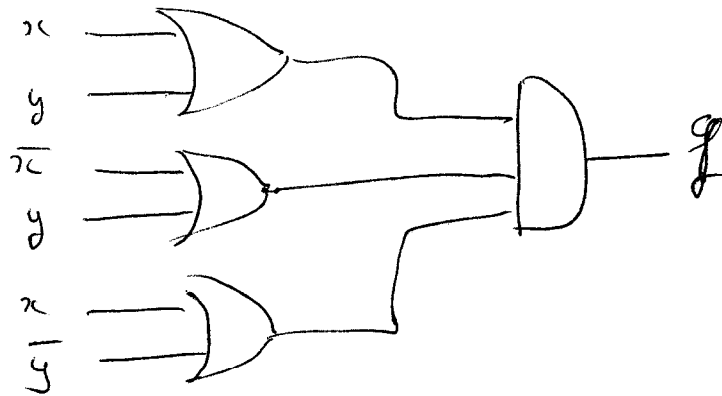
$$f = \frac{(\bar{b} + d)(\bar{b} + c)(b + \bar{c} + \bar{d})(\bar{a} + \bar{b})}{\text{of } (\bar{a} + \bar{c})} \xrightarrow{VV}$$

(6) a)  $f = xyz + \bar{x}y\bar{z} + \bar{x}\bar{y}z$



7.

(6) b)  $g = (x+y)(\bar{x}+y)(x+\bar{y})$



c)  $g = \left[ \left[ (x \uparrow \bar{x}) \uparrow (y \uparrow \bar{y}) \right] \uparrow \left[ x \uparrow (y \uparrow \bar{y}) \right] \uparrow \left[ y \uparrow (x \uparrow \bar{x}) \right] \right]$

7

a) 
$$\begin{array}{r} 1011_2 \\ + \quad 101_2 \\ \hline 10000_2 \end{array} \rightarrow$$

b) 
$$\begin{array}{r} 0F3F_{16} \\ - \quad 0123_{16} \\ \hline 0E1C_{16} \end{array} \rightarrow$$

c) 
$$\begin{array}{r} 234_5 \\ - \quad 43_5 \\ \hline 141_5 \end{array} \rightarrow$$

c) 
$$\begin{array}{r} 1000_{10} \\ - \quad 987_{10} \\ \hline 13_{10} \end{array} \rightarrow$$

4

8

a) 
$$\begin{array}{r} 10010011 \\ + \quad 01101101 \\ \hline \times 00000000 \end{array}$$

$c_7=1, c_8=1$   
 $\therefore$  Antwort korrekt  
 $= 00000000 \rightarrow$

b) 
$$\begin{array}{r} 10011011 \\ + \quad 10011011 \\ \hline \times 00110110 \end{array}$$

$c_7=0, c_8=1$   
 $\therefore$  Antwort falsch.

Regel  
 9. Linie 
$$\begin{array}{r} 110011011 \\ + \quad 110011011 \\ \hline \times 100110110 \end{array} \rightarrow$$

$c_8=1, c_9=1$   
 $\therefore$  Antwort korrekt

c) 
$$\begin{array}{r} 10010011 \\ + \quad 10010011 \\ \hline \times 00100110 \end{array} \quad \begin{array}{l} \text{(2. Kopie von } 01101101) \\ c_7=0, c_8=1 \end{array} \therefore \text{ Antwort falsch}$$

Regel  
 mit 9. Linie 
$$\begin{array}{r} 110010011 \\ + \quad 110010011 \\ \hline \times 100100110 \end{array} \rightarrow$$

$c_7=0, c_8=1$   
 Antwort  $\checkmark$

d) 
$$\begin{array}{r} 11111101 \\ + \quad 10010011 \\ \hline \times 10010000 \end{array} \quad \begin{array}{l} \text{(2. Kopie von } 01101101) \\ c_7=1, c_8=1 \end{array} \therefore \text{ Antwort } \checkmark$$

