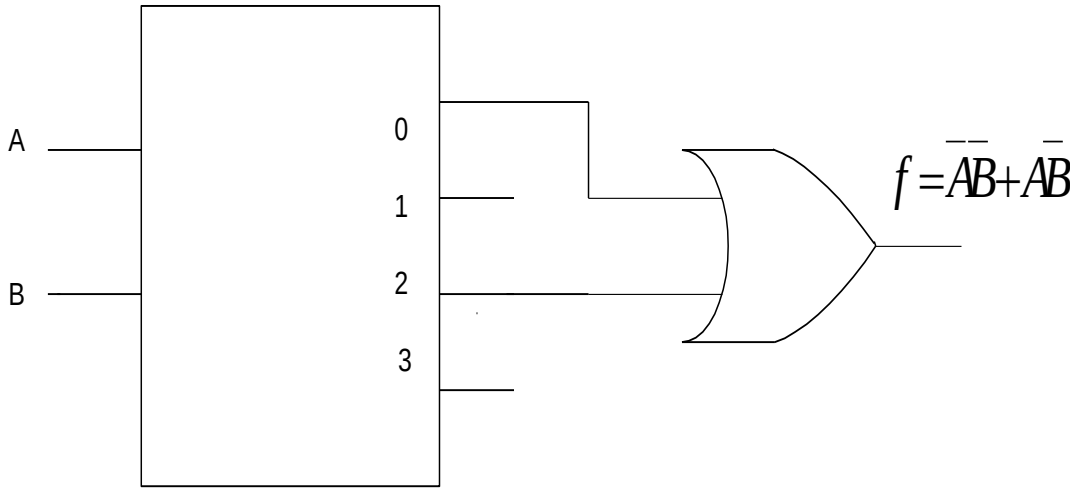
OSNOVE DIGITALNE ELEKTRONIKE

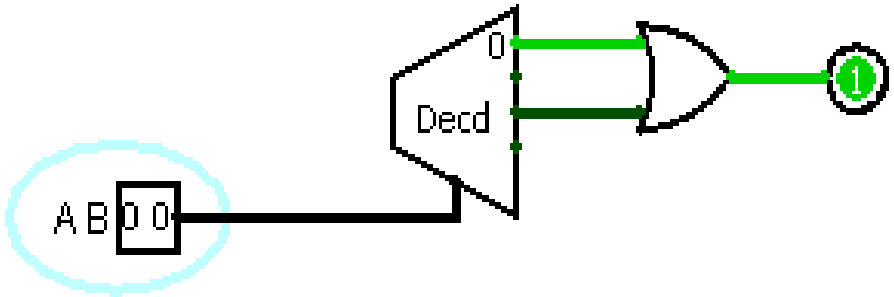
Kombinacijski sklopovi

Ostvarivanje logičkih funkcija dekoderom

Zadatak: Pomoću simbola dekodera ostvariti logičku funkciju zadanu tablicom stanja

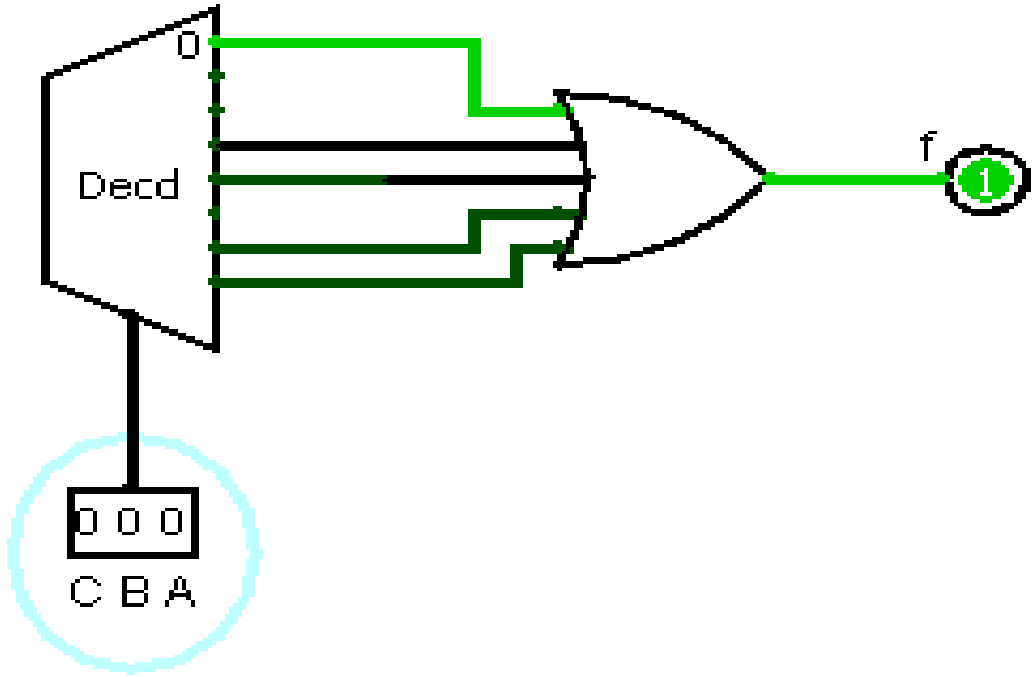


A	B	f
0	0	1
0	1	0
1	0	1
1	1	0



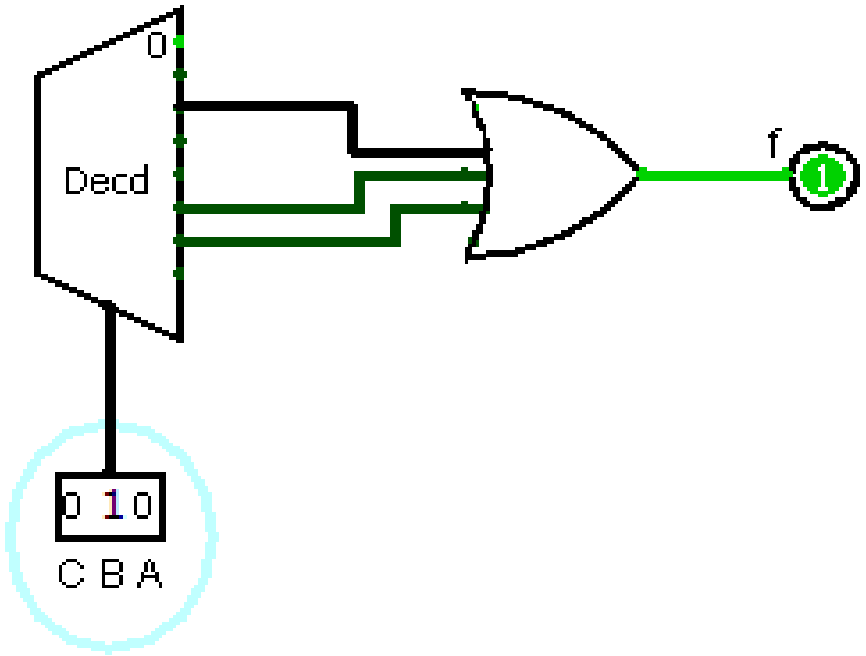
Zadatak: Pomoću simbola dekodera 3/8 ostvariti logičku funkciju f=Σ (0,3,4,6,7)

A	B	C	f
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1



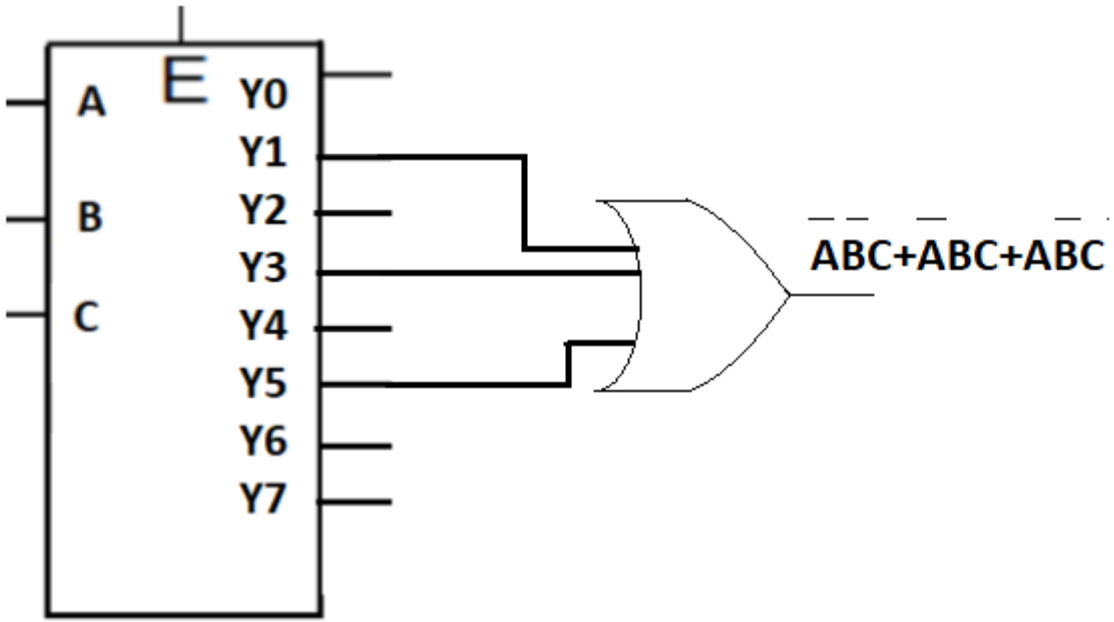
Zadatak: Koristeći simbol dekodera 3/8 realizirati funkciju

