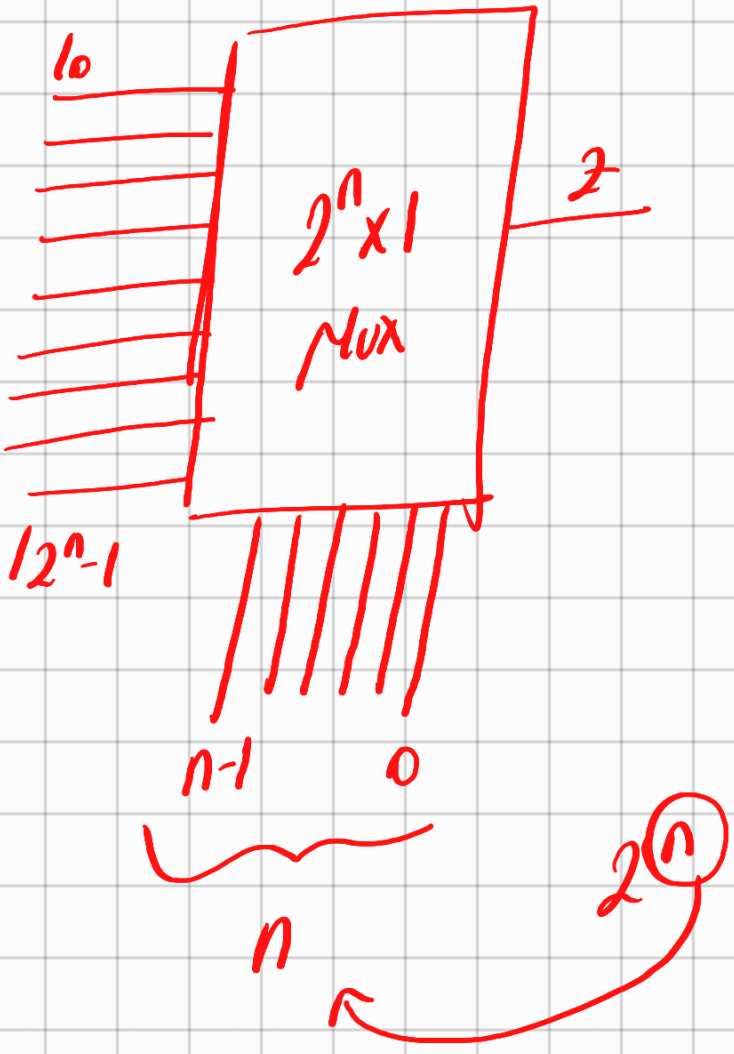
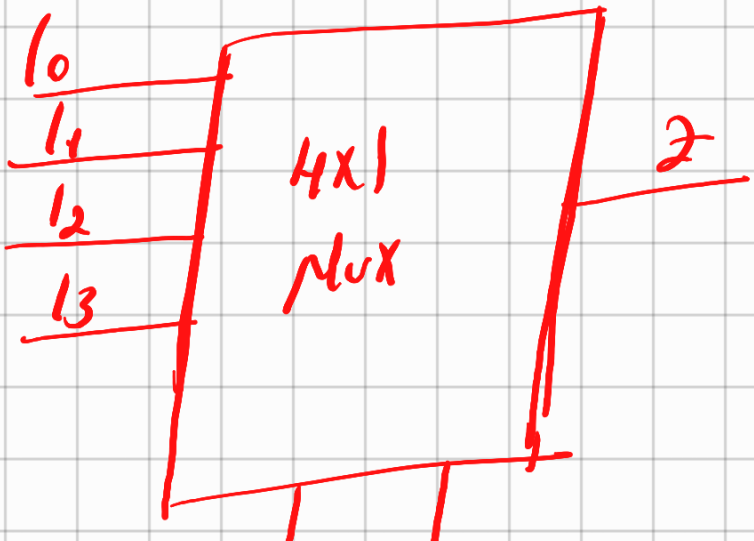
4- Seçiciler (Multiplexer - Mux)





S_1	S_0	Sayısal değer
0	0	0

0	0	0
0	1	1
1	0	2
1	1	3

Örnek → Bir devrede 4x1 Mux kullanarak f fonksiyonunu gerçekleyiniz

x_3, x_4 → Seçim uçları

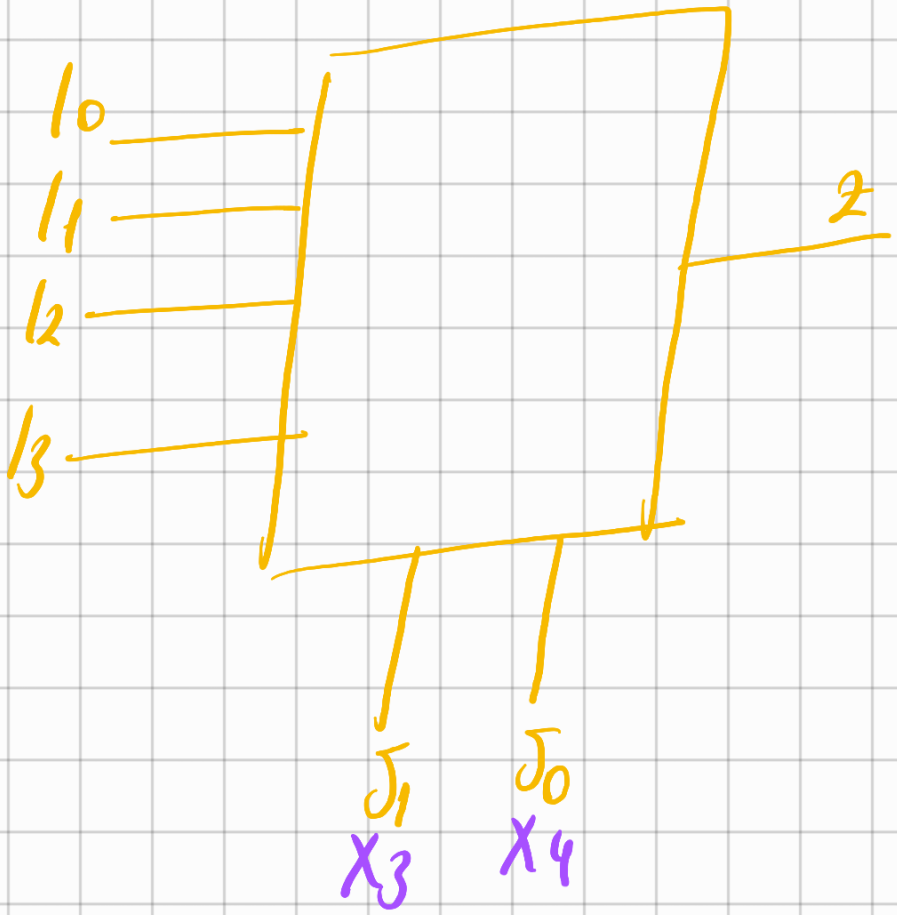
Örnek

x_1	x_2	x_3	x_4	$f(x_1, x_2, x_3, x_4)$
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1

01	10	0
01	11	1
10	00	1
10	01	1
10	10	1
10	11	1
11	00	0
11	01	0
11	10	0
11	11	0

$$\hookrightarrow f \rightarrow \bar{X}_1\bar{X}_2X_3\bar{X}_4 + \bar{X}_1\bar{X}_2X_3X_4 + \bar{X}_1X_2\bar{X}_3X_4 + \bar{X}_1X_2X_3X_4 + X_1\bar{X}_2\bar{X}_3\bar{X}_4 + X_1\bar{X}_2\bar{X}_3X_4 + X_1\bar{X}_2X_3\bar{X}_4 + X_1\bar{X}_2X_3X_4$$

↳ X_3 ve X_4 seçim uçları bunu kullanacağız



$\bar{X}_3\bar{X}_4$, $X_3\bar{X}_4$, $\bar{X}_3X_4$, X_3X_4

Bunların parantezine alırız ifadeleri sonra bulan değerler artık input-lara bağlayabileceğimiz duruma gelir

$$f \rightarrow \bar{X}_3\bar{X}_4(X_1\bar{X}_2) + \bar{X}_3X_4(\bar{X}_1X_2 + X_1\bar{X}_2)$$

$$+ X_3\bar{X}_4(\bar{X}_1\bar{X}_2 + X_1\bar{X}_2) + X_3X_4(\bar{X}_1\bar{X}_2 + \bar{X}_1X_2$$

$$+ X_3\bar{X}_4(\bar{X}_1\bar{X}_2 + X_1\bar{X}_2) + X_3X_4(\bar{X}_1\bar{X}_2 + \bar{X}_1X_2$$

