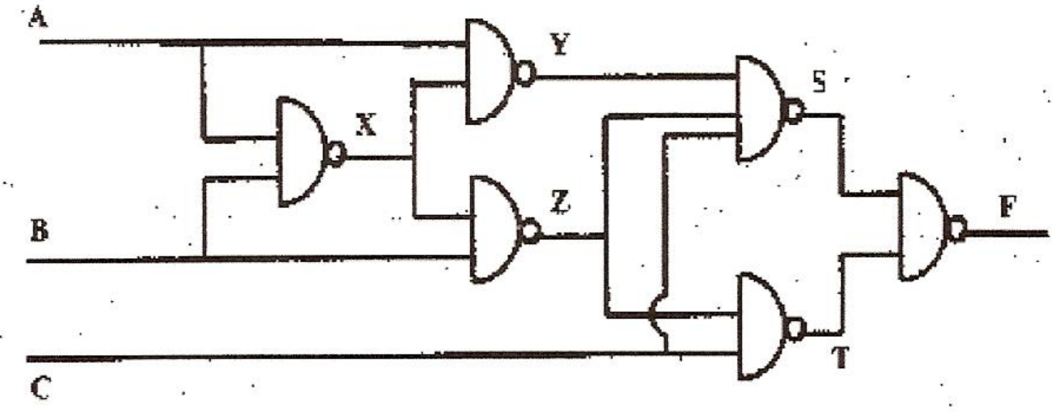
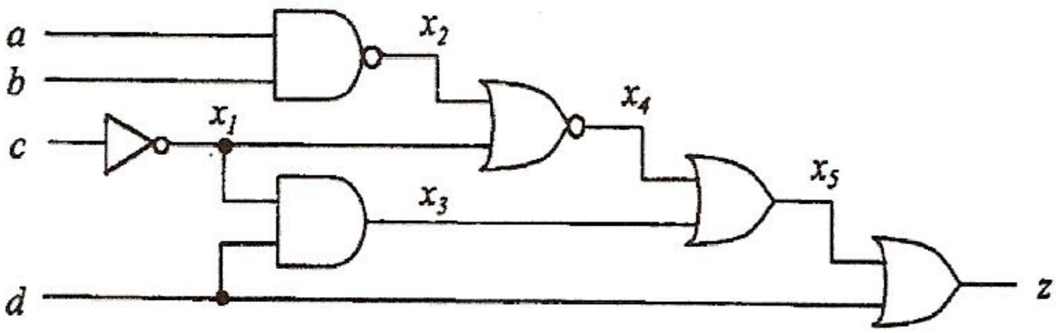
1	F funtzioaren egitaula lortu

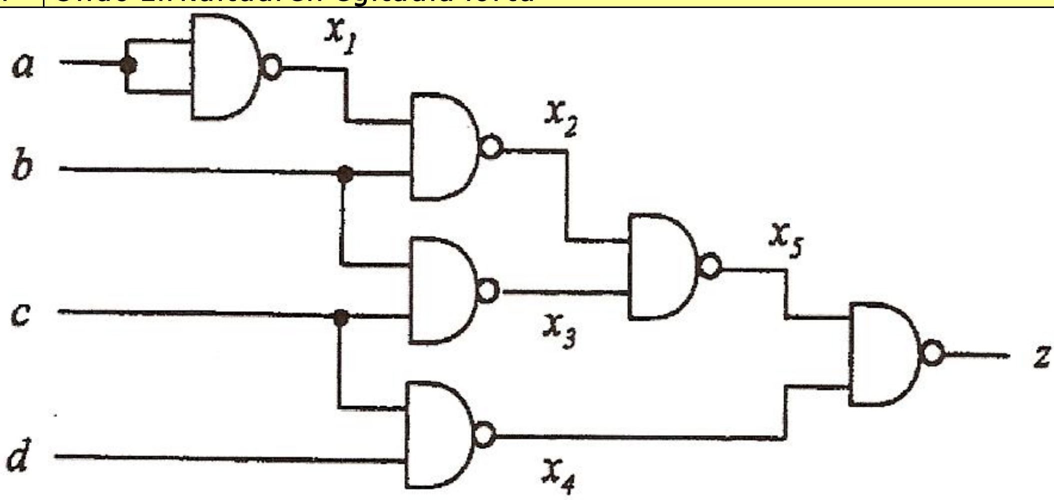


2	Ondokoa egin:
	zirkuitu logiko bat diseinatu x_1x_0 bi zenbaki hartzen ditunak (2 bitekoak) eta irteera zenbaki horren karratua ematen duena (y_3 y_2 y_1 y_0). Funtzio logikoak lortu.