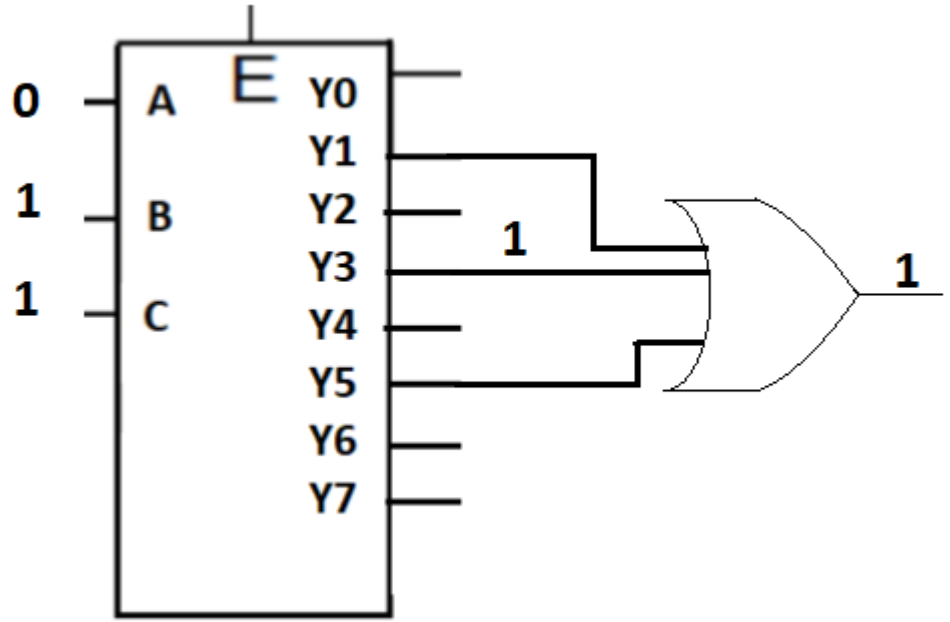
$$f=\overline{A}B\overline{C} + A\overline{B}C+AB\overline{C}$$



$$f=\Sigma\ (2,5,6)$$

Zadatak: Realizirati funkciju koja na svom izlazu daje jedinicu za binarne kombinacije dekadskih brojeva 1,3,5. Napisati funkciju u kanonskom obliku.

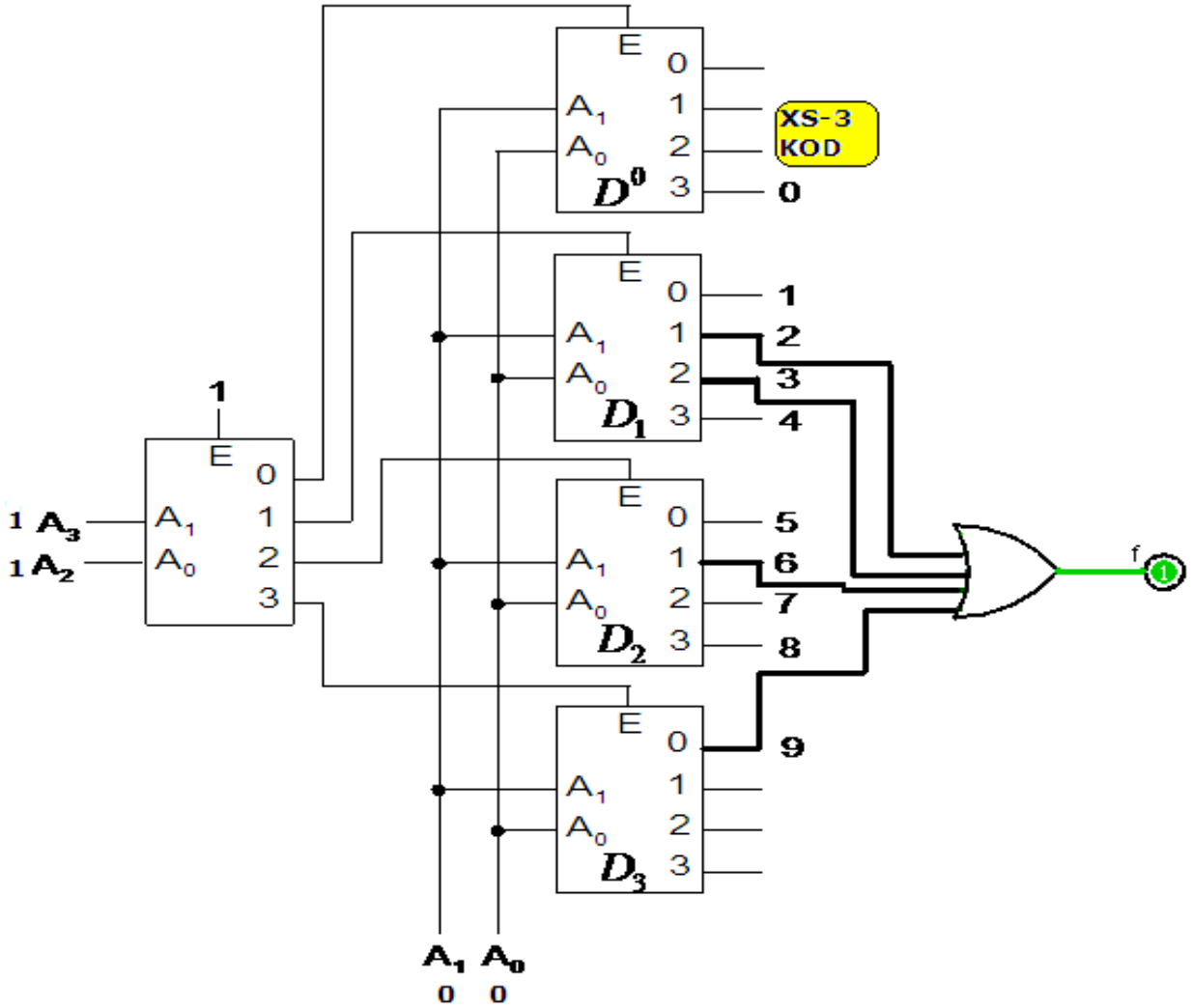




Zadatak: Realizirati dekoder koji će dekodirati znamenke 2,3,6,9 prikazane XS-3 kodom

- Koristimo dekoder 2/4

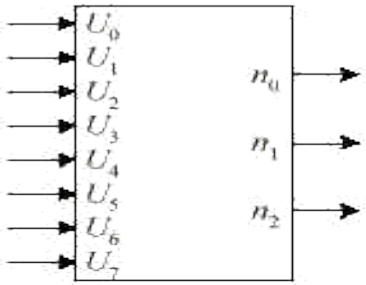
A A 3	B A 2	C A 1	D A 0	f
0	1	0	1	1
0	1	1	0	1
1	0	0	1	1
1	1	0	0	1



KODER-

Kodiranje je suprotna operaciju od dekodiranja i označava postupak dogovornog jednoznačnog pridruživanja skupa ulaznih binarnih znamenaka odgovarajućem binarnom nizu - kodu.

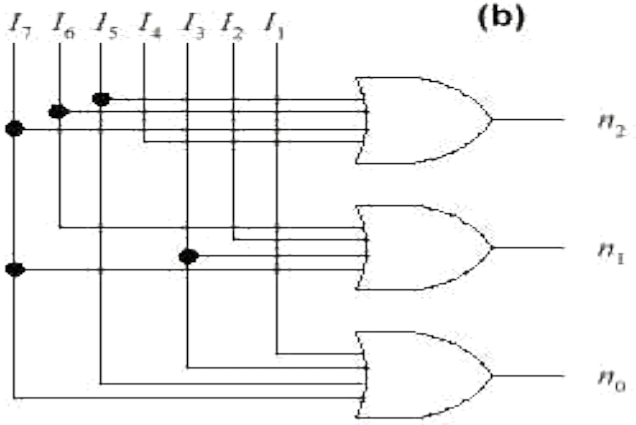
Koder je kombinacijska mreža koja na izlazu daje *n* bitni binarni kod zavisno od *m* aktiviranih ulaza,



(a)

U_7	U_6	U_5	U_4	U_3	U_2	U_1	U_0	n_2	n_1	n_0
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	1
0	1	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	1	1	1

(b)



(c)

Koder-dekoder

- Koderi mogu biti potpuni, odnosno binarni, kada imaju 2^n ulaza i n izlaza i nepotpuni, kada je za n izlaza broj ulaza manji od 2^n.

