

3.1 a) b) c) d) e) f) g) h)
s s f s s f s s

3.2 a) c) b) d)

p	q	$\neg p \vee q$	$(p \wedge \neg q) \vee (\neg p \wedge q)$
f	f	s	f
f	s	s	s
s	f	f	s
s	s	s	f

p	q	r	$(p \wedge \neg q) \vee r$	$(\neg p \vee q) \wedge (\neg q \vee r)$
f	f	f	f	s
f	f	s	s	s
f	s	f	f	f
f	s	s	s	s
s	f	f	s	f
s	f	s	s	f
s	s	f	f	f
s	s	s	s	s

3.3 a) b)

p	q	$\neg p \wedge q$	$(p \vee (\neg p \wedge q))$	$p \vee q$	$\neg p \vee q$	$(p \wedge (\neg p \vee q))$	$p \wedge q$
f	f	f	f	f	f	f	f
f	s	s	s	s	s	f	f
s	f	f	s	s	f	f	f
s	s	f	s	s	s	s	s

c)

p	q	$p \vee q$	$\neg p \vee q$	$(p \vee q) \wedge (\neg p \vee q)$
f	f	f	f	f
f	s	s	s	s
s	f	s	f	f
s	s	s	s	s

d)

p	q	r	$p \vee q$	$\neg p \vee r$	$(p \vee q) \wedge (\neg p \vee r)$	$p \wedge r$	$\neg p \wedge q$	$(p \wedge r) \vee (\neg p \wedge q)$
f	f	f	f	s	f	f	f	f
f	f	s	f	s	f	f	f	f
f	s	f	s	s	s	f	s	s
f	s	s	s	s	s	f	s	s
s	f	f	s	f	f	f	f	f
s	f	s	s	s	s	f	f	s
s	s	f	s	f	f	f	f	f
s	s	s	s	s	s	s	f	s

3.4 a)

x	y	z	$y+z$	$x(y+z)$	xy	xz	$xy+xz$
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

b)

x	y	z	yz	$x+yz$	$x+y$	$x+z$	$(x+y)(x+z)$
0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0
0	1	0	0	0	1	0	0
0	1	1	1	1	1	1	1
1	0	0	0	1	1	1	1
1	0	1	0	1	1	1	1
1	1	0	0	1	1	1	1
1	1	1	1	1	1	1	1

c)

x	y	xy	$x+xy$
0	0	0	0
0	1	0	0
1	0	0	1
1	1	1	1

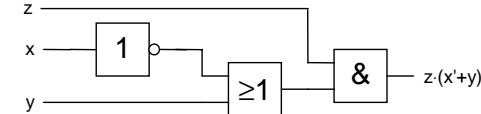
d)

x	y	$x+y$	$x(x+y)$
0	0	0	0
0	1	1	0
1	0	1	1
1	1	1	1

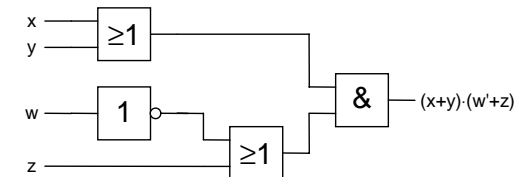
e)

x	y	xy	$(xy)'$	$x'y$	$x'+y'$
0	0	0	1	1	1
0	1	0	1	1	1
1	0	0	1	0	1
1	1	1	0	0	0

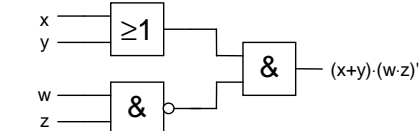
3.5 a)



b)



c)



3.6

a)

b)

c)

d)

x	y	z	$p = (x \vee y) \wedge (\neg z)$	$p = (x \wedge y) \vee (\neg y \wedge z)$	$p = x \wedge y \vee \neg z$	$p = (x \vee y) \wedge \neg z$
f	f	f	f	f	s	f
f	f	s	f	s	f	f
f	s	f	s	f	s	s
f	s	s	f	f	f	f
s	f	f	s	f	s	s
s	f	s	f	s	f	f
s	s	f	s	s	s	s
s	s	s	f	s	s	f