3	Ondo zirkuituaren egitaula lortu



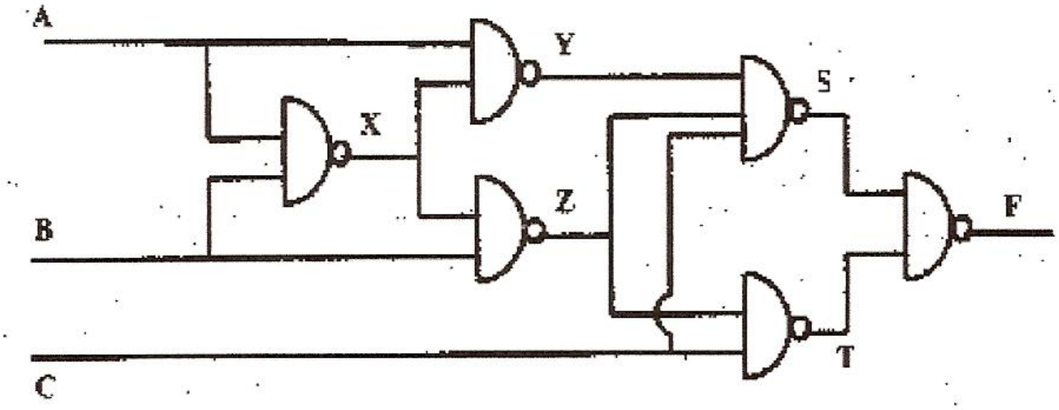
4	Ondo zirkuituaren egitaula lortu

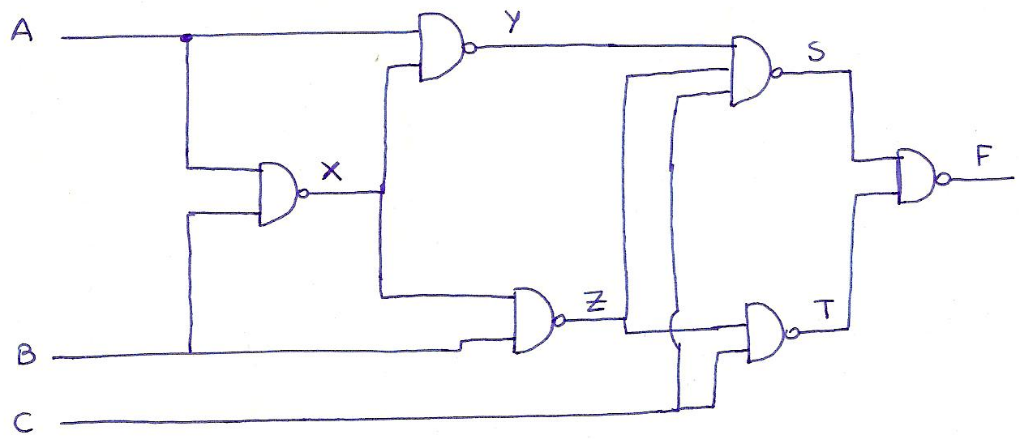


5	Boole-ren algebra erabiliz eta a, b eta c aldagaiak zenbaki bitarrak direla kontuan harturik, ondoko berdintasunak frogatu
	a) $(a \cdot b)+(a \cdot b)+(a \cdot b)+(a \cdot b)=1$ b) $\overline{\left(\,\overline{(a \cdot b)} \cdot \overline{(c \cdot d)}\,\right)}=\overline{(\bar{a}+\bar{b})}+\overline{(\bar{c}+\bar{d})}$ c) $a \cdot (a+b) \cdot (a+(b+c))=a$