  Za potpune kodere važi $m = 2^n$; imaju n izlaza i 2^n ulaza
  Za nepotpune kodere važi $m < 2^n$ imaju n izlaza i manje od 2^n ulaza
- 74147 primjer je *integrirane* izvedbe *kodera*.

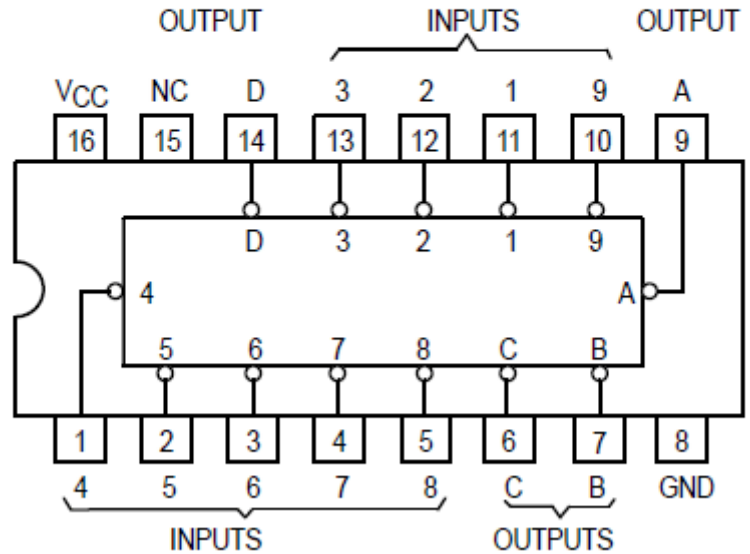
74147 Truth Table

FUNCTION TABLE – '147, 'LS147

INPUTS									OUTPUTS			
1	2	3	4	5	6	7	8	9	D	C	B	A
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	X	L	H	H	H	H	L	L	H
X	X	X	X	L	H	H	H	H	H	L	H	L
X	X	X	L	H	H	H	H	H	H	L	H	H
X	X	L	H	H	H	H	H	H	H	H	L	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

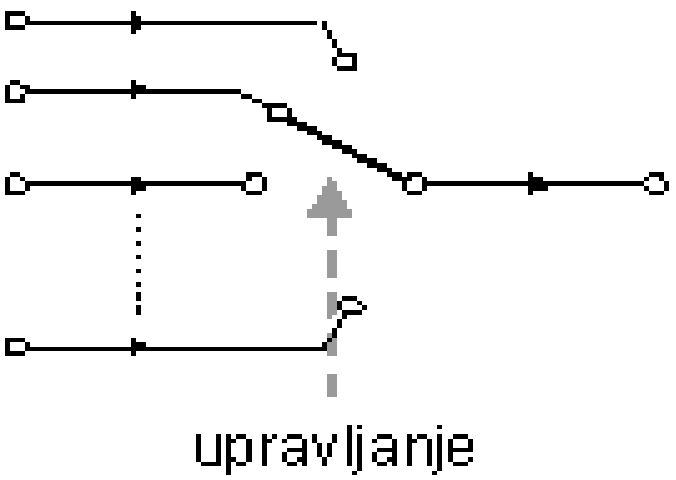
H = high logic level, L = low logic level, X = irrelevant

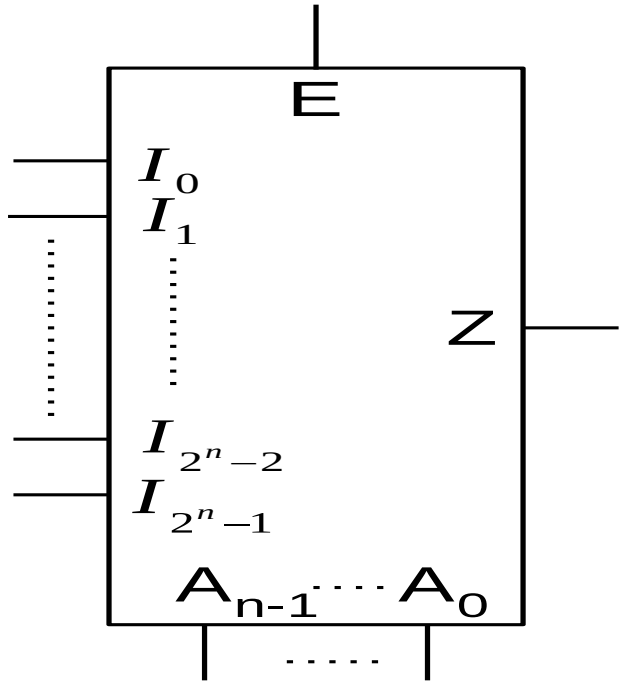
74LS147



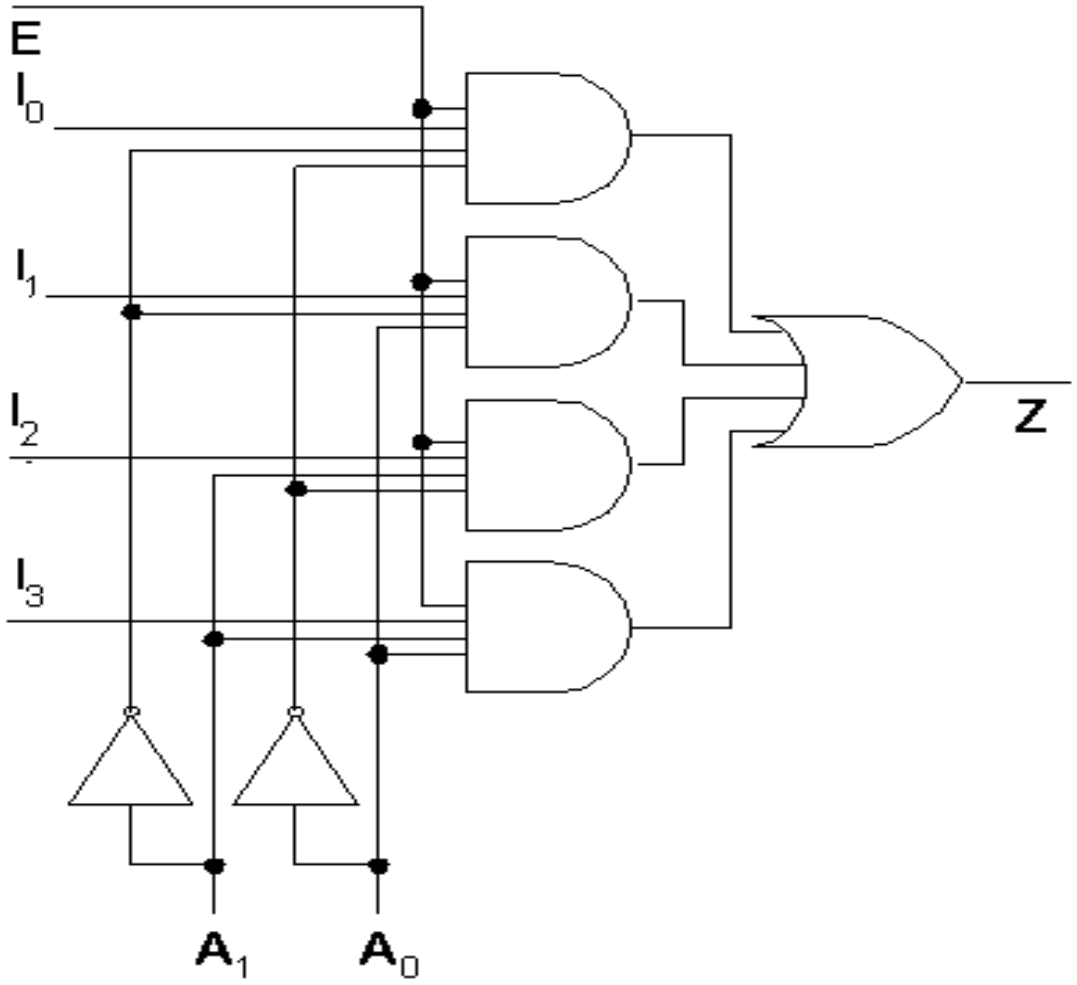
Multipleksor-selektor podataka

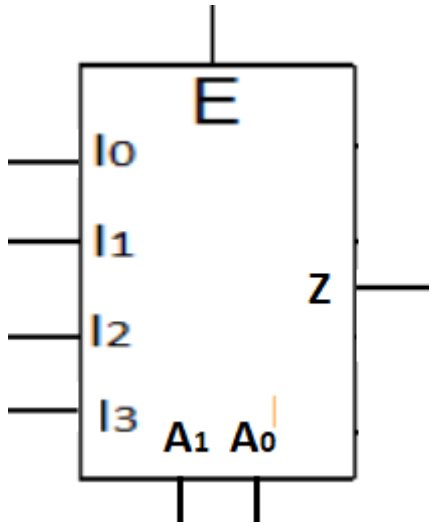
- sklop povezuje jedan od 2^n ulaza s *jedinim* izlazom
- bira jedan od ulaza
- posebni ulazi za upravljanje: *adrese*
  n adresnih linija za 2^n (informacijskih) ulaza