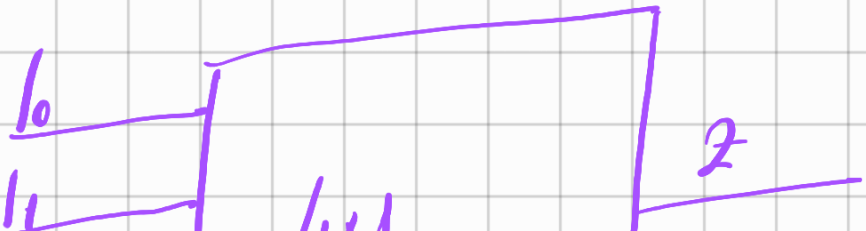
$+ x_1 x_2)$

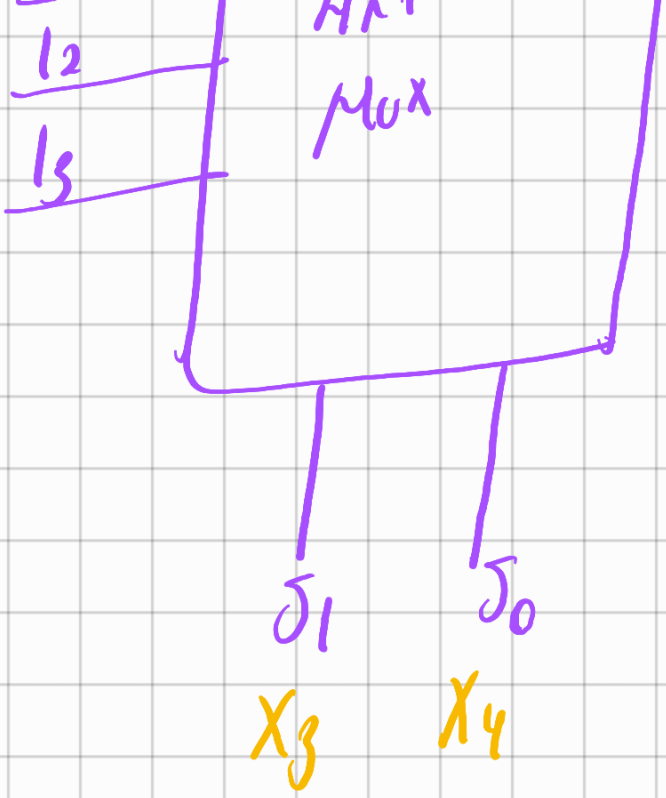
$$\hookrightarrow f = \bar{x}_3 \bar{x}_4 (x_1 \bar{x}_2) + \bar{x}_3 x_4 (x_1 \oplus x_2) + x_3 \bar{x}_4 (\bar{x}_2 (\bar{x}_1 + x_1)) + x_3 x_4 (\bar{x}_1 (\bar{x}_2 + x_2) + x_1 \bar{x}_2)$$

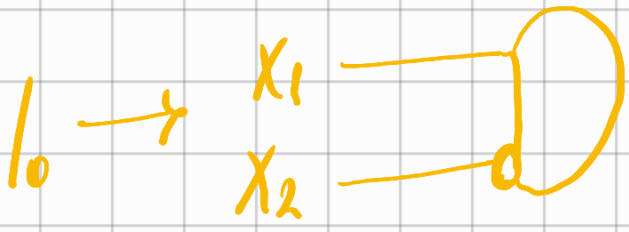
$$\bar{x}_1 + (x_1 \bar{x}_2)$$

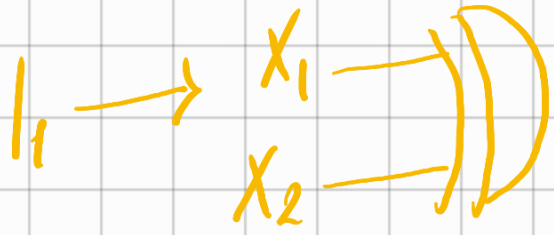
$$(\bar{x}_1 + x_1)(\bar{x}_1 + \bar{x}_2) = (\bar{x}_1 + \bar{x}_2)$$

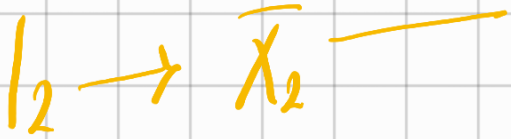
a	x_3	x_4	I_a
0	0	0	$x_1 \bar{x}_2$
1	0	1	$x_1 \oplus x_2$
2	1	0	$\bar{x}_2$
3	1	1	$\bar{x}_1 + \bar{x}_2$

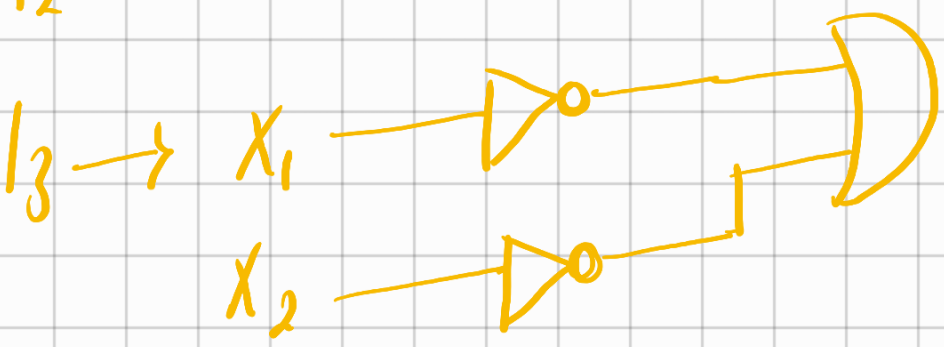



I2
I3
Mux
δ1
δ0
X3
X4


I0
X1
X2


I1
X1
X2


I2
X2


I3
X1
X2

Örnek 2 → Seçim uçlarını X_3, X_4 yerine X_1 ve X_2 yaparsak ne olur

(Bu sefer X_1 ve X_2 üzerinden parantezle alır içerdeki ifadelere bakarız)

↳ $\bar{X}_1\bar{X}_2$, $\bar{X}_1X_2$, $X_1\bar{X}_2$, X_1X_2

↳ $f \rightarrow \bar{X}_1\bar{X}_2(X_3\bar{X}_4 + X_3 + X_4) + \bar{X}_1X_2(\bar{X}_3X_4 + X_3X_4)$

$+ X_1\bar{X}_2(\bar{X}_3\bar{X}_4 + \bar{X}_3X_4 + X_3\bar{X}_4 + X_3X_4)$

$+ X_1X_2(0)$

→ $\bar{X}_1\bar{X}_2(X_3)(\bar{X}_4 + X_4) + \bar{X}_1X_2(X_4)(\bar{X}_3 + X_3)$

$(\bar{X}_4 + X_4) = 1$

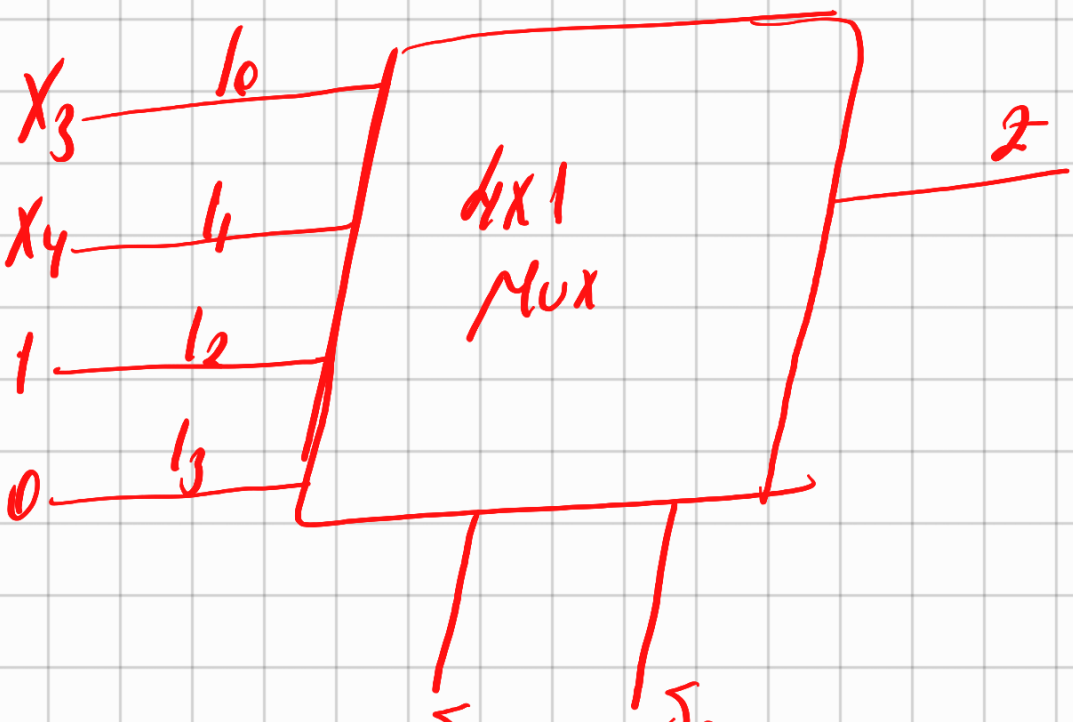
$X_1\bar{X}_2(\bar{X}_3)(\bar{X}_4 + X_4) + X_3(\bar{X}_4 + X_4)$