6	Beheko funtzioa Karnaugh-en mapa batean irudikatu eta sinplifikazioa burutu
	$f(a,b,c)=\bar{c} \cdot (\overline{(a+b)}+a \cdot b)+c \cdot (\bar{a} \cdot \bar{b}+a)$

1	F funtzioaren egitaula lortu





A	B	C	X	Y	Z	S	T	F
0	0	0	1	1	1	1	1	0
0	0	1	1	1	1	0	0	1
0	1	0	1	1	0	1	1	0
0	1	1	1	1	0	1	1	0
1	0	0	1	0	1	1	1	0
1	0	1	1	0	1	1	0	1
1	1	0	0	1	0	1	1	0
1	1	1	0	1	0	1	1	0

$X = \overline{A.B}$

$Y = \overline{A.\overline{AB}} = \overline{A} + \overline{\overline{AB}} = \overline{A} + AB$

$Z = \overline{\overline{AB}.B}$

$S = \overline{Y.Z.C} = \overline{\overline{A.\overline{AB}}.\overline{\overline{AB}.B}.C} = A.\overline{AB} + \overline{AB}.B + \overline{C}$

2	Ondokoa egin: zirkuitu logiko bat diseinatu x_1x_0 bi zenbaki hartzen ditunak (2 bitekoak) eta irteera zenbaki horren karratua ematen duena (y_3 y_2 y_1 y_0). Funtzio logikoak lortu.

x_1	x_0	dec(x)	dec(x^2)	bin(x^2)	y_3	y_2	y_1	y_0
0	0	0	0	0000	0	0	0	0
0	1	1	1	0001	0	0	0	1
1	0	2	4	0100	0	1	0	0
1	1	3	9	1001	1	0	0	1

9 : 2 → 4 − 1
4 : 2 → 2 − 0
2 : 2 → 1   0

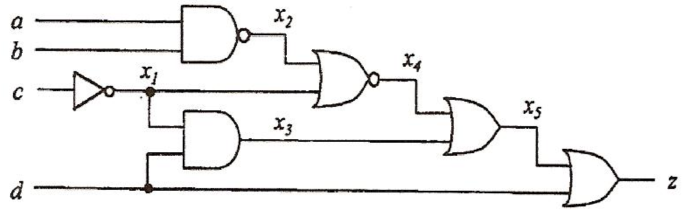
$$y_0 = \overline{x_1} \cdot x_0 + x_1 \cdot x_0$$

$$y_1 = 0$$

$$y_2 = x_1 \cdot \overline{x_0}$$

$$y_3 = x_1 \cdot x_0$$

3	Ondo zirkuituaren egitaula lortu



a	b	c	d	X_1	X_2	X_3	X_4	X_5	Z
0	0	0	0	1	1	0	0	0	0
0	0	0	1	1	1	1	0	1	1
0	0	1	0	0	1	0	0	0	0
0	0	1	1	0	1	0	0	0	1
0	1	0	0	1	1	0	0	0	0
0	1	0	1	1	1	1	0	1	1
0	1	1	0	0	1	0	0	0	0
0	1	1	1	0	1	0	0	0	1
1	0	0	0	1	1	0	0	0	0
1	0	0	1	1	1	1	0	1	1
1	0	1	0	0	1	0	0	0	0
1	0	1	1	0	1	0	0	0	1
1	1	0	0	1	0	0	0	0	0
1	1	0	1	1	0	1	0	1	1
1	1	1	0	0	0	0	1	1	1
1	1	1	1	0	0	0	1	1	1

$X_1 = \overline{c}$

$X_2 = \overline{a\,b}$

$X_3 = X_1 . d$

$X_4 = \overline{X_2 + X_1}$

$X_5 = X_3 + X_4$

$Z = X_5 + d$

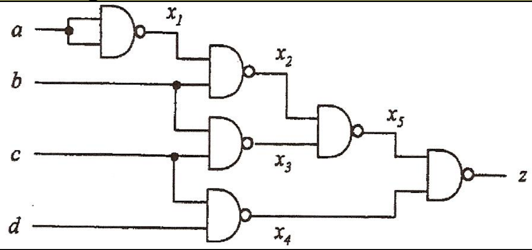
cd \ ab	00	01	11	10
00				
01	1	1	1	1
11	1	1	1	1
10			1	