Multipleksor 4/1

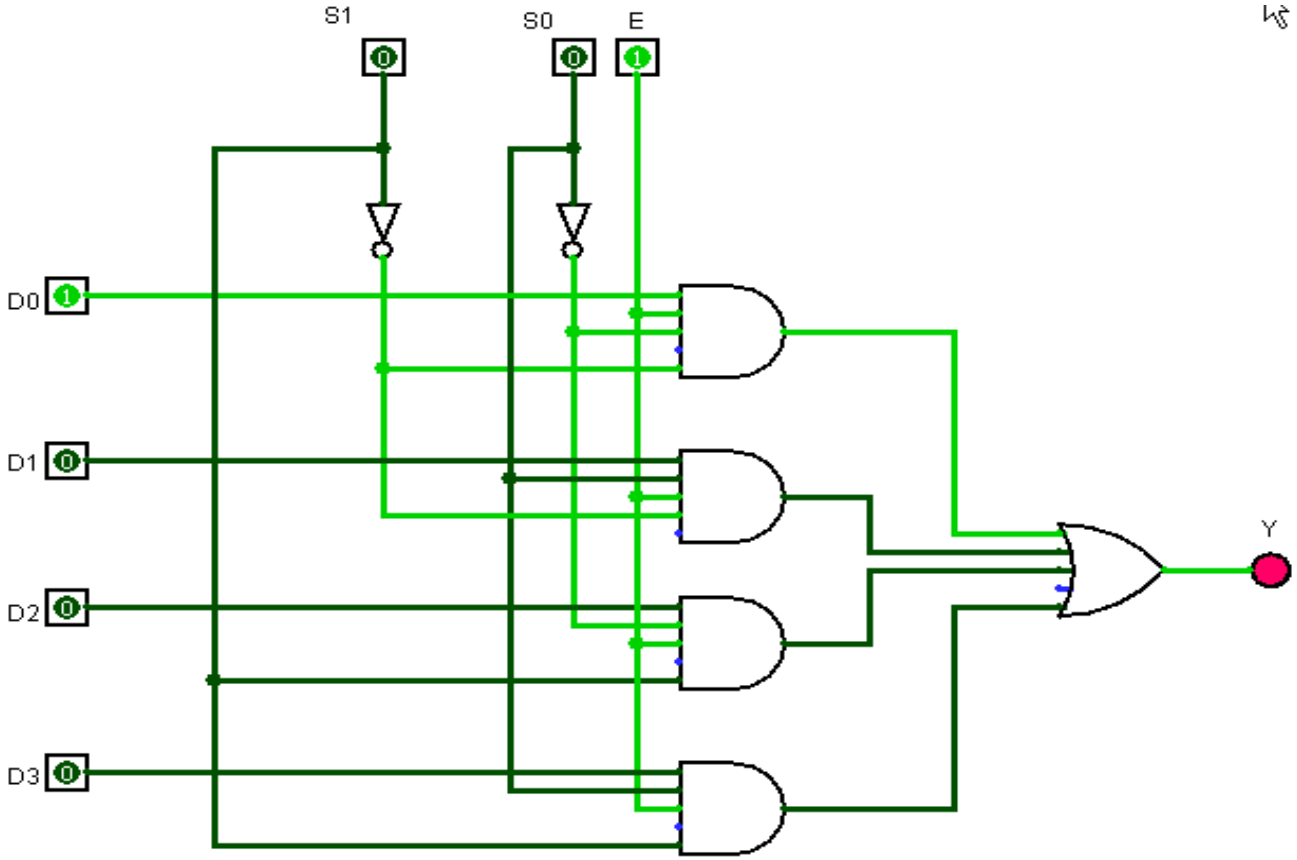


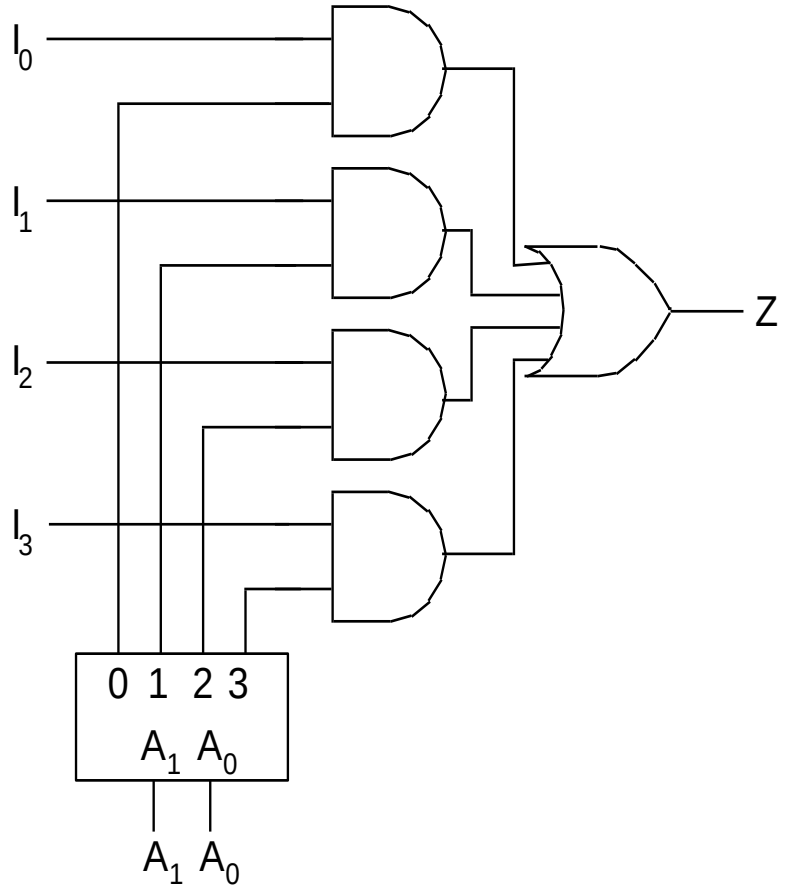


A_1	A_0	E	Z
x	x	0	0
0	0	1	I_0
0	1	1	I_1
1	0	1	I_2
1	1	1	I_3

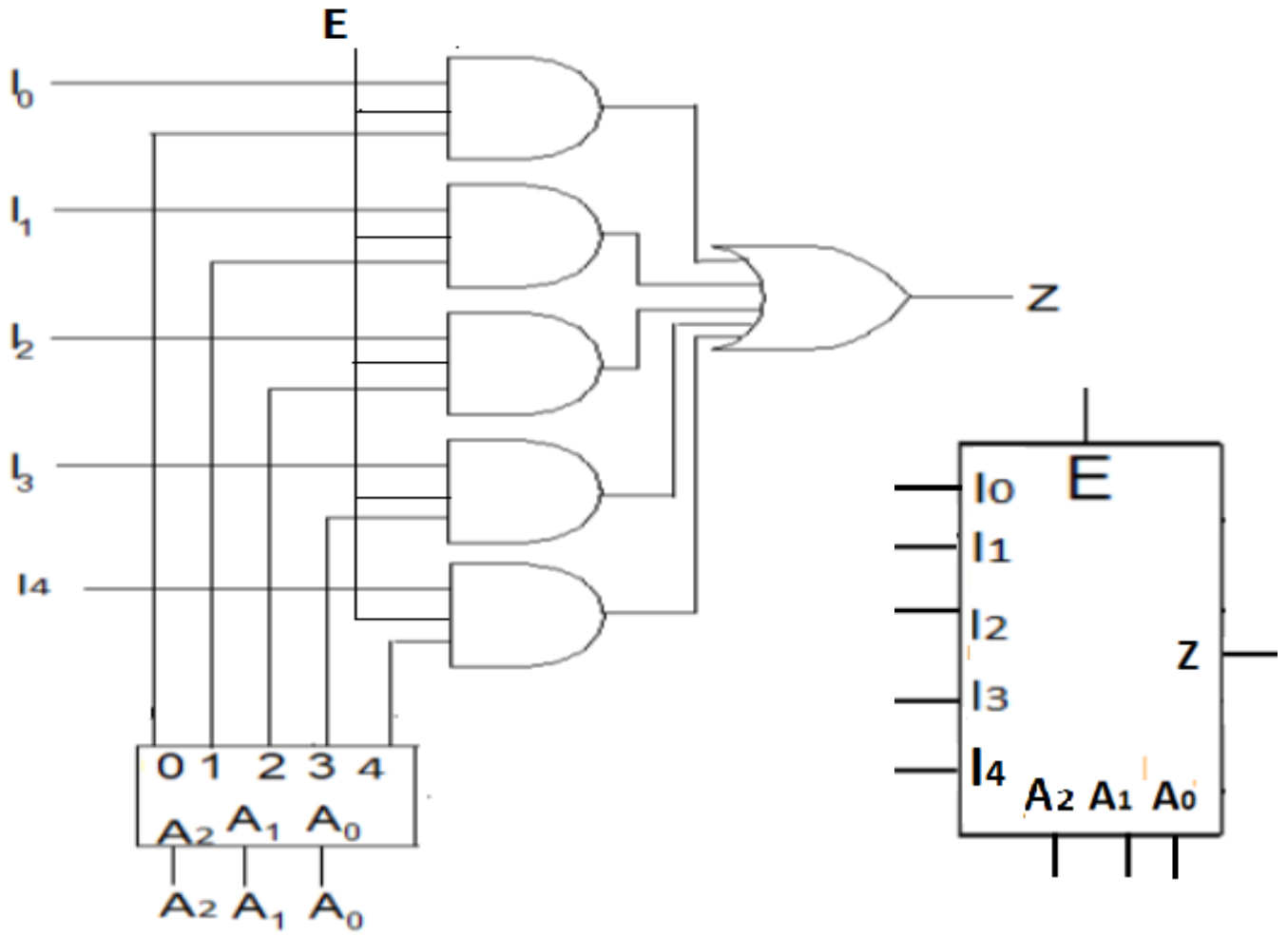
Logička shema-izraz

