

Musterlösung Prüfungsklausur Digitaltechnik und Rechnersysteme

für die Bachelorprüfung im Sommersemester 2021

Aufgabe 1: Verständnisfragen

a)

☒ $(a + b)(b + c + d).$

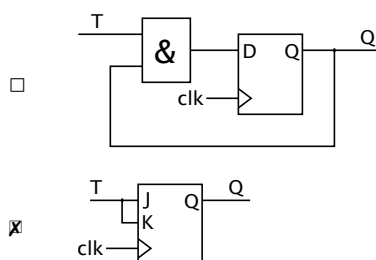
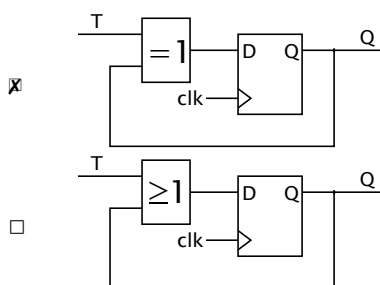
☒ $b + f + g.$

☐ $d(r + x) + d.$

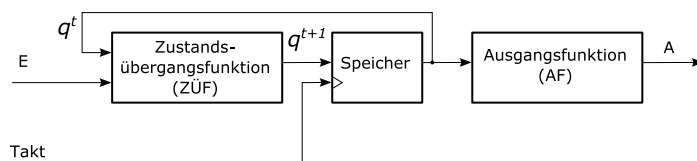
☐ $dfg + f + g.$

☒ $(a + x)(a + x + y)y.$

b)



c)



d)

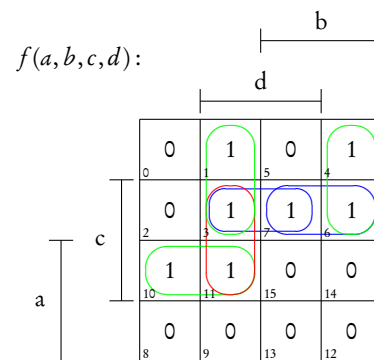
$$5_{10} = 0101_2$$

$$\overline{0101}_2 = 1010_2$$

$$\begin{array}{r} 1010_2 \\ + \quad 1_2 \\ \hline = 1011_2 \end{array}$$

$$-5_{10} = 1011_{2K}$$

e)



KIPs: $a\bar{b}c, \bar{a}\bar{b}d, \bar{a}b\bar{d}$

API: $\bar{b}cd$

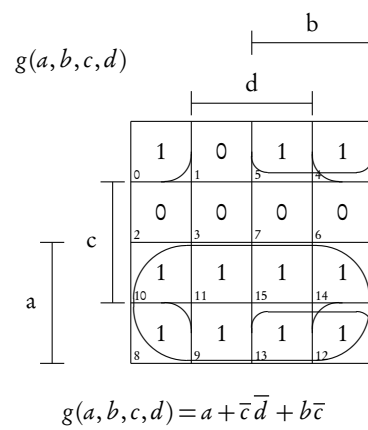
REPIs: $\bar{a}cd, \bar{a}bc$

Aufgabe 2: Schaltungsvereinfachung

a)

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

b)

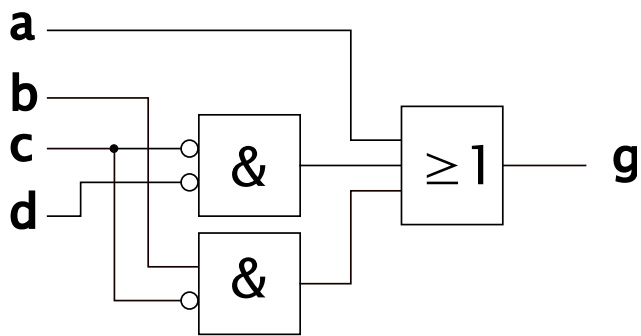


$$g(a, b, c, d) = a + \bar{c}\bar{d} + b\bar{c}$$

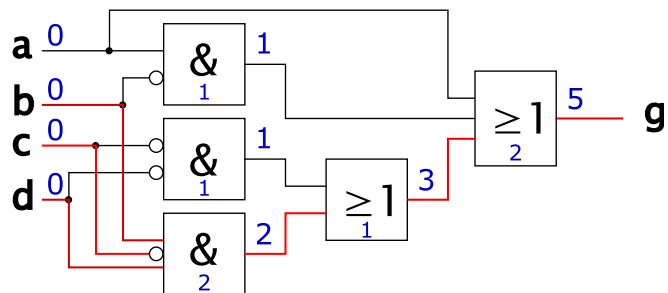
c)

$$\begin{aligned}
 g(a,b,c,d) &= a + a\bar{b} + \bar{c}\bar{d} + b\bar{c}d \\
 &= a + \bar{c}\bar{d} + b\bar{c}d \\
 &= a + \bar{c}(\bar{d} + bd) \\
 &= a + \bar{c}(\bar{d} + b) \\
 &= a + \bar{c}\bar{d} + \bar{c}b
 \end{aligned}$$

d)



e)