d

abc

$Z = abc + d$

4	Ondo zirkuituaren egitaula lortu



a	b	c	d	X_1	X_2	X_3	X_4	X_5	Z	
0	0	0	0	1	1	1	1	0	1	✓
0	0	0	1	1	1	1	1	0	1	✓
0	0	1	0	1	1	1	1	0	1	✓
0	0	1	1	1	1	1	0	0	1	✓
0	1	0	0	1	0	1	1	1	0	
0	1	0	1	1	0	1	1	1	0	
0	1	1	0	1	0	0	1	1	0	
0	1	1	1	1	0	0	0	1	1	✓
1	0	0	0	0	1	1	1	0	1	✓
1	0	0	1	0	1	1	1	0	1	✓
1	0	1	0	0	1	1	1	0	1	✓
1	0	1	1	0	1	1	0	0	1	✓
1	1	0	0	0	1	1	1	0	1	✓
1	1	0	1	0	1	1	1	0	1	✓
1	1	1	0	0	1	0	1	1	0	
1	1	1	1	0	1	0	0	1	1	✓

$X_1 = \overline{a}$

$X_2 = \overline{X_1 . b}$

$X_3 = \overline{bc}$

$X_4 = \overline{cd}$

$X_5 = \overline{X_2 . X_3}$

$Z = \overline{X_4 . X_5}$

cd \ ab	00	01	11	10
00	1		1	1
01	1		1	1
11	1	1	1	1
10	1			1

$\overline{b}$

$a\overline{c}$

cd

$Z = a\overline{c} + \overline{b} + cd$

5	Boole-ren algebra erabiliz eta a, b eta c aldagaiak zenbaki bitarrak direla kontuan harturik, ondoko berdintasunak frogatu

a) $(a \cdot b)+(a \cdot b)+(a \cdot b)+(a \cdot b)=1$

b) $\overline{\left(\overline{(a \cdot b)} \cdot \overline{(c \cdot d)}\right)}=\overline{(\bar{a}+\bar{b})}+\overline{(\bar{c}+\bar{d})}$

c) $a \cdot(a+b) \cdot(a+(b+c))=a$

---

a) $(a.b)+(a.\bar{b})+(\bar{a}.b)+(\bar{a}.\bar{b}) =$

$= a\,(\underbrace{b+\bar{b}}_{1})+\bar{a}\,(\underbrace{b+\bar{b}}_{1}) = a+\bar{a} = 1$

b) $\overline{\overline{(a.b)} \cdot \overline{(c.d)}} = \overline{(\bar{a}+\bar{b}) \cdot (\bar{c}+\bar{d})} = \overline{(\bar{a}+\bar{b})} + \overline{(\bar{c}+\bar{d})}$

c) $\underbrace{a \cdot (a+b)}_{a} \cdot (a+(b+c)) = \underbrace{a \cdot (a+(b+c))}_{a} = a$

6	Beheko funtzioa Karnaugh-en mapa batean irudikatu eta sinplifikazioa burutu

$$f(a,b,c)=\bar{c}\cdot((\overline{a+b})+a\cdot b)+c\cdot(\bar{a}\cdot\bar{b}+a)$$

) a) b) $f(a,b,c)=\underbrace{\bar{c}\cdot\overbrace{((\overline{a+b})+a.b)}^{Y_1}}_{X_1}+\underbrace{c\,\overbrace{(\bar{a}.\bar{b}+a)}^{Y_2}}_{X_2}$

a	b	c	$\overline{a+b}$	a.b	Y_1	X_1	$\bar{a}\,\bar{b}$	Y_2	X_2	f
0	0	0	1	0	1	1	1	1	0	1
0	0	1	1	0	1	0	1	1	1	1
0	1	0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1	0	0
1	0	1	0	0	0	0	0	1	1	1
1	1	0	0	1	1	1	0	1	0	1
1	1	1	0	1	1	0	0	1	1	1

Karnaugh

c \ ab	00	01	11	10
0	1		1	
1	1		1	1

$\bar{a}\bar{b}$ $\quad ab \quad ac$

$f(a,b,c)=ab+\bar{a}\bar{b}+ac$