$\bar{X}_2 + X_3$

1

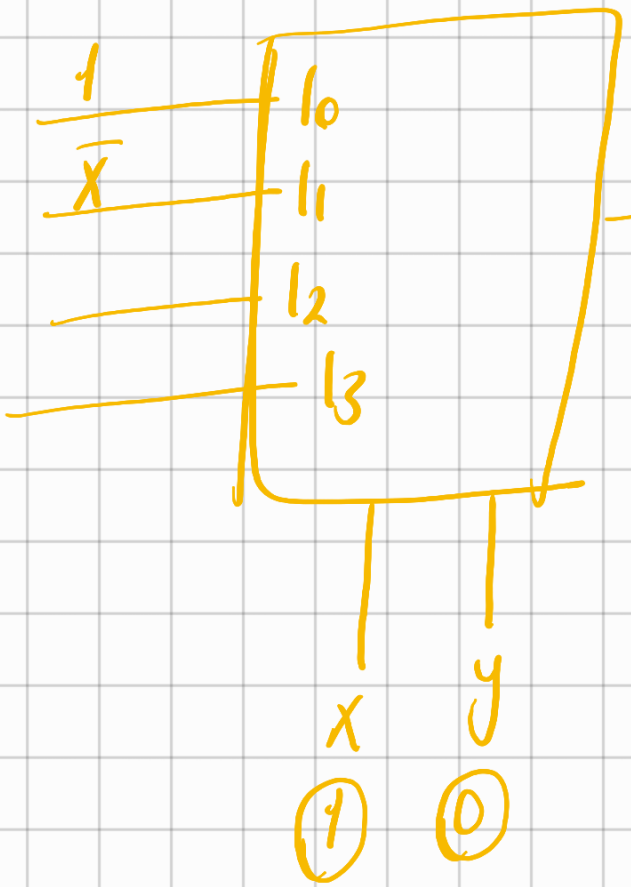
$\bar{X}_1 \bar{X}_2 X_3 + \bar{X}_1 X_2 X_4 + X \bar{X}_2 + X_1 X_2$ (0)

Q	X_1 X_2	I_Q
0	0 0	X_3
1	0 1	X_4
2	1 0	1
3	1 1	0



S_1 S_0

X_1 X_2



$\bar{x}$

$(x.y).1$

$(x\bar{y})\bar{x}$

$z = I_0(\bar{x}\bar{y}) + I_1(\bar{x}y)$

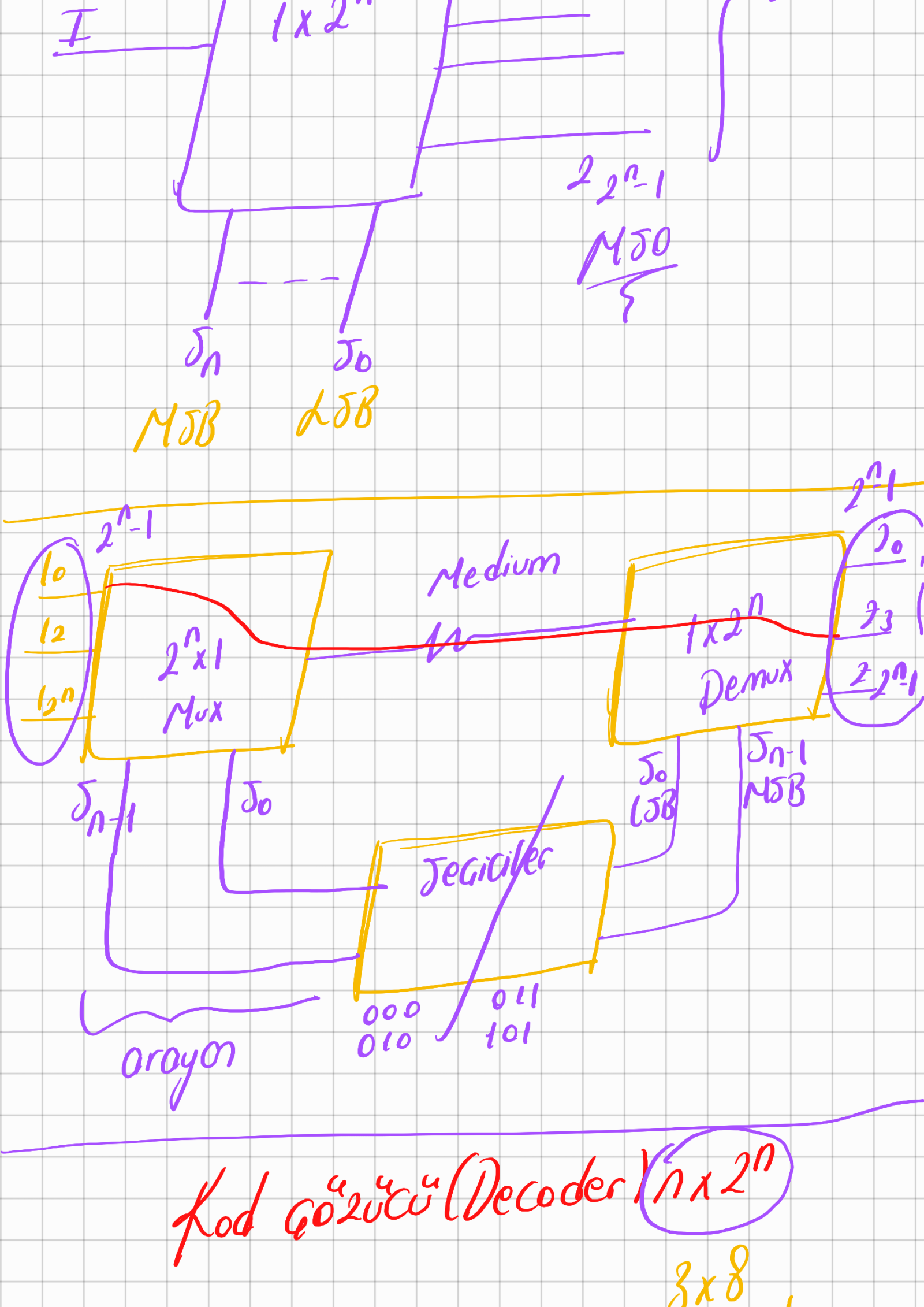
$I_2(x\bar{y}) + I_3(xy)$

$X_1' + X_3$

↳ Sınavlarda böyle de çıkabilir

Dağıtıcılar (Demultiplexer - Demux)

2^n z_0



Kod qo'zg'ich (Decoder) $n \times 2^n$

3x8

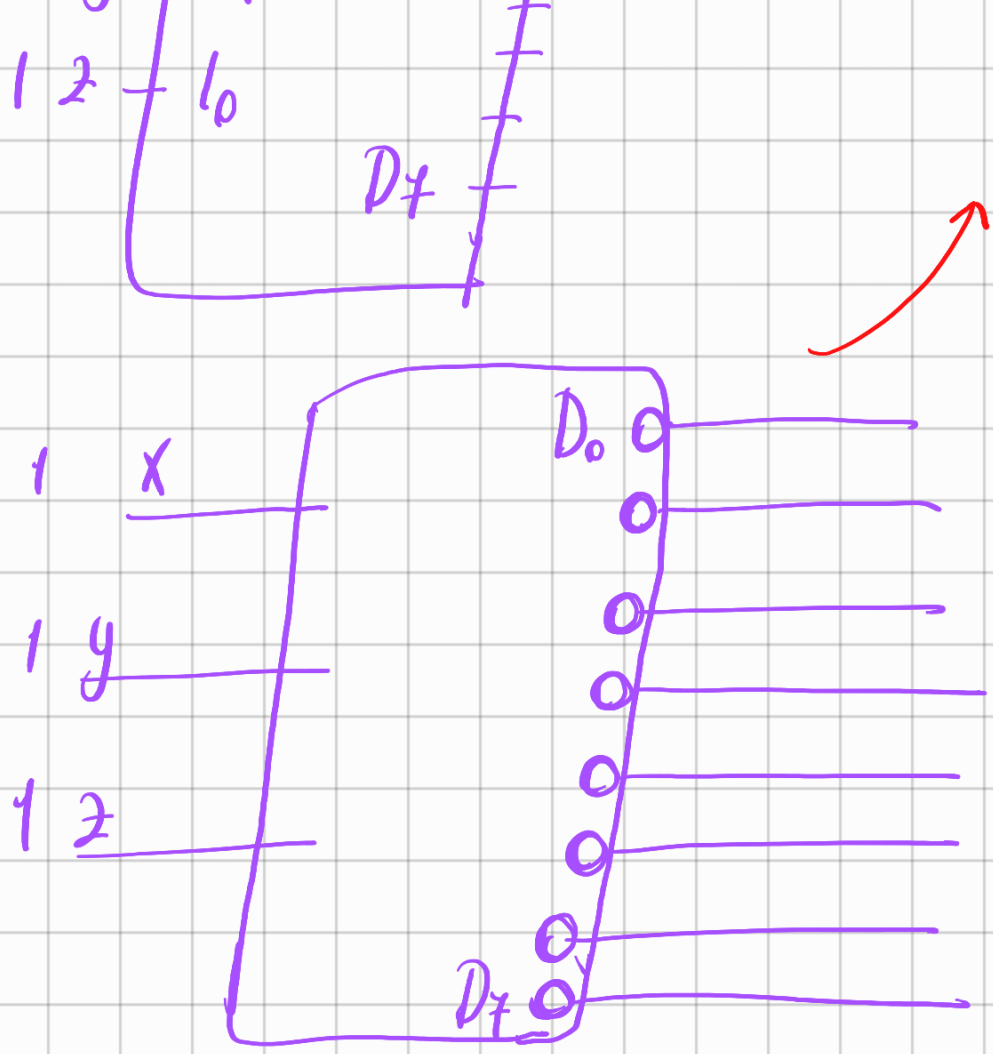
decoder
Mesela

↳ Sayısal değer | girişler x y z | çıkışlar $D_7\ D_6\ D_5\ D_4\ D_3\ D_2\ D_1\ D_0$

