

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	s	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)

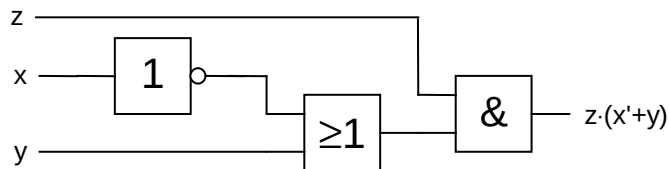
x	y	x+y	x(x+y)
0	0	0	0
0	1	1	0
1	0	1	1
1	1	1	1

e)

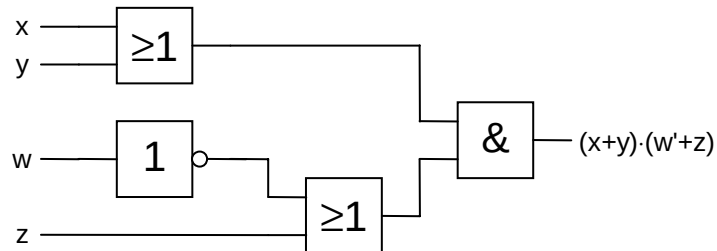
x	y	xy	(xy)'	x'	y'	x'+y'
0	0	0	1	1	1	1
0	1	0	1	1	0	1
1	0	0	1	0	1	1
1	1	1	0	0	0	0

3.5

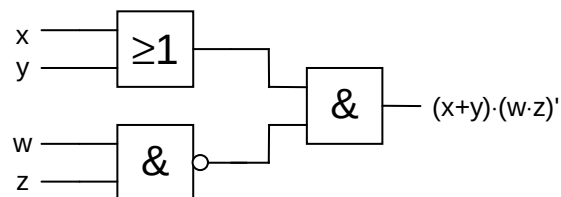
a)



b)



c)



3.6

a)

b)

c)

d)

x	y	z	p = (x ∨ y) ∧ (¬z)	p = (x ∧ y) ∨ (¬y ∧ z)	p = x ∧ y ∨ ¬z	p = (x ∨ y) ∧ ¬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	s	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 $f = A'B + AB'$

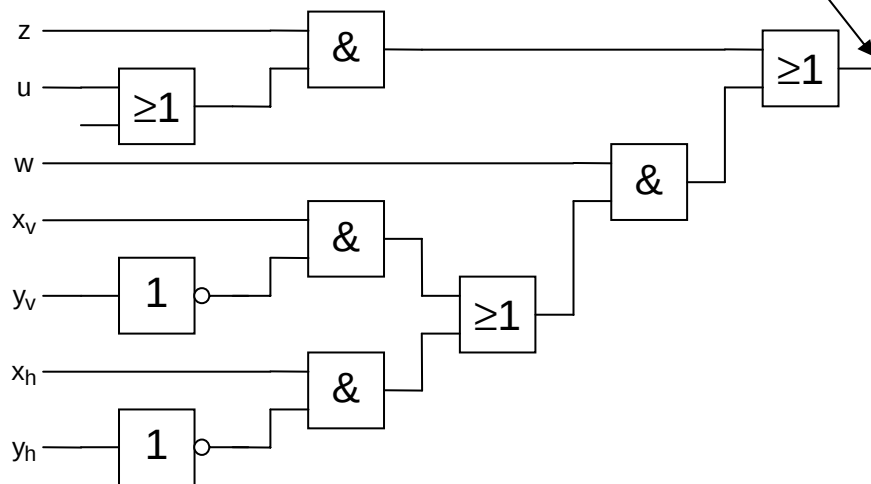
3.10

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 tänd:	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

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

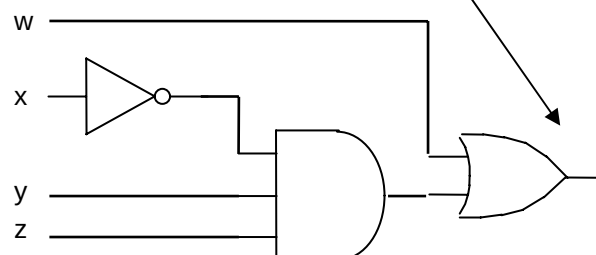


3.11

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

Sammanfattad 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) $f = x'yz' + xy'z' + xyz' + xyz$

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

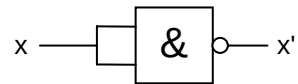
b) $f = (x + y)$

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

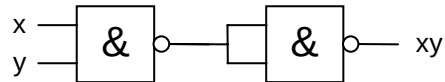
d) $f = (x + y + z)(x + y + z')(x + y' + z)(x' + y + z')$