14



9) a) 
$$\begin{array}{r} 0123 \\ + 9999 \\ \hline X0122 \end{array} \rightarrow$$

b) 
$$\begin{array}{r} 0123 \\ \underline{0001} \\ 0124 \end{array} \rightarrow$$
 (10<sup>e</sup> Kopf von 9999)

c) 
$$\begin{array}{r} 9999 \\ + 0888 \\ \hline X0887 \end{array} \rightarrow$$

d) 
$$\begin{array}{r} 9999 \\ \underline{9112} \\ X9111 \end{array} \rightarrow$$
 (10<sup>e</sup> Kopf von 0888)

8

10

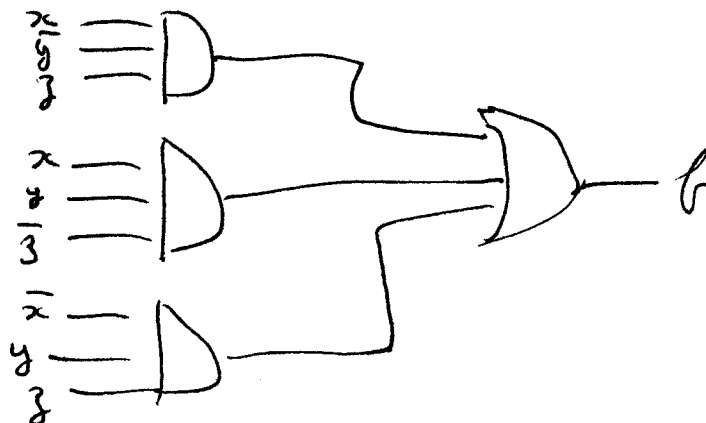
x	y	z	f
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

6

x \ yz	00	01	11	10
0	1		1	
1		1		1

$$f = x\bar{y}z + xy\bar{z} + \bar{x}yz \quad [+x\bar{y}\bar{z}]$$

4



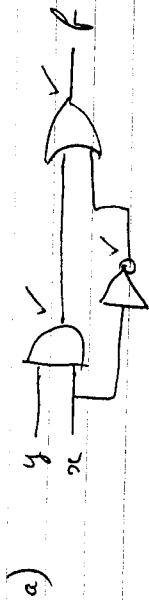
2

12

1

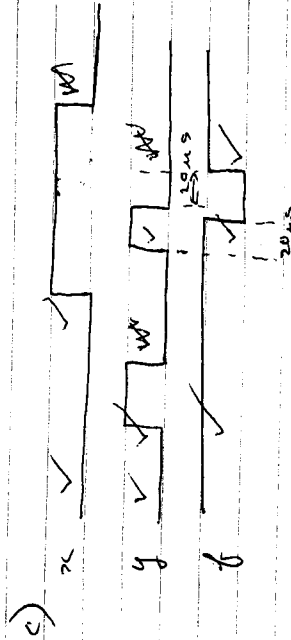
SS144-71-2002

①  $f = xy + \bar{x}$

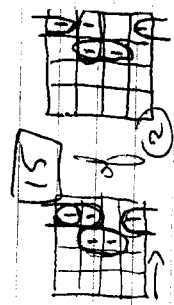


b) 

x	y	f
0	0	1
0	1	1
1	0	1
1	1	0

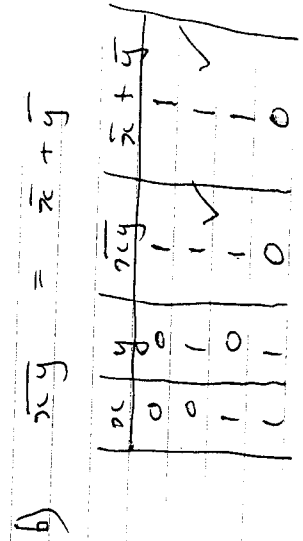
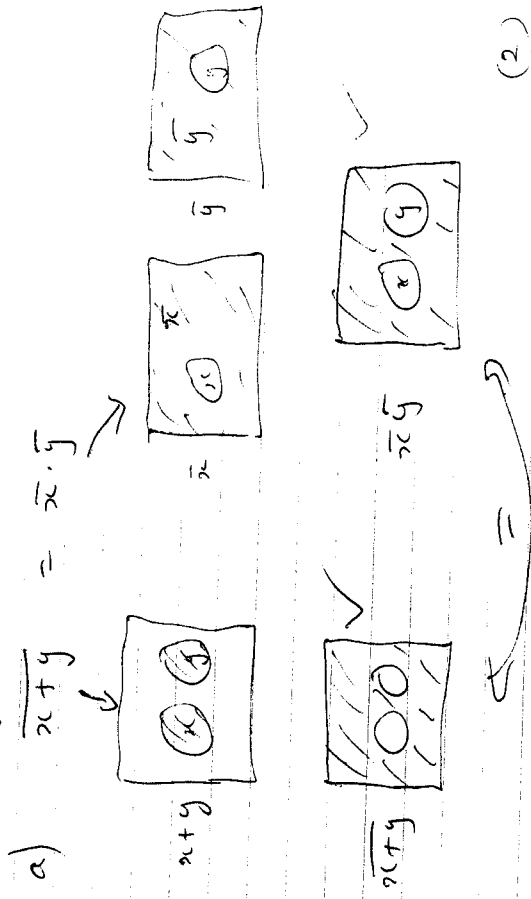