Sayısal değer	x y z	$D_7\ D_6\ D_5\ D_4\ D_3\ D_2\ D_1\ D_0$
0	0 0 0	0 0 0 0 0 0 0 1
5	1 0 1	0 0 1 0 0 0 0 0
7	1 1 1	1 0 0 0 0 0 0 0
	1 1 1	0 1 1 1 1 1 1 1

tümleyen mantığında 7 böyle olur

		D_0
1 x	I_2	
0 y	I_4	



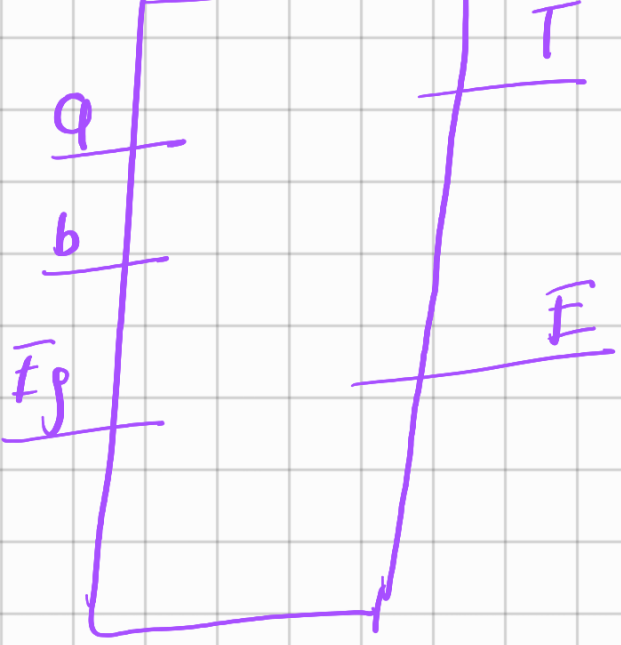
Örnek 1 tam toplayıcı Devre

toplam çıkışı (a, b, E_g) =

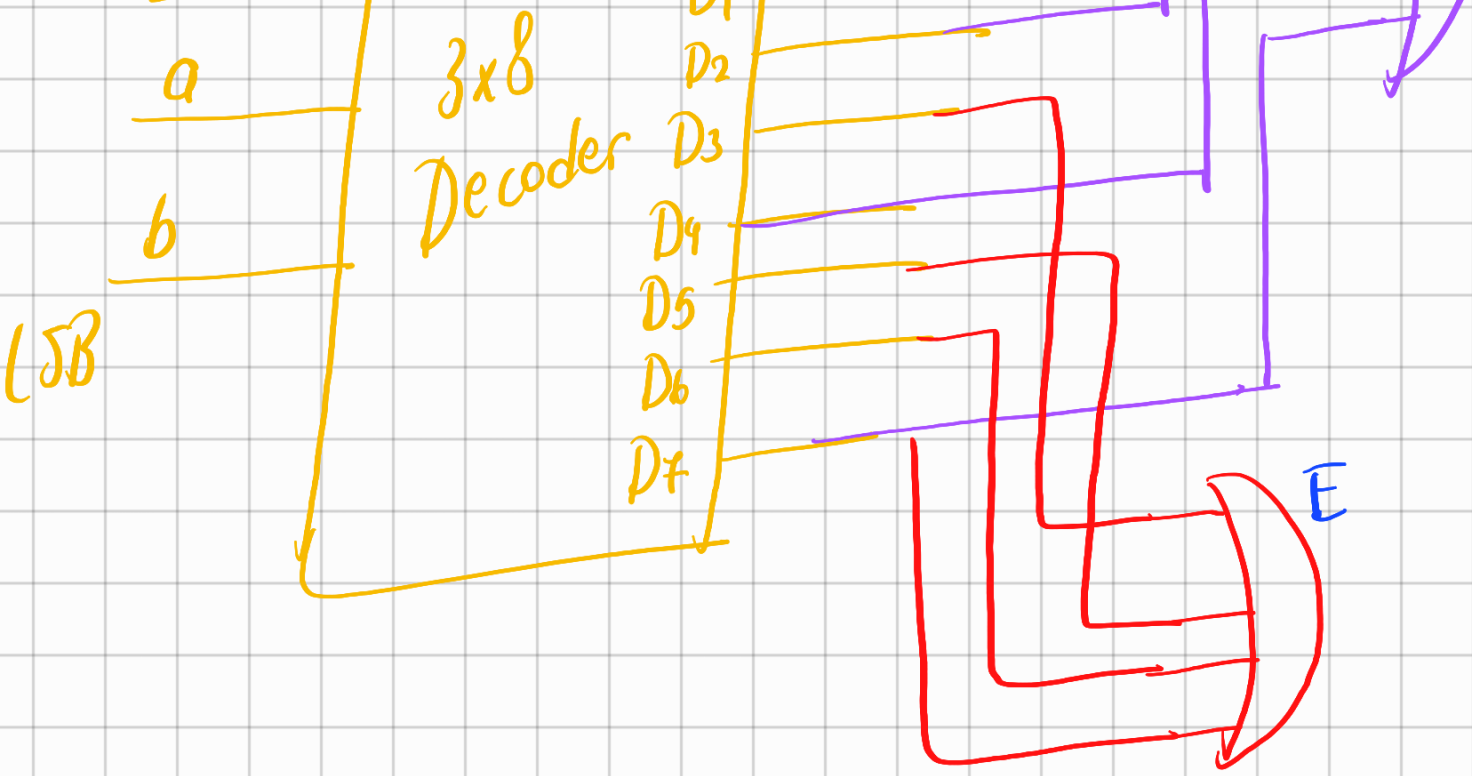
elde çıkışı (a, b, E_g)

→ $\sum(1,2,4,7)$'de toplam çıkışı 1 üretiyor

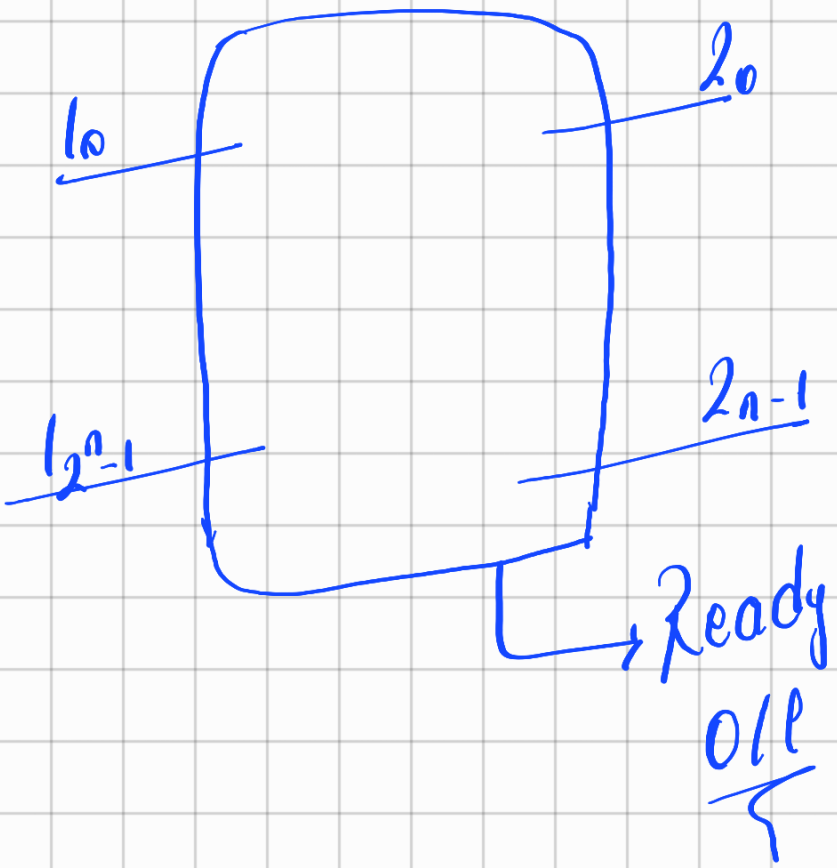
→ $\sum(3,5,6,7)$'de elde çıkışı 1 üretir



Es	a	b	T	E
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1



Kodlayıcı (Encoder) $2^n \times n$

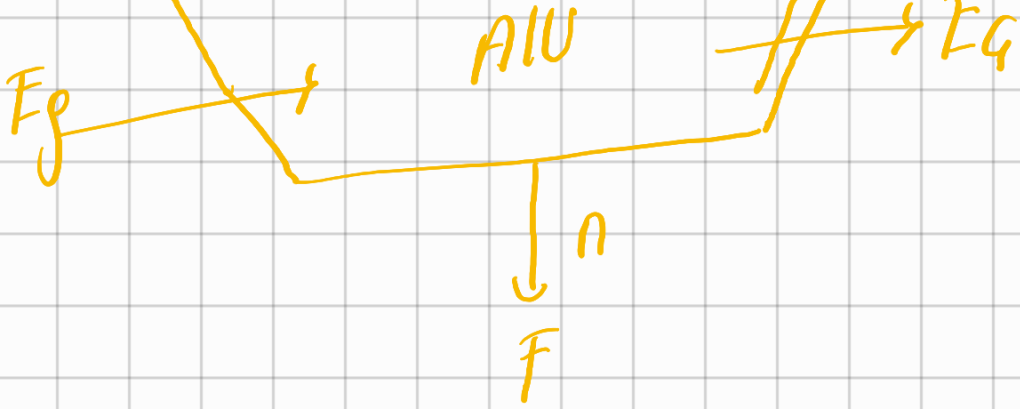


4x2 Encoder

girişler (MSB ... LSB) I_3 I_2 I_1 I_0	çıkışlar x	y	Hazır (ready)
0 0 0 0	Ø	Ø	0
0 0 0 1	0	0	1
0 0 1 Ø	0	1	1
0 1 Ø Ø	1	0	1
1 Ø Ø Ø	1	1	1