$$Z = \overline{A}_1\overline{A}_0 I_0 E + \overline{A}_1 A_0 I_1 E + A_1 \overline{A}_0 I_2 E + A_1 A_0 I_3 E$$



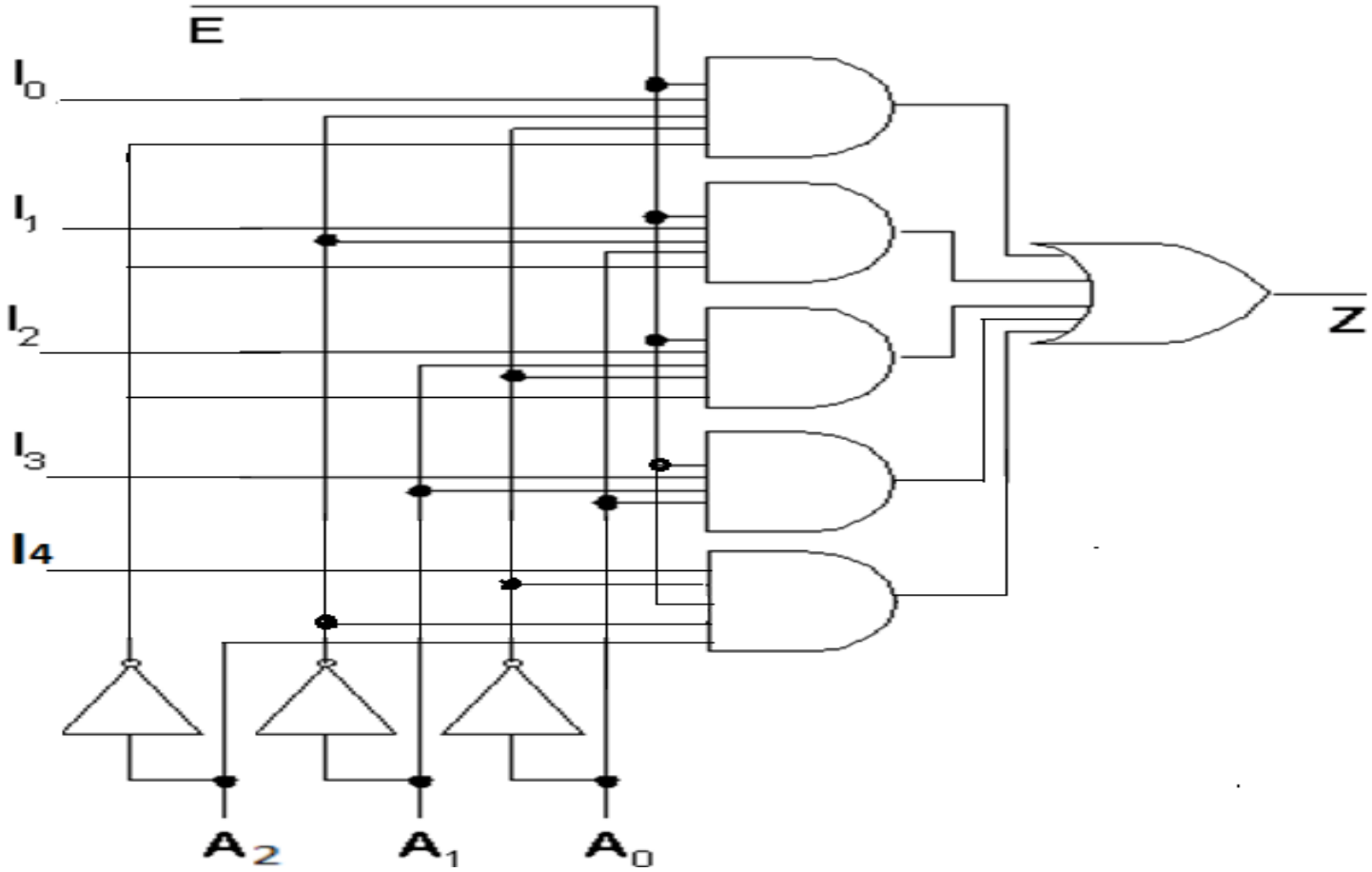


Zadatak: Realizirati multipleksor sa 5 ulaza



A_2	A_1	A_0	E	z
x	x	x	0	0
0	0	0	1	I_0
0	0	1	1	I_1
0	1	0	1	I_2
0	1	1	1	I_3
1	0	0	1	I_4