② a)  $f = xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + x\bar{y}z\bar{w}$   
 $= x(\bar{y}\bar{z} + yz + \bar{y}z\bar{w}) = x(\bar{y}\bar{z} + yz + \bar{y}z\bar{w})$   
 $= x(\bar{y}\bar{z} + yz) + x\bar{y}z\bar{w}$   
 $= \bar{y}\bar{z}(x + x\bar{y}z\bar{w}) + yz(x + x\bar{y}z\bar{w}) + x\bar{y}z\bar{w}$   
 $= \bar{y}\bar{z}(x + \bar{y}z\bar{w}) + yz(x + \bar{y}z\bar{w}) + x\bar{y}z\bar{w}$   
 $= \bar{y}\bar{z}(x + \bar{y}z\bar{w}) + yz(x + \bar{y}z\bar{w}) + x\bar{y}z\bar{w}$   
 $= \bar{y}\bar{z}(x + \bar{y}z\bar{w}) + yz(x + \bar{y}z\bar{w}) + x\bar{y}z\bar{w}$



2

③ De Morgan:



4

5

3

4) a)  $721_8 = 7 \times 8^2 + 2 \times 8^1 + 1 \times 8^0$   
 $= 465_{10} \rightarrow$  (2)

b)  $1000 \div 2 = 500$  ms  $\phi$   
 $500 \div 2 = 250$  " "  
 $250 \div 2 = 125$  " "  
 $125 \div 2 = 62$  ms 1  
 $62 \div 2 = 31$  ms  $\phi$   
 $31 \div 2 = 15$  ms 1  
 $15 \div 2 = 7$  ms 1  
 $7 \div 2 = 3$  ms 1  
 $3 \div 2 = 1$  ms 1  
 $1 \div 2 = 0$  ms 1

Ans = 1111101000<sub>2</sub>

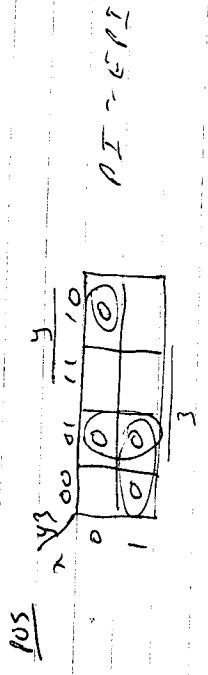
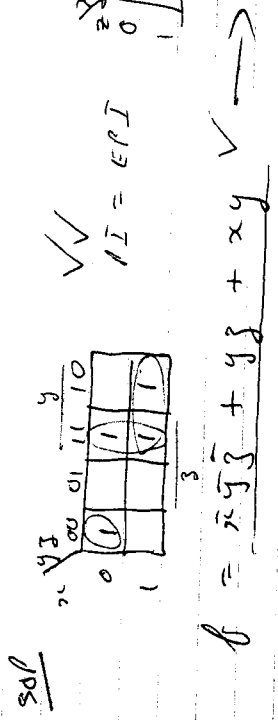
c)  $129 \div 2 = 64$  ms 1  
 $64 \div 2 = 32$  ms  $\phi$   
 $32 \div 2 = 16$  ms  $\phi$   
 $16 \div 2 = 8$  ms  $\phi$   
 $8 \div 2 = 4$  ms  $\phi$   
 $4 \div 2 = 2$  ms  $\phi$   
 $2 \div 2 = 1$  ms  $\phi$   
 $1 \div 2 = 0$  ms 1