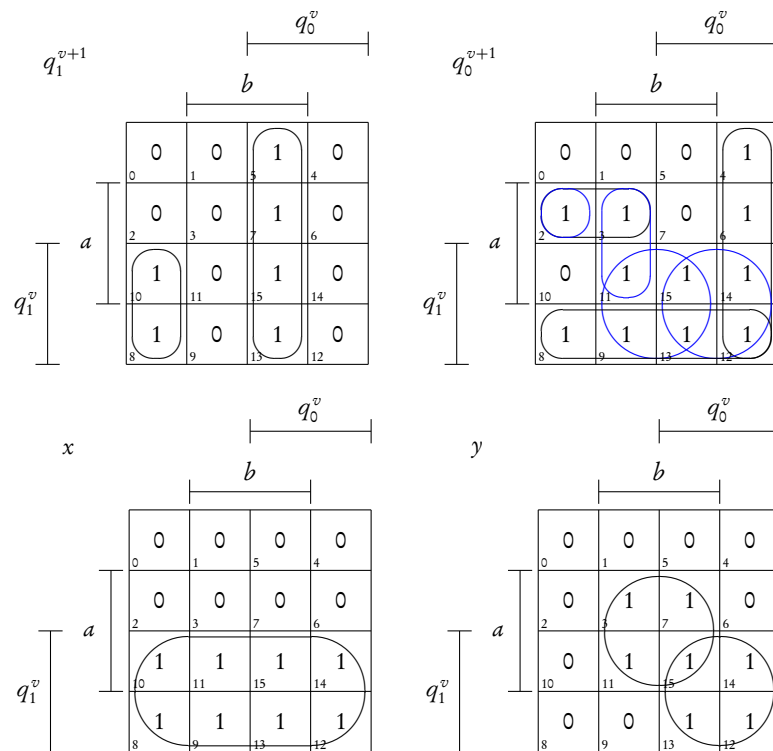


f) $t_{p,d} = 5 \text{ ns}$

Aufgabe 3: Schaltwerkssynthese

q_1^v	q_0^v	a	b	q_1^{v+1}	q_0^{v+1}	x	y
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0
0	0	1	0	0	1	0	0
0	0	1	1	0	1	0	1
0	1	0	0	0	1	0	0
0	1	0	1	1	0	0	0
0	1	1	0	0	1	0	0
0	1	1	1	1	0	0	1
1	0	0	0	1	1	1	0
1	0	0	1	0	1	1	0
1	0	1	0	1	0	1	0
1	0	1	1	0	1	1	1
1	1	0	0	0	1	1	1
1	1	0	1	1	1	1	1
1	1	1	0	0	1	1	1
1	1	1	1	1	1	1	1

a)



REPIs sind blau markiert, alle anderen Primimplikanten sind KPIs.

b)

$$q_1^{v+1} = q_1^v \overline{q_0^v} \overline{b} + q_0^v b$$

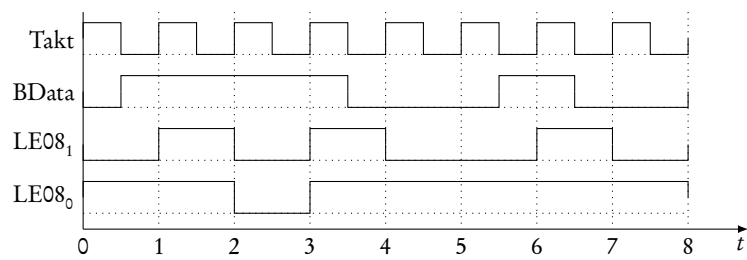
$$q_0^{v+1} = q_1^v \overline{a} + \overline{q_1^v} \overline{q_0^v} a + q_0^v \overline{b} + q_1^v b$$

$$x = q_1^v$$

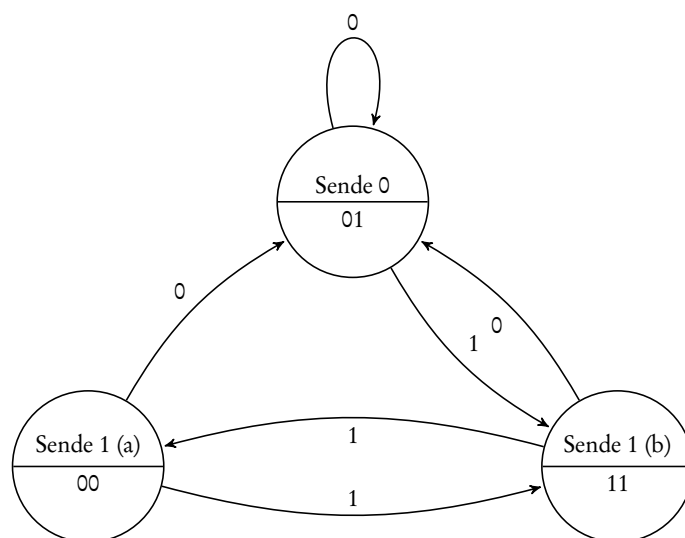
$$y = ab + q_1^v q_0^v$$

Aufgabe 4: Kommunikationsprotokoll

a)



b)



Aufgabe 5: MIPS Assembler

Takt	PC	\$t0	\$t1	\$t2
1	0x3000	0	-	-
2	0x3004	0	2	-
3	0x3008	1	2	-
4	0x300c	1	2	1
5	0x3010	1	2	1
6	0x3008	2	2	1
7	0x300c	2	2	0
8	0x3010	2	2	0
9	0x3014	0	2	0