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

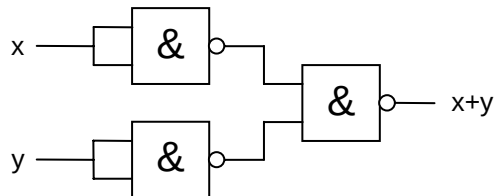
3.15 a) $f = (x \cdot y)'$ sätt $x = y$ vilket ger $f = (x \cdot x)' = x'$



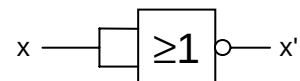
b) $f = x \cdot y = [(x \cdot y)']'$



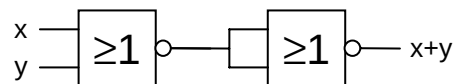
c) $f = x + y = [(x + y)']' = (x' \cdot y)'$



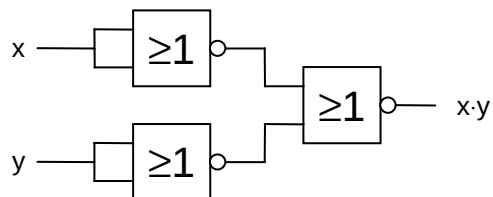
3.16 a) $f = (x + y)'$ sätt $x = y$ vilket ger $f = (x + x)' = x'$



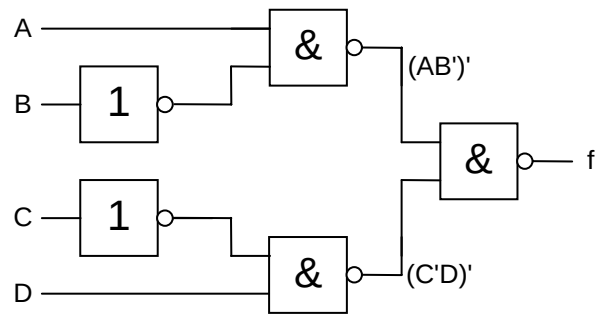
b) $f = x + y = [(x + y)']'$



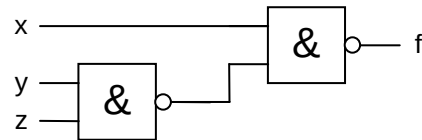
c) $f = x \cdot y = [(x \cdot y)']' = (x' + y)'$



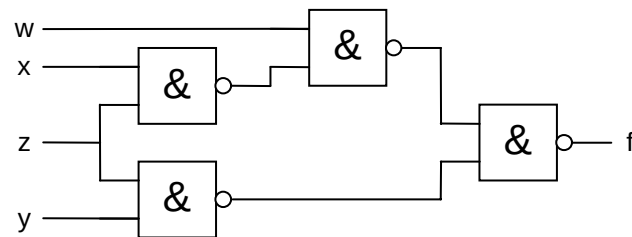
3.17



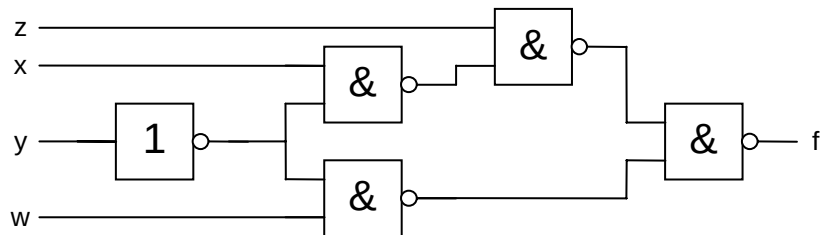
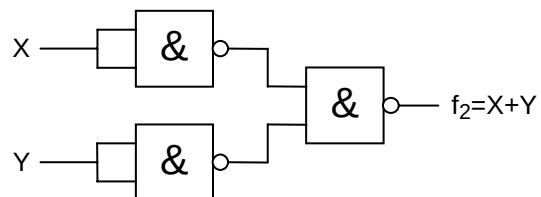
3.18