3.7 $f = A + B + C + D$

3.8 $X = A'$; $Y = B'$ eller $X = B'$; $Y = A'$

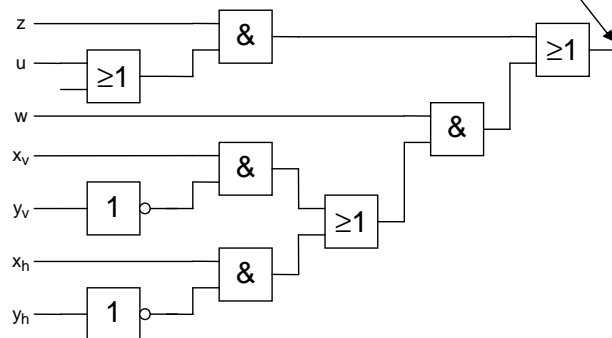
3.9 $f = A'B + AB'$

3.10

p :	Bilnyckeln sitter i tändningslåset:	w
q _v :	Vänstra framsätet är nedtyngt:	x _v
r _v :	Främre vänster säkerhetsbältet är fasthakat:	y _v
q _h :	Högra framsätet är nedtyngt:	x _h
r _h :	Främre högra säkerhetsbältet är fasthakat:	y _h
s :	Vänster framdörr är öppen:	z
t :	Varselljuset är tätt:	u

sanningsvärdesuttryck: $s \wedge (p \vee t) \vee (p \wedge ((q_v \wedge \neg r_v) \vee (q_h \wedge \neg r_h)))$

Booleskt uttryck $z(w+u) + w(x_v y_v' + x_h y_h')$

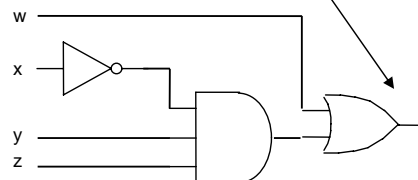


3.11

P:	Tanken är full:	w
Q:	Salthalten är > 3%:	x
R:	Vattennivån > min.:	y
S:	Utloppet är stängt:	z

Sammansatt utsaga: $P \vee (\neg Q \wedge R \wedge S)$

Booleskt uttryck: $w + x'yz$



3.12 a) $f = xw + xy' + wz$

b) $f_1 = xy'z' + x'y'z' + x'y'z + xyz$

$f_2 = xy + xz + yz$

3.13 a) $f = xy + x'y + xy'$ **b)** $f = x'y + xy' + xy$ **c)** $f = xy' + xy$

d) $f = xy'z' + xy'z + xyz$ **e)** $f = x'y'z' + xy'z' + xyz' + xyz$

3.14 a) $f = (x + y)(x + y')(x' + y)$ **b)** $f = (x + y)$

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

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

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

3.15 a) $f = (x \cdot y)'$ sätt $x = y$ vilket ger $f = (x \cdot x)' = x'$

b) $f = x \cdot y = [(x \cdot y)']'$

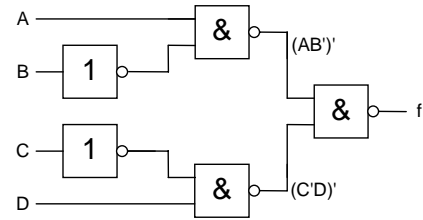
c) $f = x + y = [(x + y)']' = (x' \cdot y')'$

3.16 a) $f = (x + y)'$ sätt $x = y$ vilket ger $f = (x + x)' = x'$

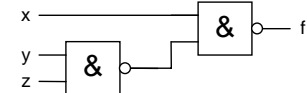
b) $f = x + y = [(x + y)']'$

c) $f = x \cdot y = [(x \cdot y)']' = (x' + y')'$

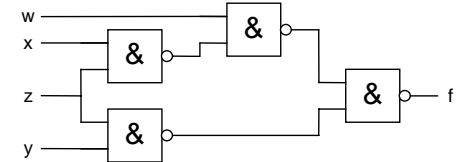
3.17



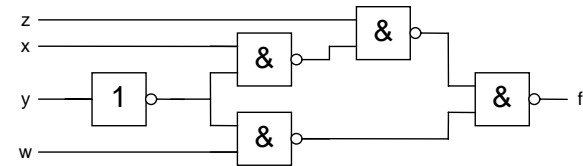
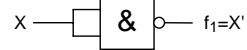
3.18