→ Bunlar ready'nin 1 olduğu yerler

Aritmetik logic Unit (ALU)



Örnek → Veri girişleri $\frac{A}{a_3 a_2 a_1 a_0}$ $\frac{B}{b_3 b_2 b_1 b_0}$

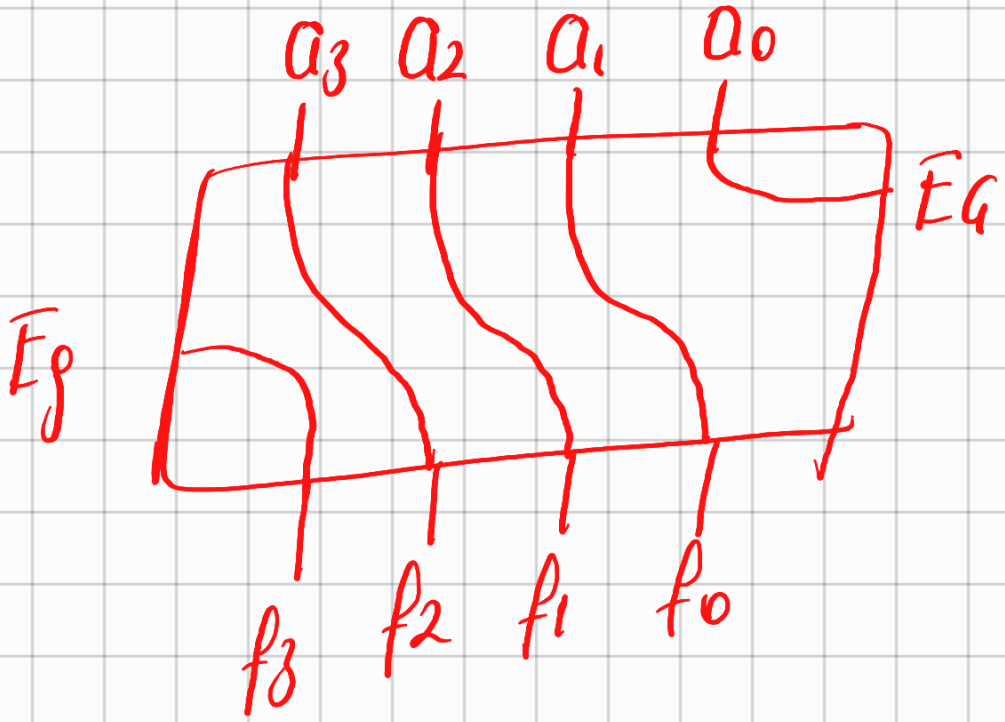
elde giriş çıkışları $E_g / E_ç$

Sonuç $F(f_3 f_2 f_1 f_0)$

İşlem Kodu $M(m_1 m_0)$ → $2^M = 4$ işlem tanımlanabilir

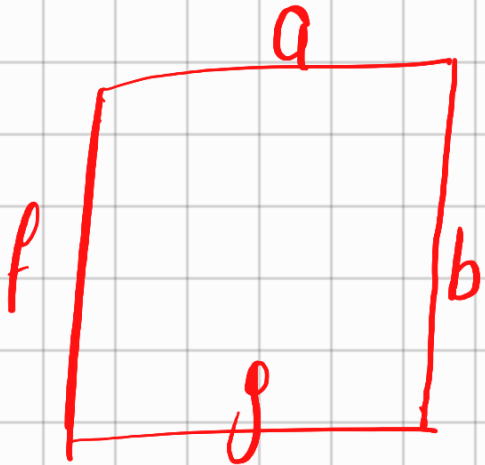
$m_1 m_0$	işlem	
0 0	$F = A + B$	toplama TT (tam toplayıcı)
0 1	$F = A - B$	çıkarma TÇ (tam çıkarıcı)
		$(A)^C$

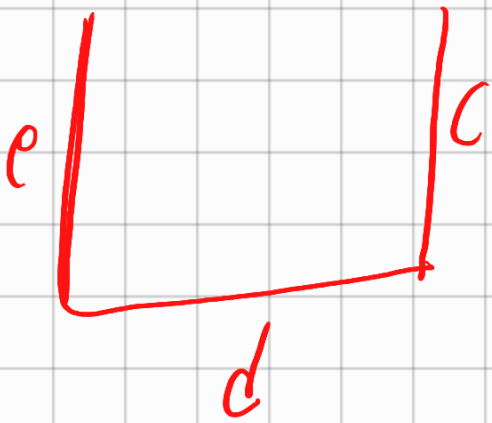
10	F=A	A'nın complement	(tümleyici)
11	$F=A_{1R}$	A 1 bit shift right (ötelegici)	