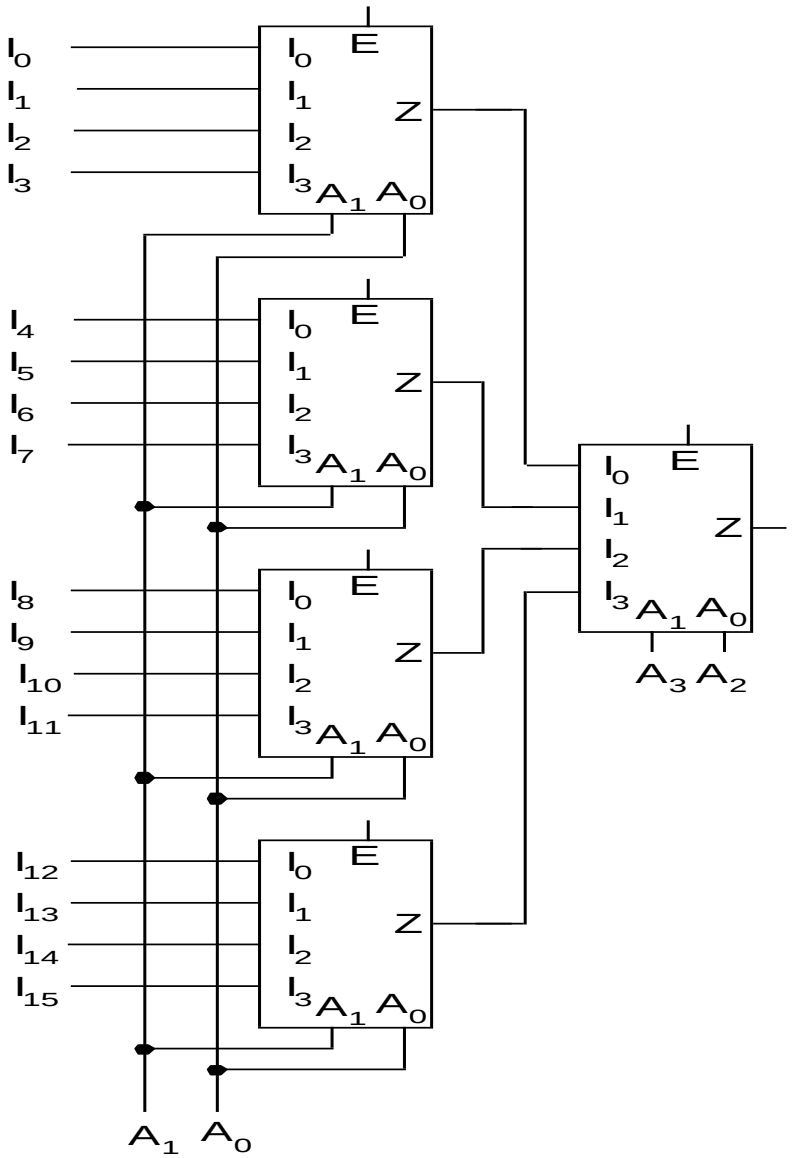
Logička shema MUX 5/1

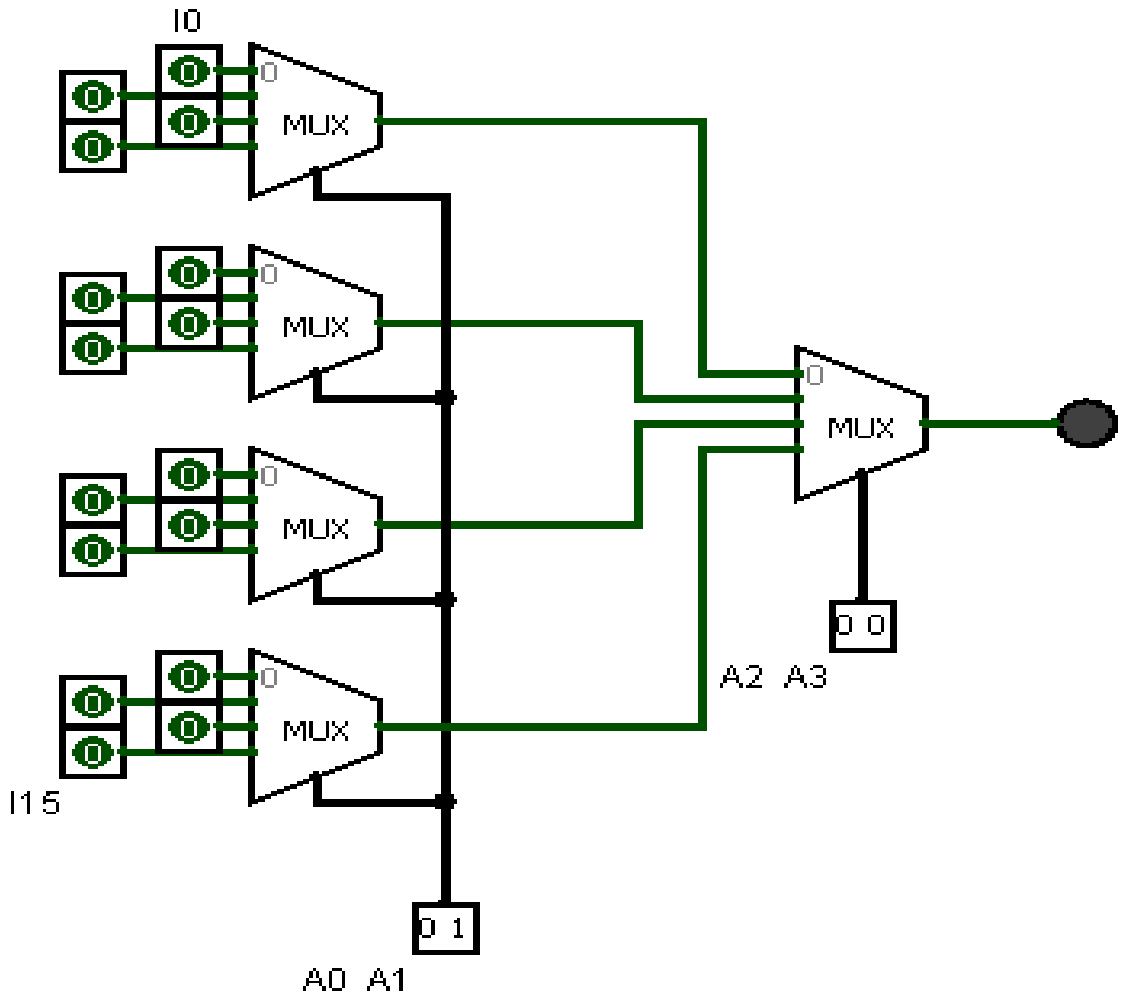


$$Z=\bar{A}_2\bar{A}_1\bar{A}_0E\,I_0 + \bar{A}_2\bar{A}_1A_0E\,I_1 + \bar{A}_2A_1\bar{A}_0E\,I_2 + \bar{A}_2A_1A_0E\,I_3 + A_2\bar{A}_1\bar{A}_0E\,I_4$$

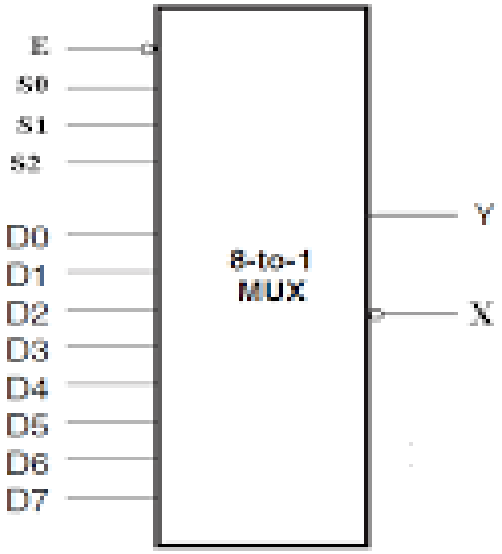
Multipleksorsko stablo

povećava broj ulaza
kaskadiranje




I0
MUX
MUX
MUX
MUX
MUX
0 0
A2 A3
I15
0 1
A0 A1

74151-integrirani multipleksor

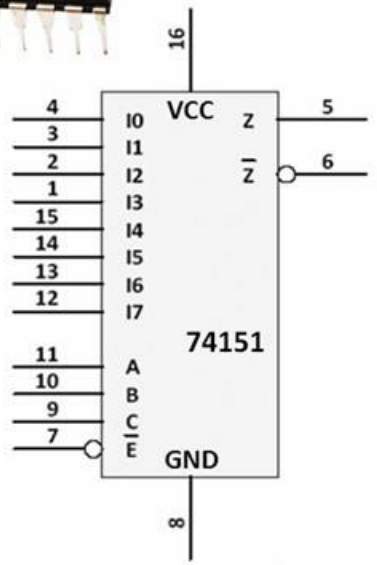


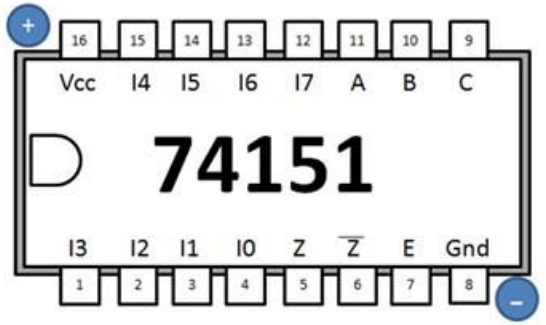
Inputs				Output	
Select			Enable		
S2	S1	S0	E	Y	X
X	X	X	H	L	H
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

E : ENABLE input
S0,S1,S2 : Select inputs
D0-D7 : Data inputs
Y,X : outputs

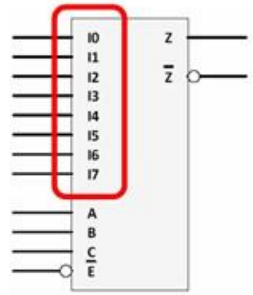
Multiplexer 74151

Simbol & pin:



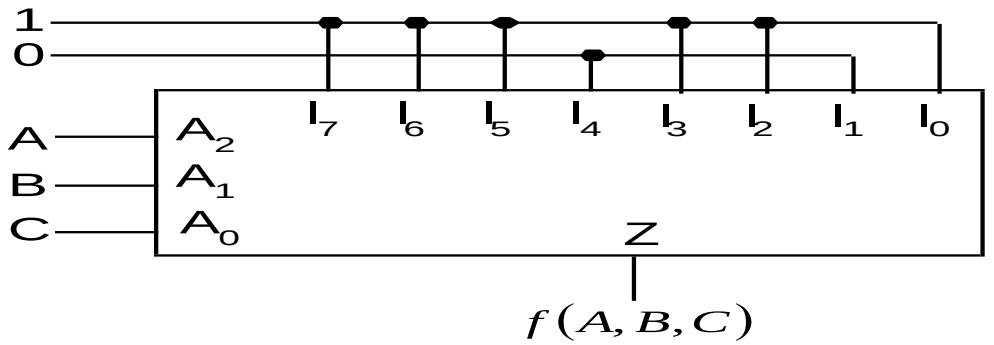


I0 .. I7 adalah 8 pilihan INPUT, bebas diisi dengan input digital.