$129_{10} = 1000001_2$   
 $= 1000/0001$   
 $= 8/16 \rightarrow$

d)  $0EF3_{16} = 000/1110/111/0011_2$   
 $= 3827_{10}$  (8)

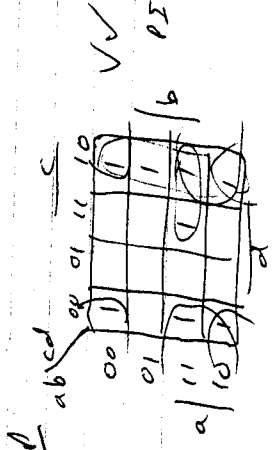
By either  
 tree method  
 $\frac{1}{2}$  or  
 right answer  
 $\frac{1}{2}$

5) a)  $f(x, y, z) = \sum m(0, 3, 6, 7)$   
 $\frac{4}{5}$



$f = x'y + y'z + xy$   
 $f = (x+y)(y+z)(x+y+z)$

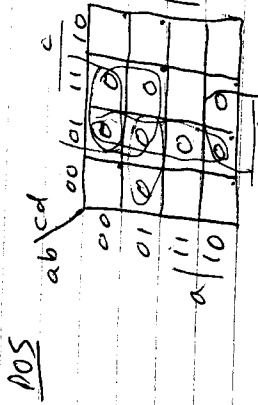
b)  $f(a, b, c, d) = \sum m(0, 2, 3, 9, 10, 13, 14, 15)$   
 $\frac{800}{800}$



$f = \bar{b}\bar{d} + a\bar{d} + c\bar{d} + abc$

5

5) b)  $f(a, b, c, d) = \sum m(0, 2, 6, 8, 10, 12, 14, 15)$

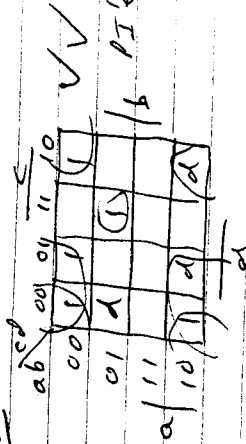


$PI'c + EPI'e$

$f = \bar{b}d + \bar{c}d + \bar{a}d + \bar{a}b\bar{c}$

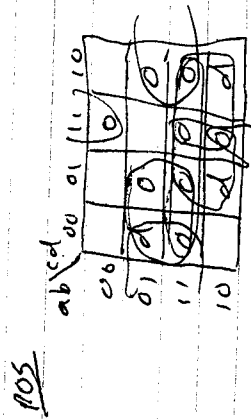
$f = (b + \bar{a})(c + \bar{a})(a + \bar{d})(a + \bar{b} + c) \xrightarrow{VV}$