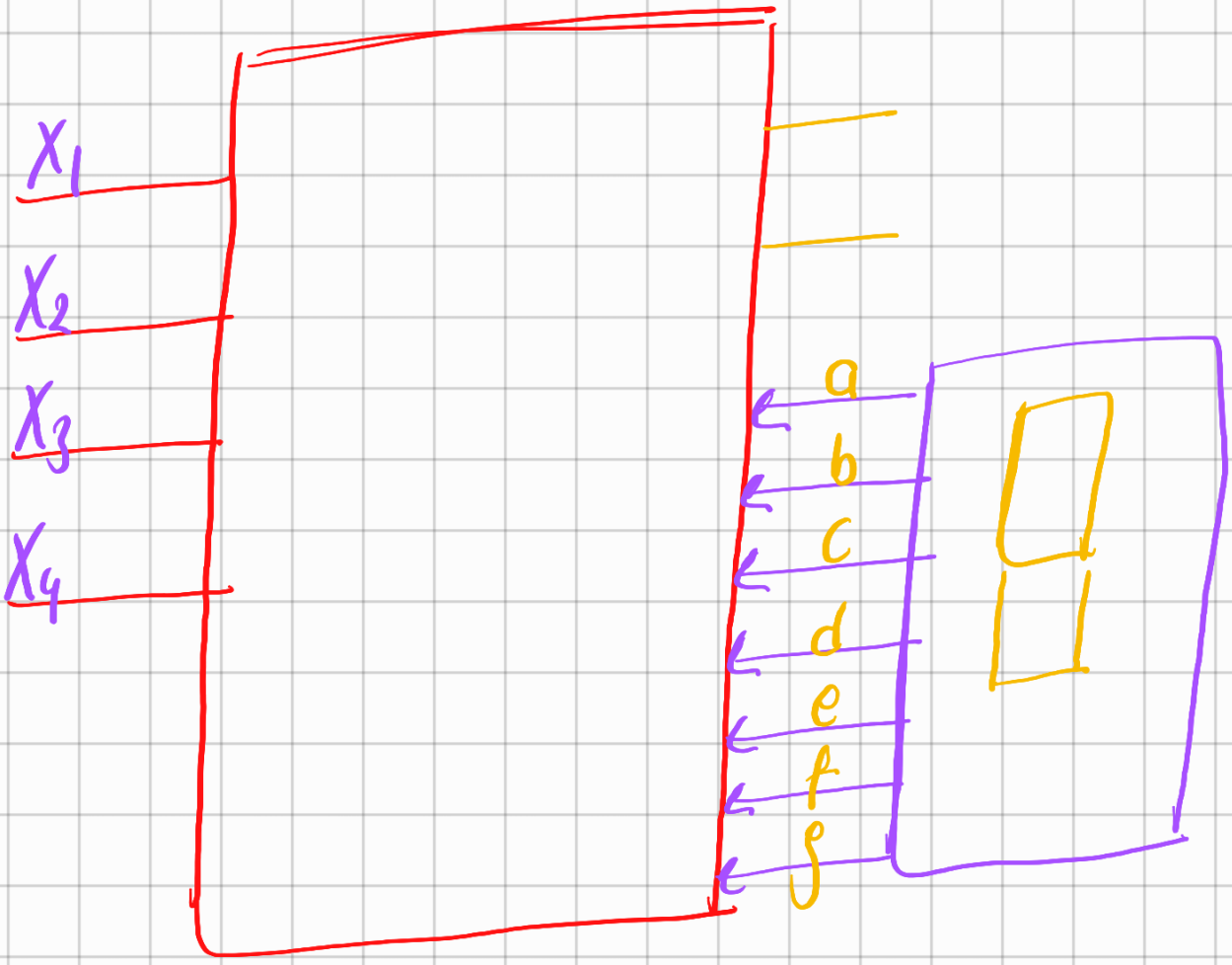


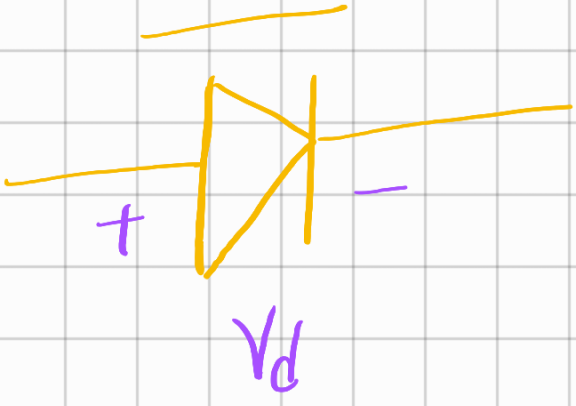
Burda bir şey var

7 segment display









V_d

$V_d > 0$ ise ışık verir

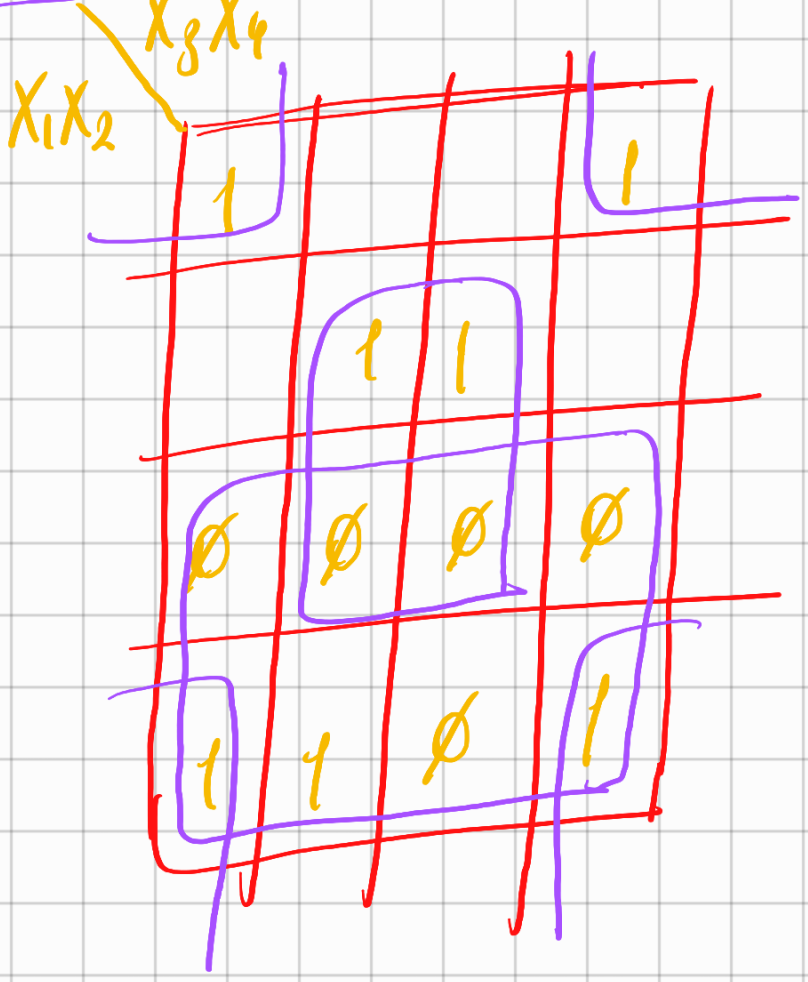
10 sayı

$2^3 \rightarrow 8$

$2^4 \rightarrow 16$

↳ 6 boşa çıkar

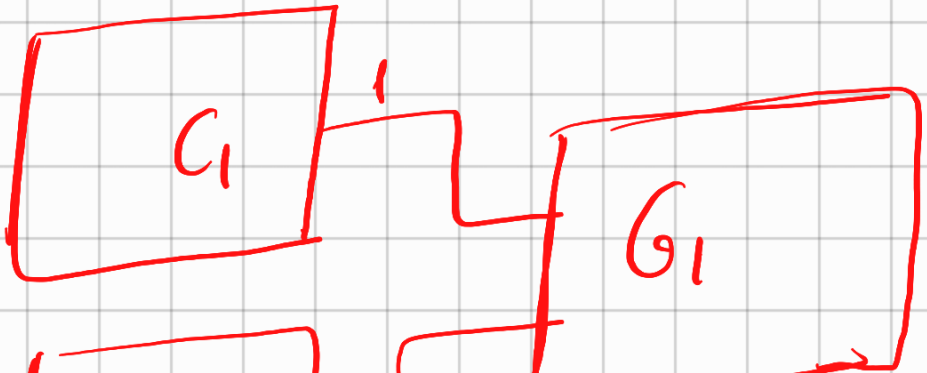
giriş				çıkışlar							
x_1	x_2	x_3	x_4	a	b	c	d	e	f	g	
0	0	0	0	1	1	1	1	1	1	0	
0	0	0	1	0	1	1	0	0	0	0	
⋮											
1	0	0	1	1	1	1	1	0	1	1	→ yazabilceğimiz en büyük sayı
1	0	1	0	ø	ø	ø	ø	ø	ø	ø	
⋮											
1	1	1	1	ø	ø	ø	ø	ø	ø	ø	

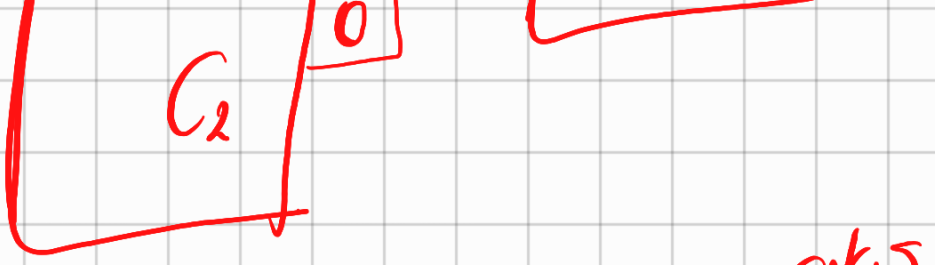


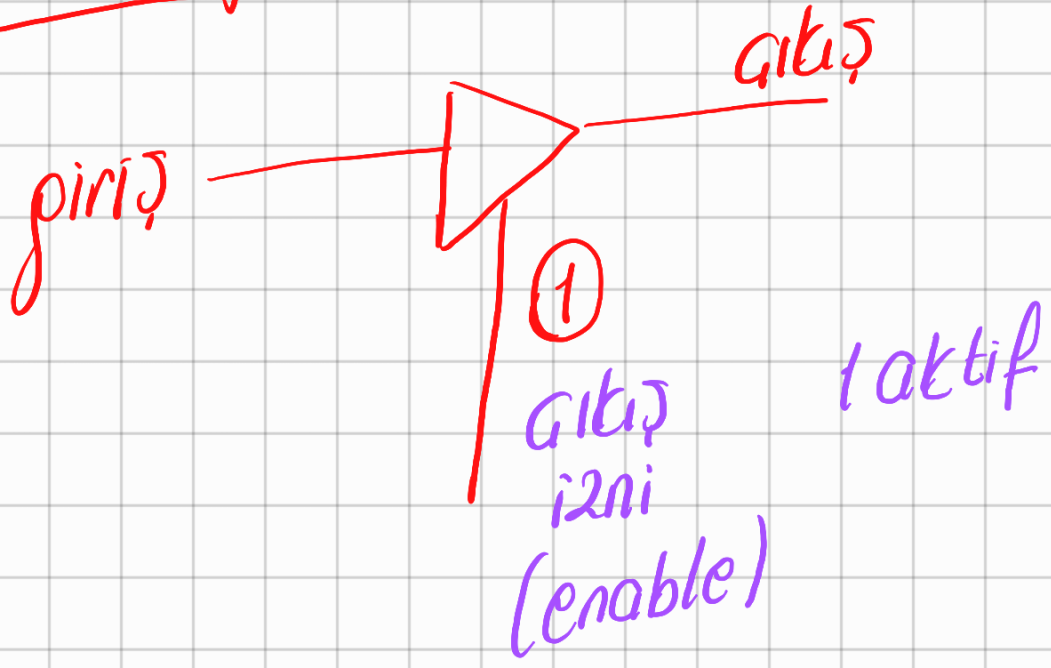
↳ a → $X_1 + \overline{X_2}\,\overline{X_4} + X_2X_4$

↳ $X_1 + X_2 \odot X_4$

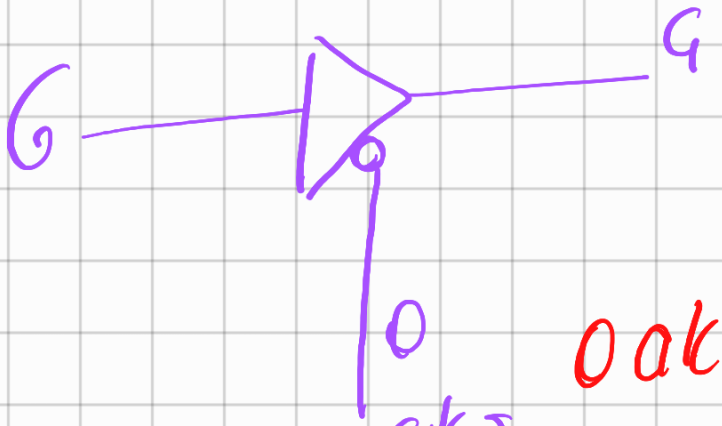
Beffer (tampon)