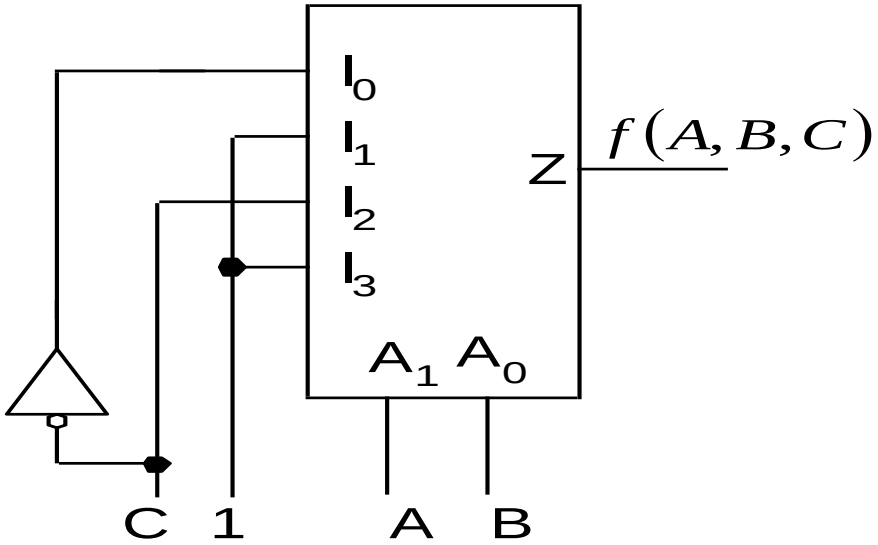


Ostvarivanje logičkih funkcija pomoću multipleksora

- Dvije metode:
- **Direktna metoda**



- **Odvajanje jedne ulazne varijable**

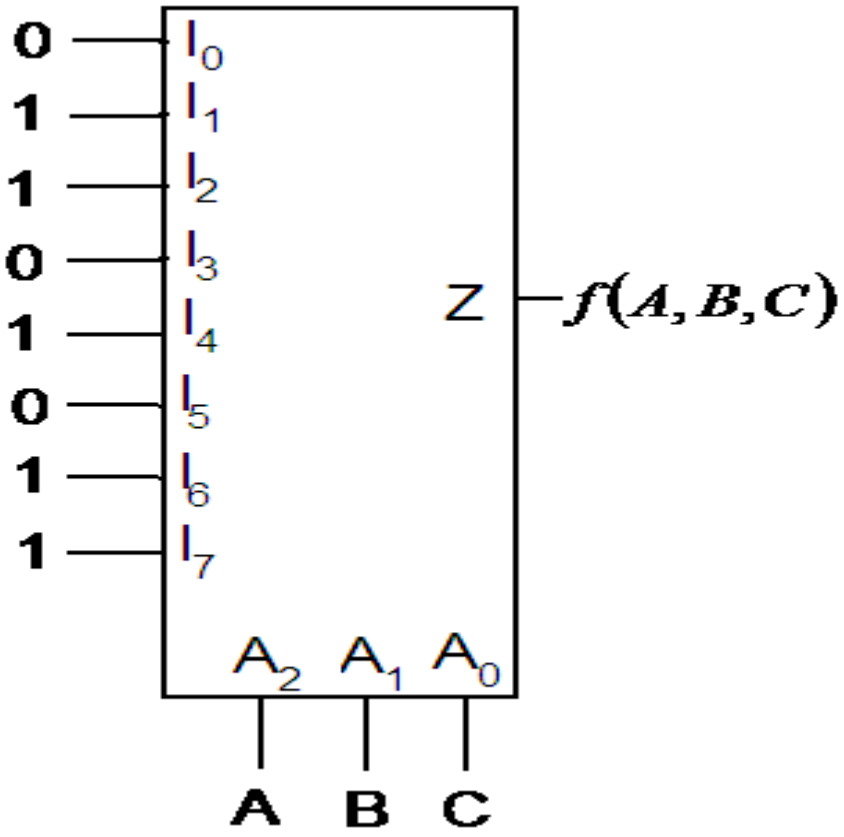


Zadatak: Zadanu logičku funkciju realizirati pomoću 8/1 multipleksora—DIREKTNA METODA

- $f=\Sigma(1,2,4,6,7)$

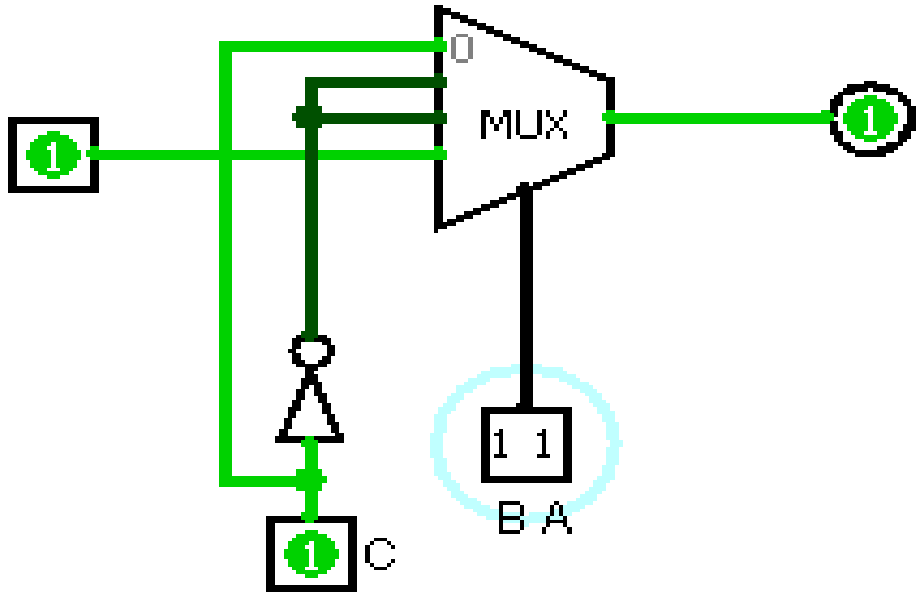
A	B	C	f
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

$$f(A,B,C)=\bar{A}\bar{B}C+\bar{A}B\bar{C}+A\bar{B}\bar{C}+AB$$



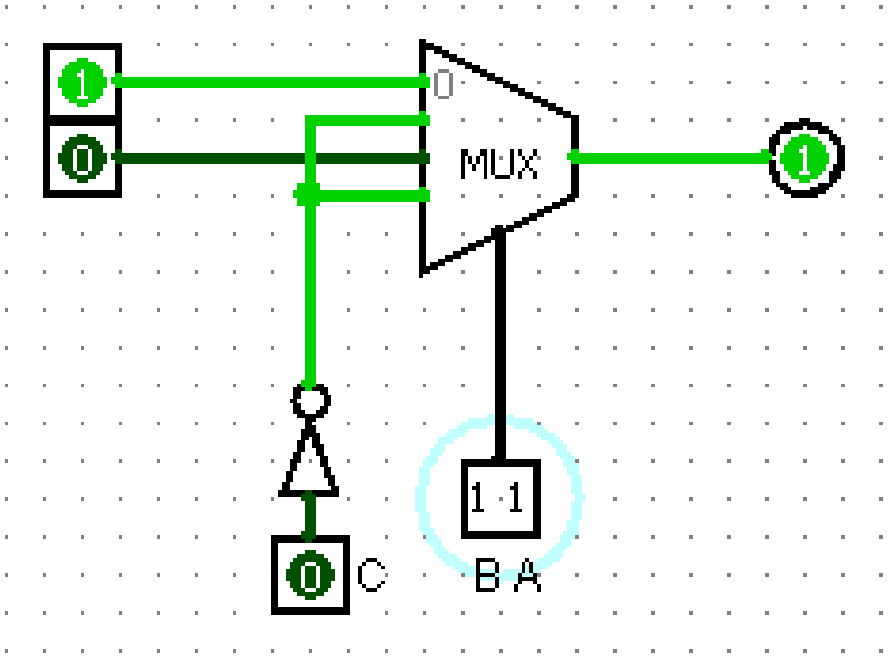
Zadatak: Primjenom multipleksora 4/1 i osnovnih logičkih sklopova ostvarite logičku funkciju $f=\Sigma(1,2,4,6,7)$