SOP  $f(a, b, c, d) = \sum m(0, 1, 2, 7, 8) + d(4, 9, 10)$

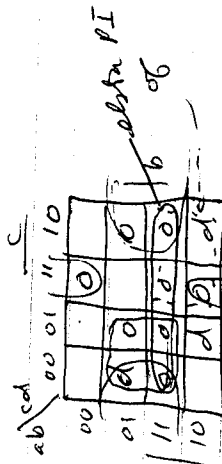


$PI'e + EPI'e$

$f = \bar{b}d + \bar{b}\bar{c} + \bar{a}bcd \xrightarrow{VV}$



$PI'e$



$EPI'c$

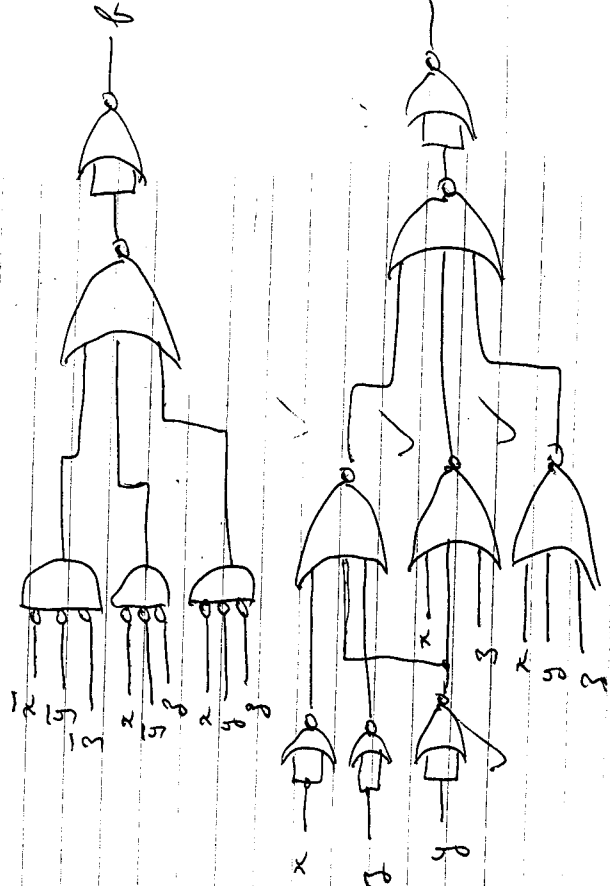
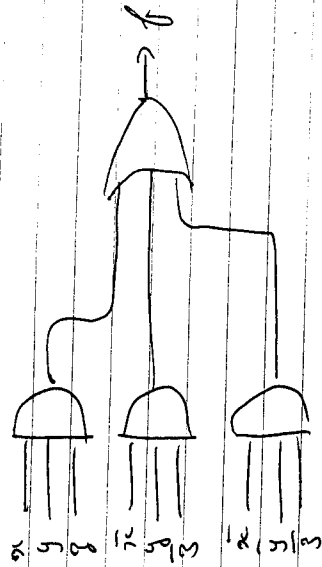
6

$f = b\bar{a} + b\bar{c} + \bar{b}cd + ab$

$f + ac$

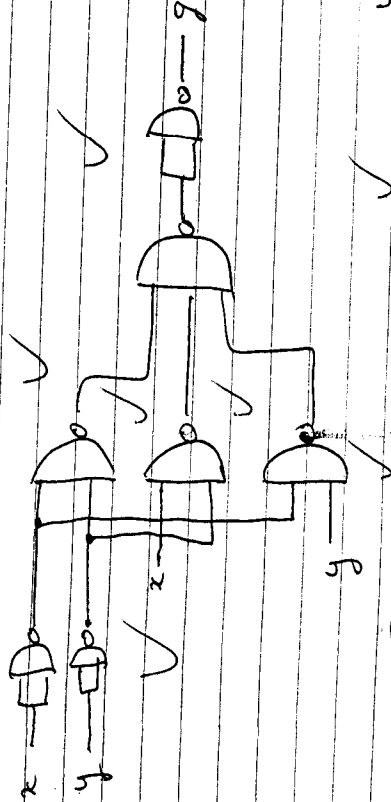
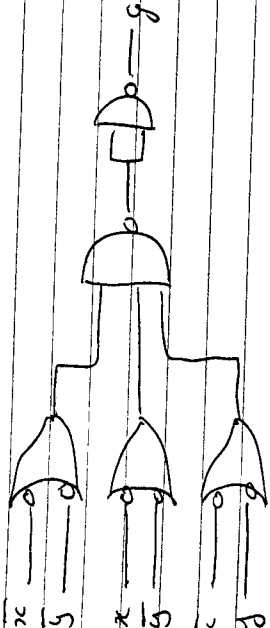
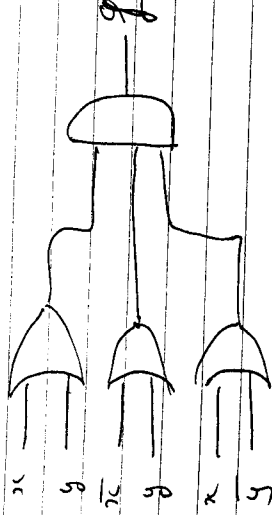
$f = (\bar{b} + a)(\bar{b} + c)(b + \bar{c} + \bar{a})(\bar{a} + \bar{b}) \xrightarrow{VV}$

6) a)  $f = xy\bar{z} + \bar{x}y\bar{z} + \bar{x}y\bar{z}$



7.