Çıkış izni	giriş	Çıkış
0	0	YE
0	1	
1	0	0
1	1	1

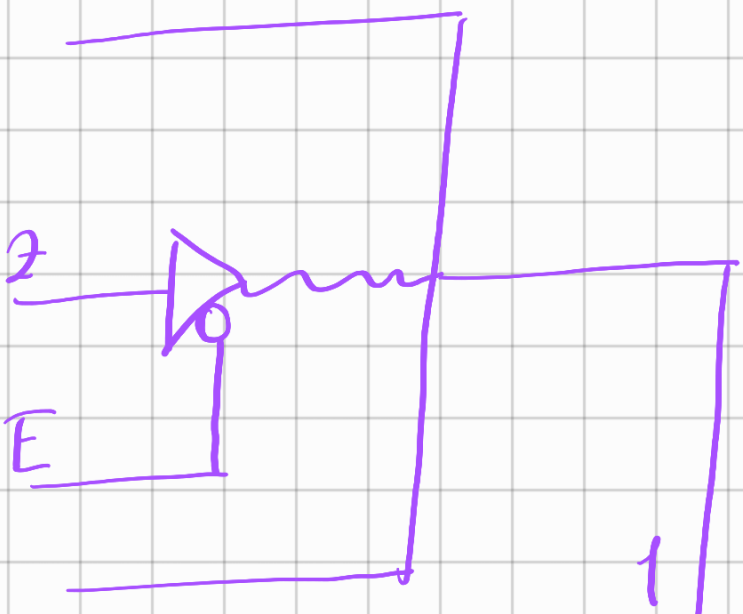


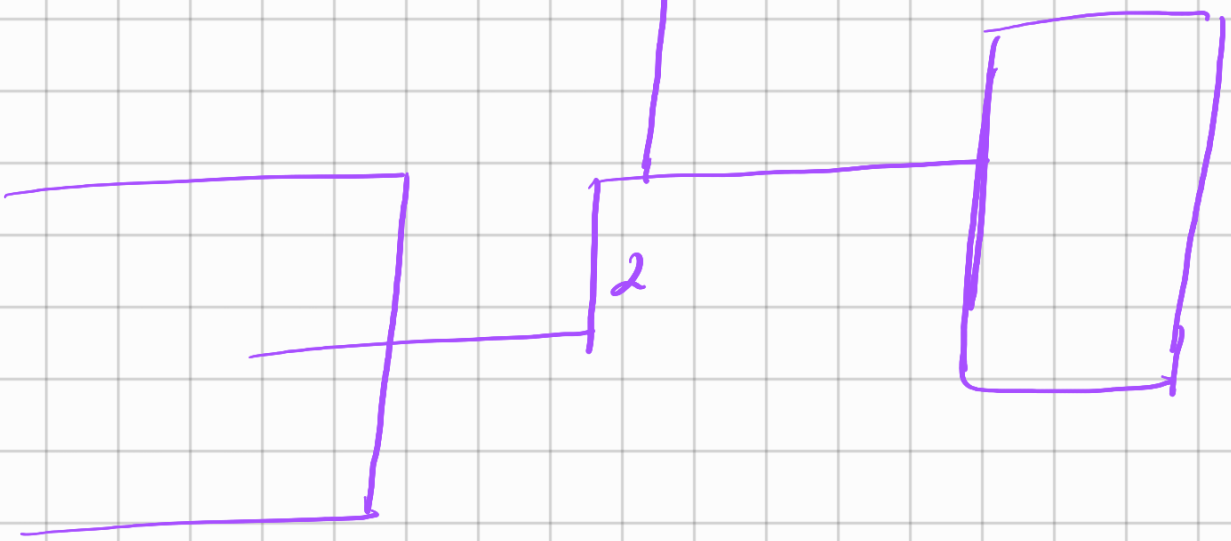
Çıkış izni

Çıkış izni	giriş	Çıkış
0	0	0
0	1	1
1	0	yüksek empedans
1	1	yüksek empedans

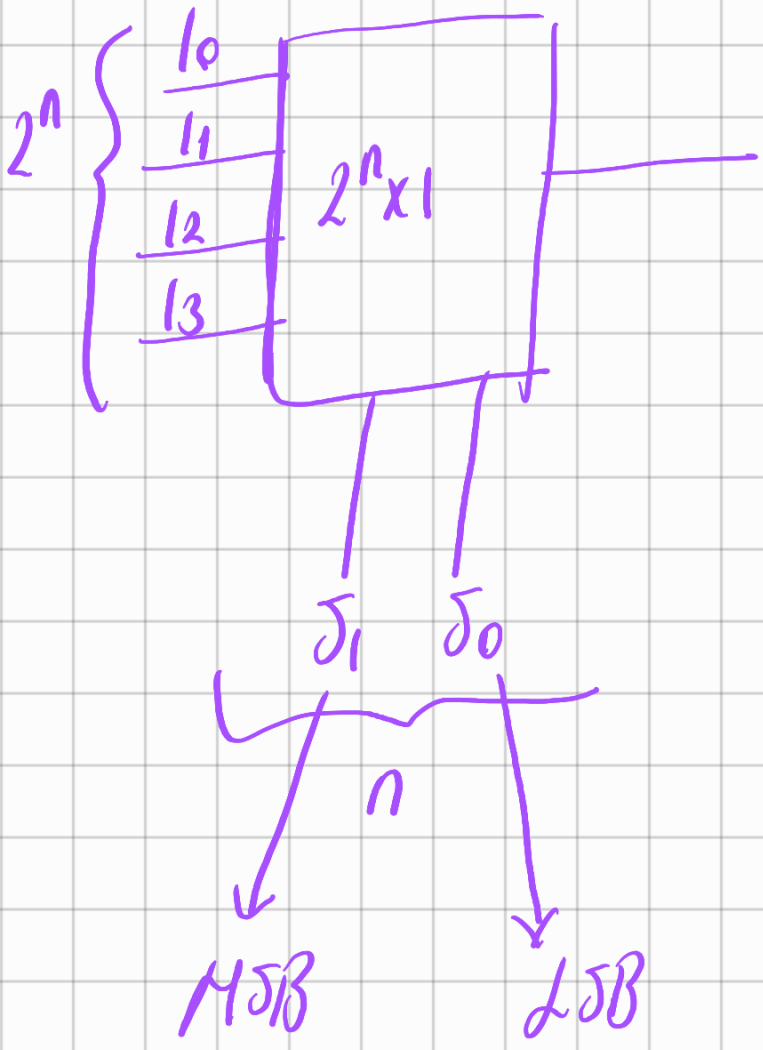
↳ yüksek empedans demek akım akmıycak demek

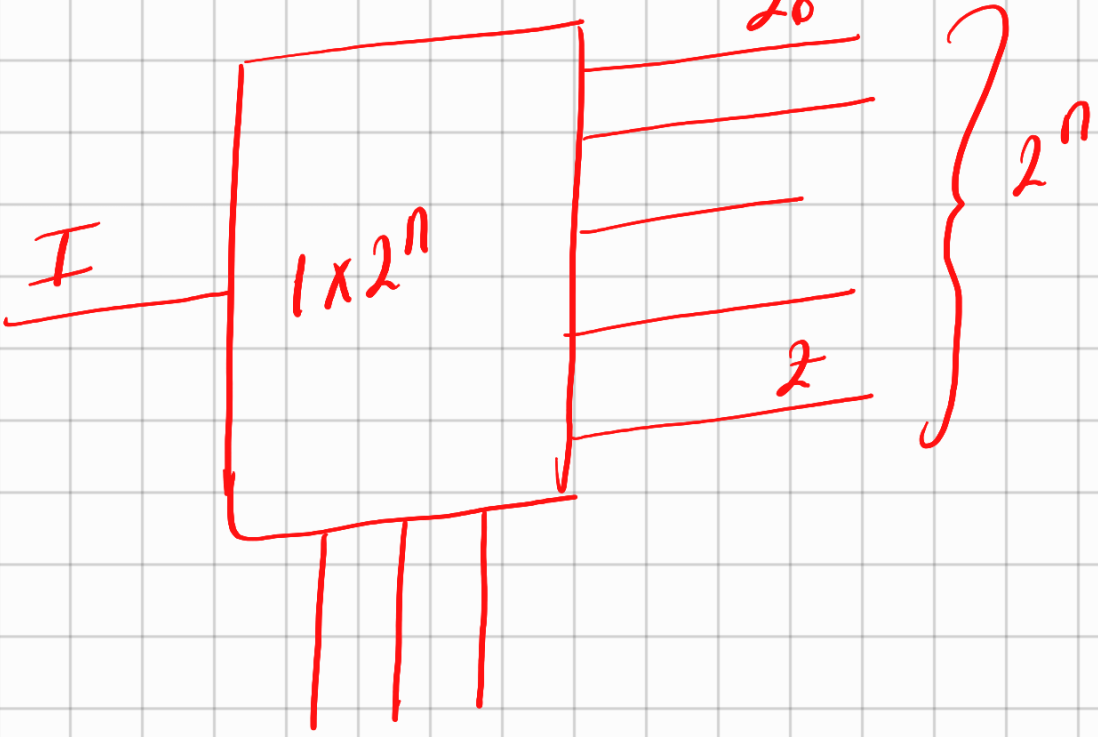
1- Bufferlar
2- Pull up direnci





Geçen Dersin Kayıtları





Sum Carry

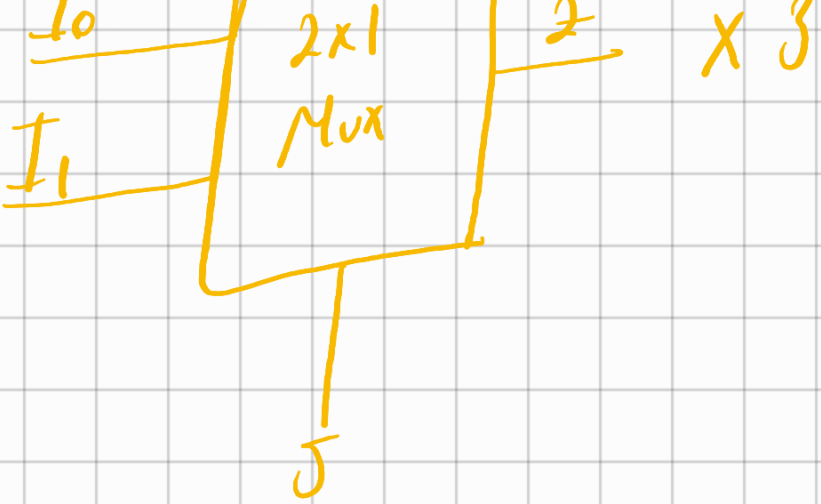
X	Y	T	E
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