A	B	C	f	
0	0	0	0	f=C
0	0	1	1	D0=f= C
0	1	0	1	$f=\overline{C}$
0	1	1	0	$D1=f=\overline{C}$
1	0	0	1	$f=\overline{C}$
1	0	1	0	$D2=f=\overline{C}$
1	1	0	1	f=1
1	1	1	1	D3=f=1



Zadatak: Primjenom multipleksora 4/1 i osnovnih logičkih sklopova ostvarite logičku funkciju $f=\Sigma(0, 1,2,6)$

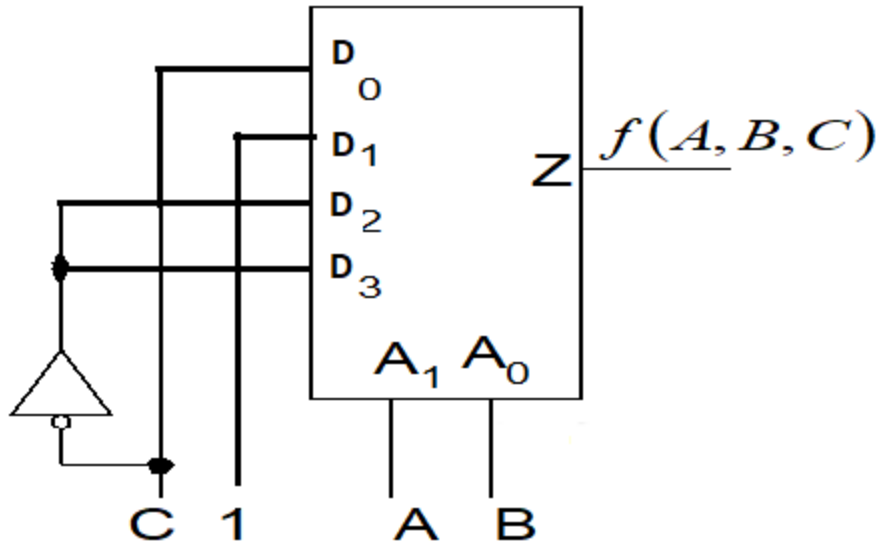
A	B	C	f	
0	0	0	1	f=1 D0=f= 1
0	0	1	1	
0	1	0	1	f= $\overline{C}$ D1=f= $\overline{C}$
0	1	1	0	
1	0	0	0	f=0 D2=f=0
1	0	1	0	
1	1	0	1	f=$\overline{C}$ D3=f=$\overline{C}$
1	1	1	0	



Zadatak: Zadanu logičku funkciju realizirati pomoću 4/1 multipleksora i potrebnog logičkog sklopa

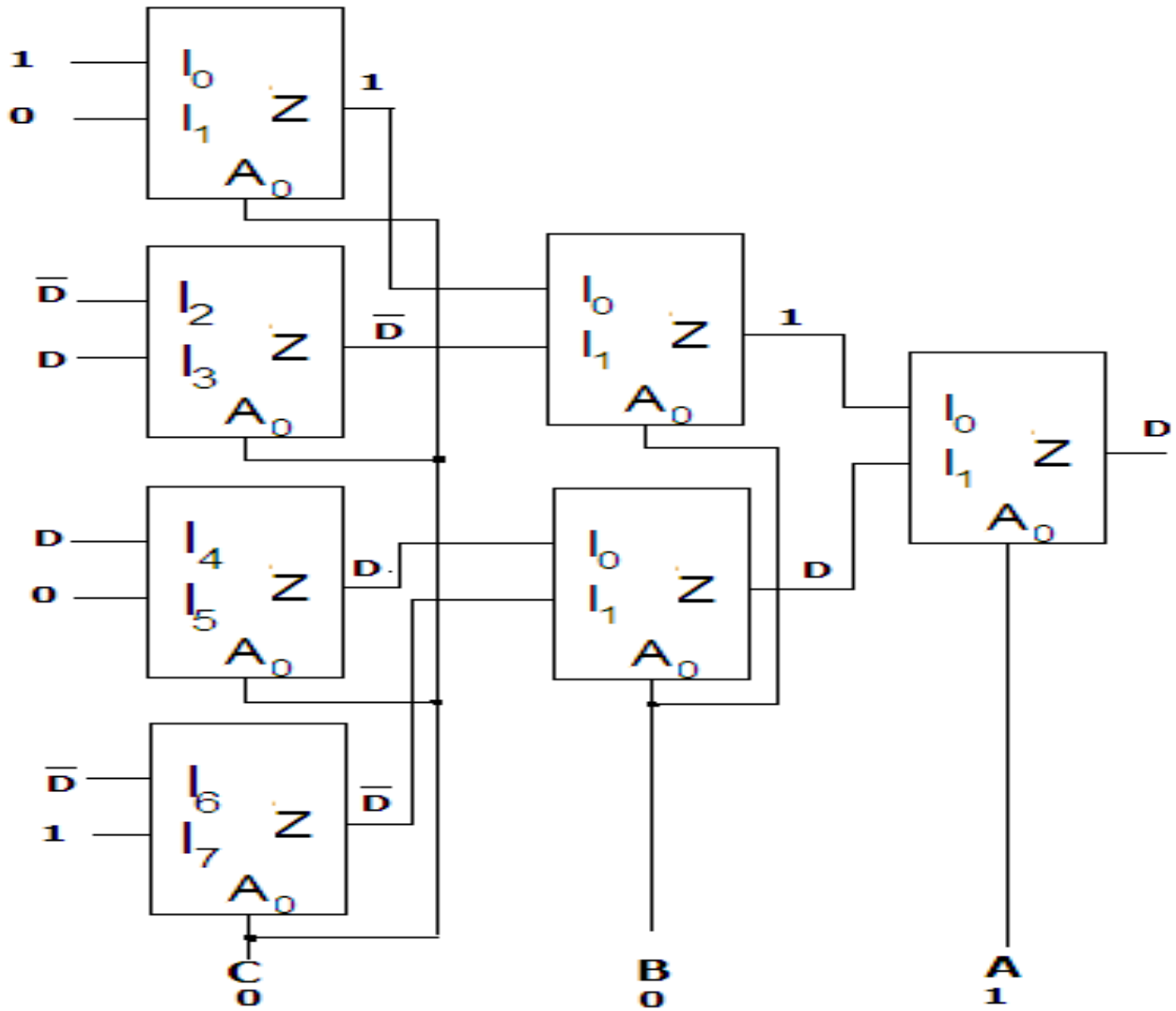
$$f(A,B,C)=\bar{A}\bar{B}C+AB\bar{C}+A\bar{B}\bar{C}+\bar{A}B$$

A	B	C	f	
0	0	0	0	f=C
0	0	1	1	Do=f= C
0	1	0	1	f=1
0	1	1	1	D1=f=1
1	0	0	1	$f=\overline{C}$
1	0	1	0	$D2=f=\overline{C}$
1	1	0	1	$f=\overline{C}$
1	1	1	0	$D3=f=\overline{C}$



Zadatak:Pomoću MUX 2/1 treba realizirati funkciju f(A,B,C,D)= $\Sigma(0,1,4,7,9,12,14,15)$

A	B	C	D	f	I
0	0	0	0	1	$I_0=1$
0	0	0	1	1	
0	0	1	0	0	$I_1=0$
0	0	1	1	0	
0	1	0	0	1	$I_2=\overline{D}$
0	1	0	1	0	
0	1	1	0	0	$I_3=D$
0	1	1	1	1	
1	0	0	0	0	$I_4=D$
1	0	0	1	1	
1	0	1	0	0	$I_5=0$
1	0	1	1	0	
1	1	0	0	1	$I_6=\overline{D}$
1	1	0	1	0	
1	1	1	0	1	$I_7=1$
1	1	1	1	1	


1
0
I_0
I_1
Z
A_0
1
$\overline{D}$
D
I_2
I_3
Z
A_0
$\overline{D}$
D
0
I_4
I_5
Z
A_0
D
$\overline{D}$
1
I_6
I_7
Z
A_0
$\overline{D}$
I_0
I_1
Z
A_0
1
I_0
I_1
Z
A_0
D
I_0
I_1
Z
A_0
D
C
0
B
0
A
1

Povezanost kombinacijskih sklopova

- Paralelno –serijska pretvorba podataka