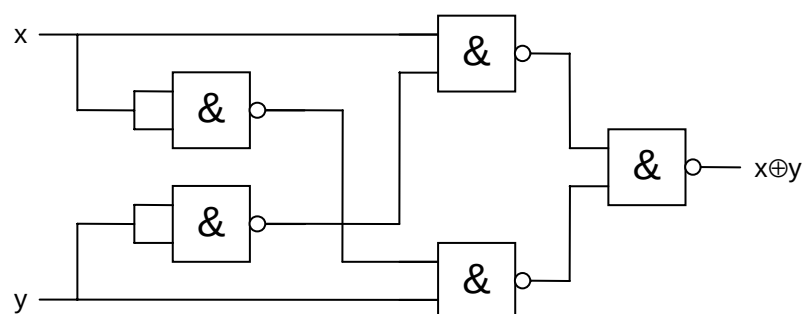
3.19



3.20

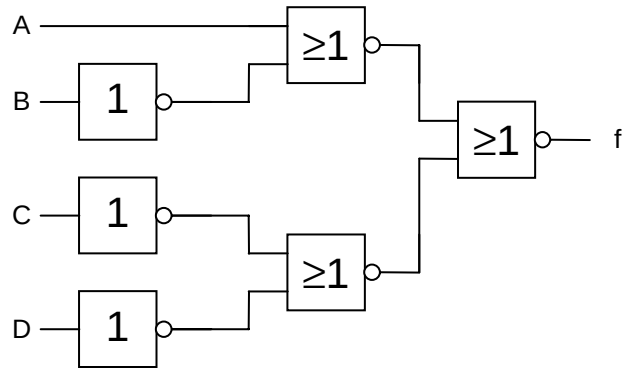
3.21 $f_1 = X'$  $f_2 = X+Y = (X' \cdot Y)'$ 

3.22

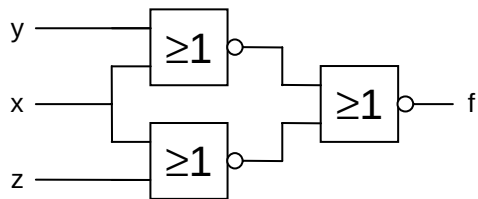


3.23 $f = AB + A'B'$

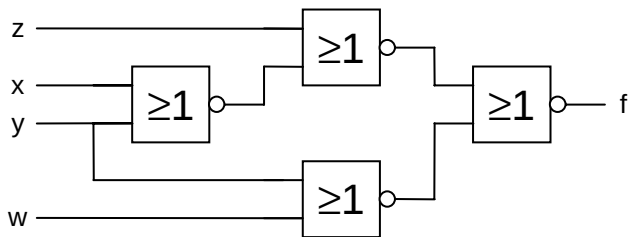
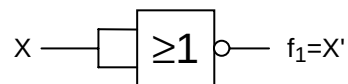
3.24



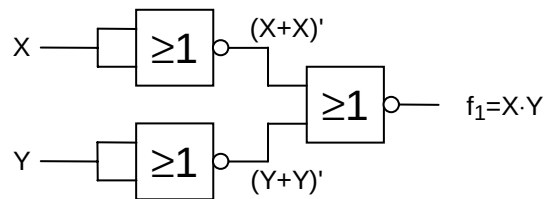
3.25



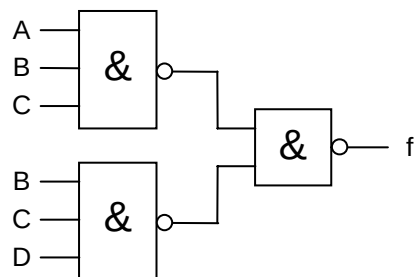
3.26

3.27 $f_1 = X'$ 

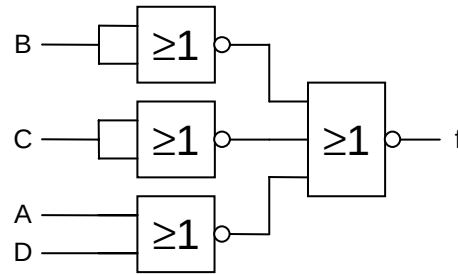
$$f_2 = [(X+X)' + (Y+Y)']' = XY$$



3.28 a)

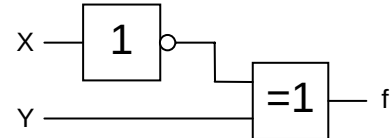
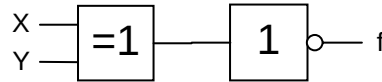


b)



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

$f = X'Y' + (X')'Y = X'Y' + XY$



3.30 a) $f = x + y$ b) $f = x + y$ c) $f = x'z + y'z$ d) $f = z'$

e) $f = y' + z$ f) $f = y + zw$

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

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

3.33 $f = xy + y'z$

3.34 a) $f = w'xz$ b) $f = w'xz + xyz$ c) $f = x'y$
d) $f = w'y'z' + w'x'y' + w'x'z'$ e) $f = x'z' + w'xyz$ f) $f = x' + w'y'z'$
g) $f = w'x'yz + x'y'z' + wxz'$

3.35 a) $f = xzw'$ b) $f = xz(w'+y)$ c) $f = yx'$

d) $f = w' \cdot (y'+z') \cdot (x'+y') \cdot (x'+z')$ e) $f = (w'+x') \cdot (x'+z) \cdot (x+z') \cdot (y+z')$

f) $f = (w'+x') \cdot (x'+y') \cdot (x'+z')$ g) $f = (w+x') \cdot (y+z') \cdot (w'+z') \cdot (w+y'+z)$

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

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

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

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

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