6)  $g = (x+y)(\bar{x}+y)(x+y)$



c)  $g = [(x+y)(\bar{x}+y)] \cdot [(x+y)(\bar{x}+y)]$

55144

7) a) 
$$\begin{array}{r} 1011_2 \\ + 101_2 \\ \hline 10002 \end{array} \rightarrow$$

b) 
$$\begin{array}{r} 0F3F_{16} \\ - 0123_{16} \\ \hline 0E1C_{16} \end{array} \rightarrow$$

c) 
$$\begin{array}{r} 2345 \\ - 435 \\ \hline 1415 \end{array} \rightarrow$$

d) 
$$\begin{array}{r} 100010 \\ - 98710 \\ \hline 1310 \end{array} \rightarrow$$

8) a) 
$$\begin{array}{r} 10010011 \\ + 01101101 \\ \hline 10000000 \end{array}$$
  $c7=1, c8=1$   
 $\therefore$  answer correct  $= 00000000 \rightarrow$

b) 
$$\begin{array}{r} 10011011 \\ + 10011011 \\ \hline 00110110 \end{array}$$
  $c7=0, c8=1$   
 $\therefore$  answer correct.

9) 
$$\begin{array}{r} 110011011 \\ + 10010011 \\ \hline 100100111 \end{array}$$
  $(c8=1, c9=1)$   
 $\therefore$  answer correct

c) 
$$\begin{array}{r} 10010011 \\ + 10010011 \\ \hline 00100110 \end{array}$$
  $(2^{\text{nd}} \text{ loop von } 01101101)$   
 $c7=9, c8=1 \therefore$  answer correct

d) 
$$\begin{array}{r} 110010011 \\ + 110010011 \\ \hline 100100110 \end{array}$$
  $c7=9, c8=1$   
 $\therefore$  answer correct

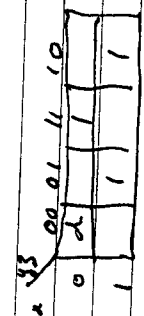
e) 
$$\begin{array}{r} 11111101 \\ + 10010011 \\ \hline 10010000 \end{array}$$
  $(2^{\text{nd}} \text{ loop von } 01101101)$   
 $c7=1, c8=1 \therefore$  answer correct

14

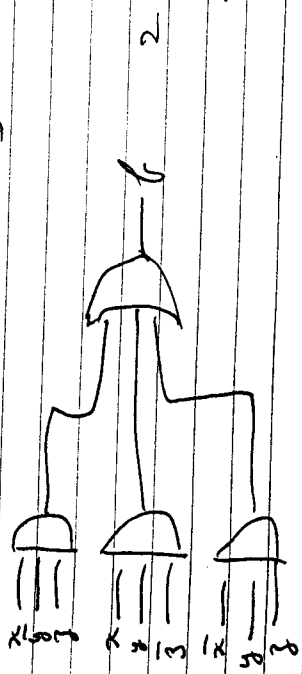
9) a) 
$$\begin{array}{r} 0123 \\ + 9999 \\ \hline X0122 \end{array} \rightarrow$$
 b) 
$$\begin{array}{r} 0123 \\ \times 001 \\ \hline 0124 \end{array} \rightarrow$$

c) 
$$\begin{array}{r} 9999 \\ + 0888 \\ \hline X0887 \end{array} \rightarrow$$
 d) 
$$\begin{array}{r} 9999 \\ \times 112 \\ \hline X9111 \end{array} \rightarrow$$

10) 
$$\begin{array}{r} 248 \\ \times 008 \\ \hline 00100 \\ 01000 \\ 01000 \\ 10000 \\ 10100 \\ 11000 \\ 11100 \end{array}$$



$$f = x\bar{y}z + x\bar{y}\bar{z} + x\bar{y}z + x\bar{y}\bar{z}$$



12