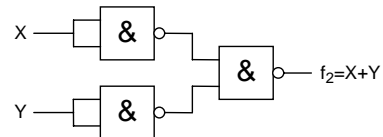
3.19



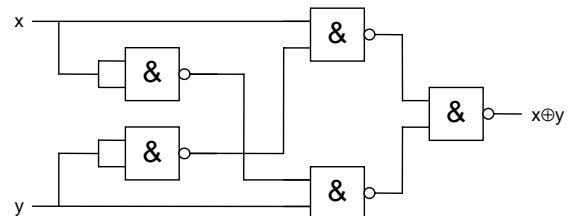
3.20

3.21 $f_1 = X'$ 

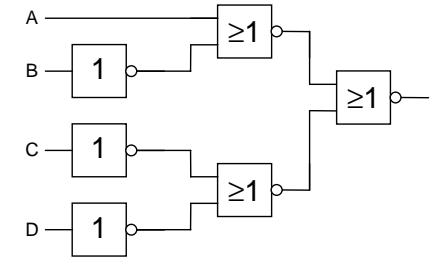
$$f_2 = X + Y = (X' \cdot Y')'$$



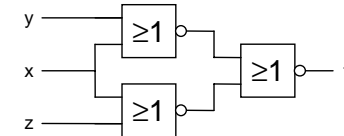
3.22

3.23 $f = AB + A'B'$

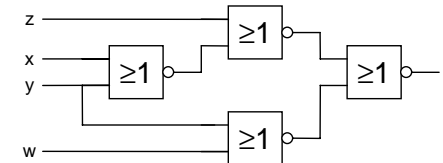
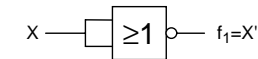
3.24



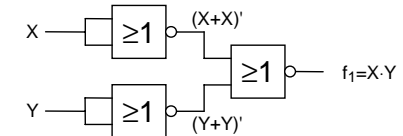
3.25



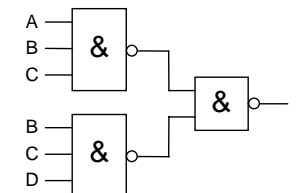
3.26

3.27 $f_1 = X'$ 

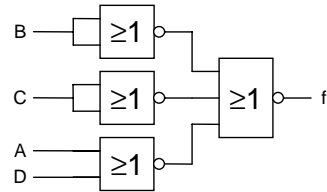
$$f_2 = [(X+X)' + (Y+Y)']' = XY$$



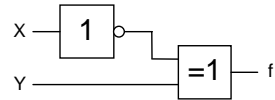
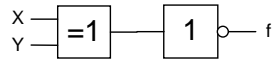
3.28 a)



b)



$$3.29 \quad f = (XY' + X'Y)' = (X' + Y)(X + Y') = X'Y' + XY \quad f = X'Y' + (X')Y = X'Y' + XY$$



$$3.30 \quad \text{a) } f = x + y \quad \text{b) } f = x + y \quad \text{c) } f = x'z + y'z \quad \text{d) } f = z'$$

$$\text{e) } f = y' + z \quad \text{f) } f = y + zw$$

$$3.31 \quad f = x'yz' + xy'z$$

$$3.32 \quad f = (x+y+z)(x+y+z')(x+y'+z')(x'+y+z)(x'+y'+z)(x'+y'+z')$$

$$3.33 \quad f = xy + y'z$$

$$3.34 \quad \text{a) } f = w'xz \quad \text{b) } f = w'xz + xyz \quad \text{c) } f = x'y$$

$$\text{d) } f = w'y'z' + w'x'y' + w'x'z' \quad \text{e) } f = x'z' + w'xyz \quad \text{f) } f = x' + w'y'z'$$

$$\text{g) } f = w'x'yz + x'y'z' + wxz'$$

$$3.35 \quad \text{a) } f = xzw' \quad \text{b) } f = xz(w'+y) \quad \text{c) } f = yx'$$

$$\text{d) } f = w' \cdot (y'+z') \cdot (x'+y') \cdot (x'+z') \quad \text{e) } f = (w'+x') \cdot (x'+z') \cdot (x+z') \cdot (y+z')$$

$$\text{f) } f = (w'+x') \cdot (x'+y') \cdot (x'+z') \quad \text{g) } f = (w+x') \cdot (y+z') \cdot (w'+z') \cdot (x+y'+z)$$

$$3.36 \quad f = x'y' + w'y'z' + wyz$$

$$3.37 \quad f = wx' + wz + xy' + w'xz'$$

$$3.38 \quad f = (y + z)(x + y')$$

$$3.39 \quad f = (w + x)(w + y' + z')(w' + x' + y' + z)$$

$$3.40 \quad f = xy + xz' + v'w'x'z + vwx'y'z$$