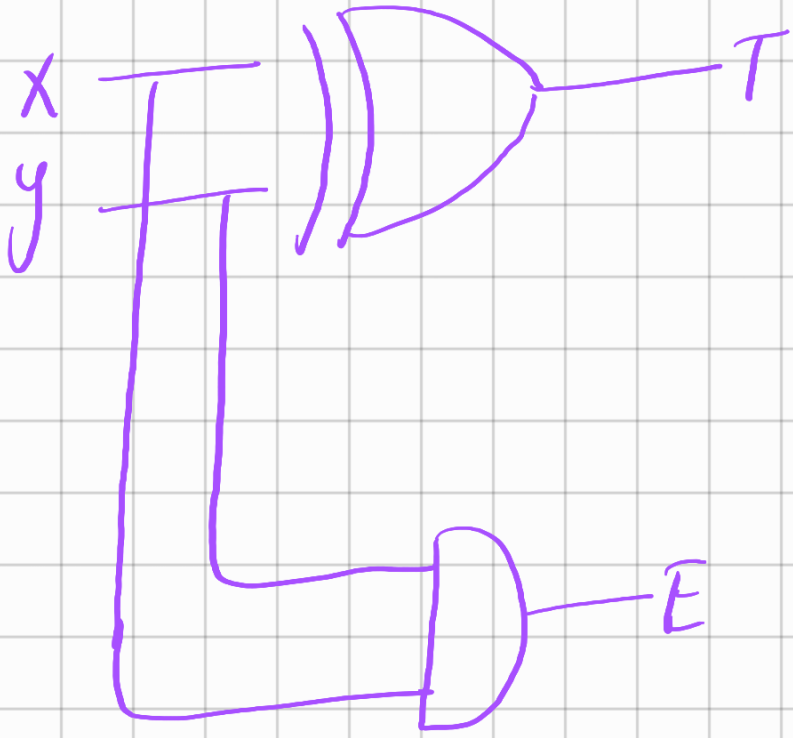
↳ XY → Yarı toplayıcı örneği

↳ XOR

Örnek

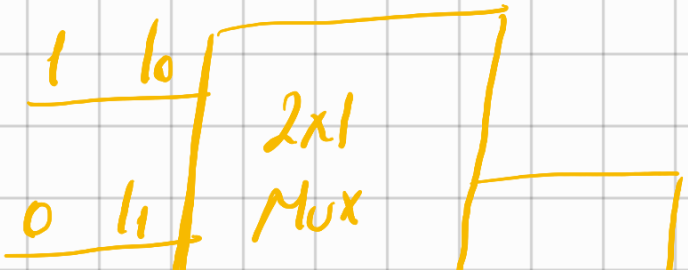
Örnek 3 tane 2x1 Mux kullanarak yarı toplayıcı gerçekleyiniz

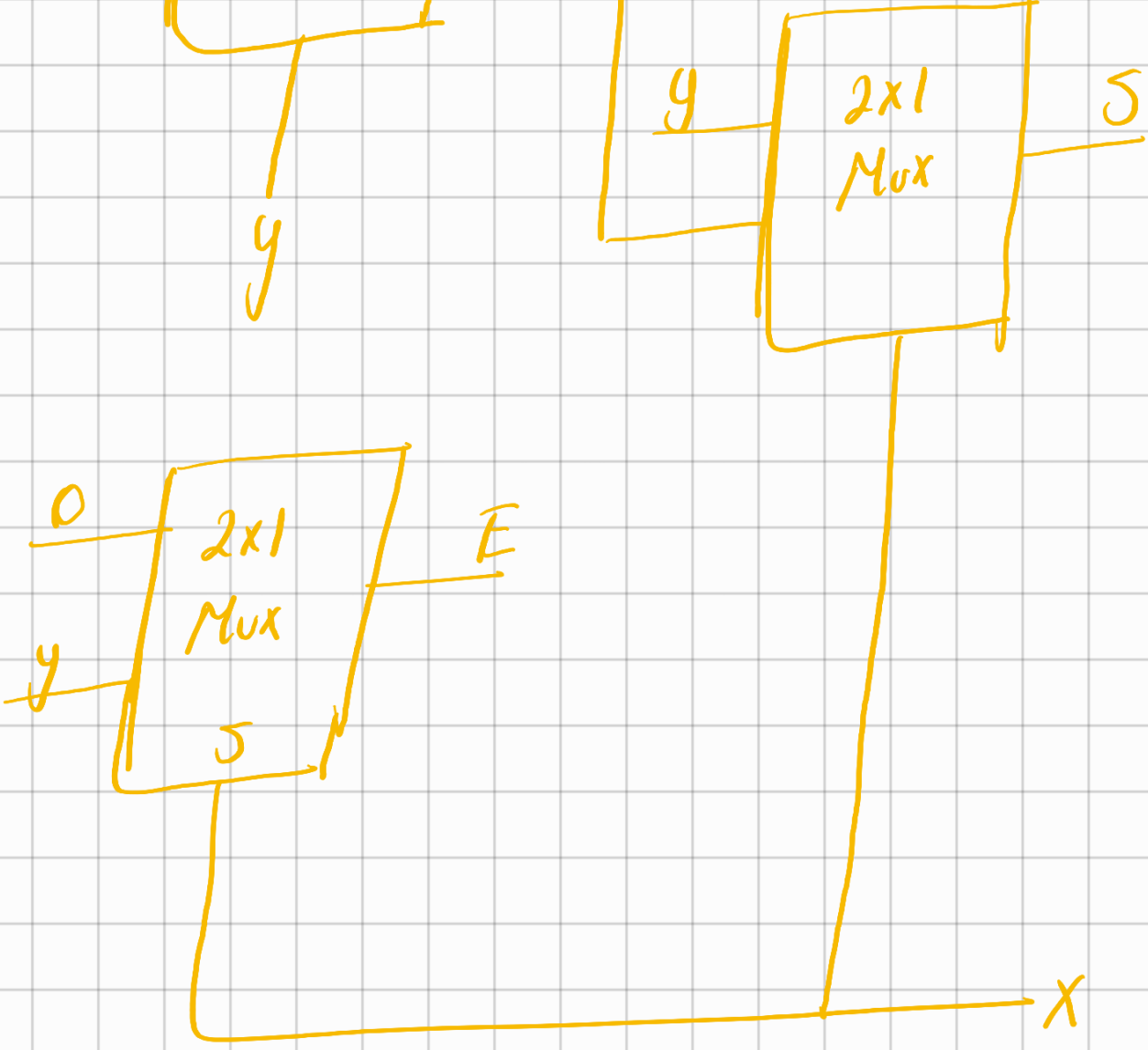




X	y
0	1

Gözəm





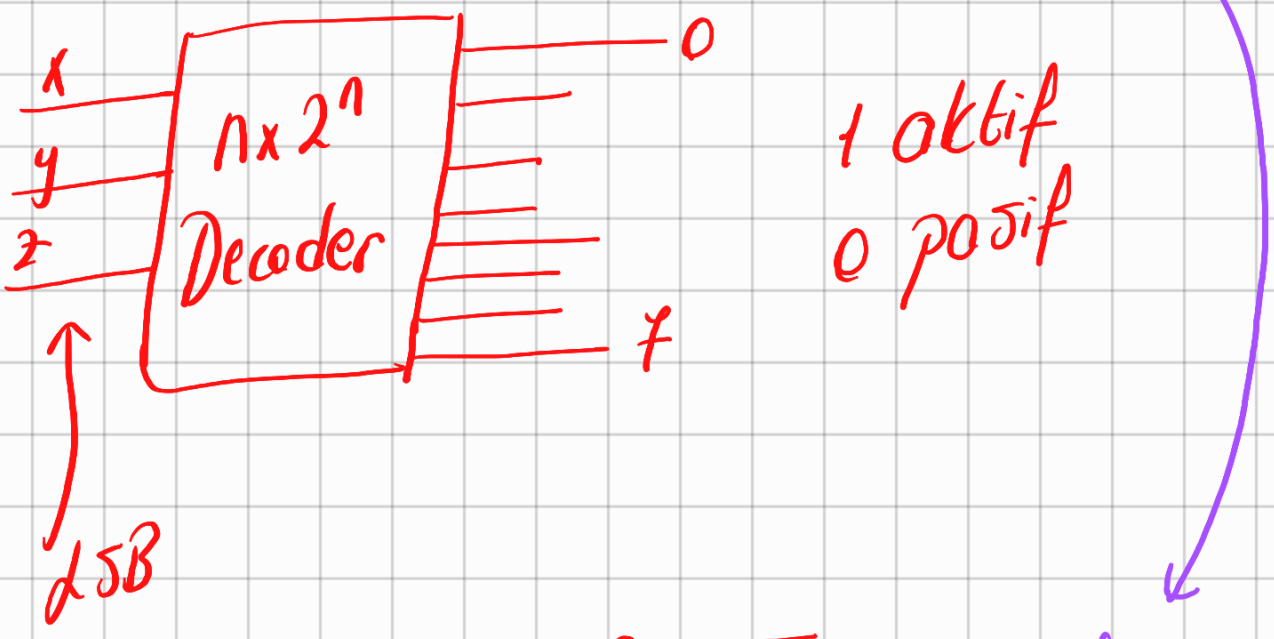
④ Kod gözüü (Decoder)

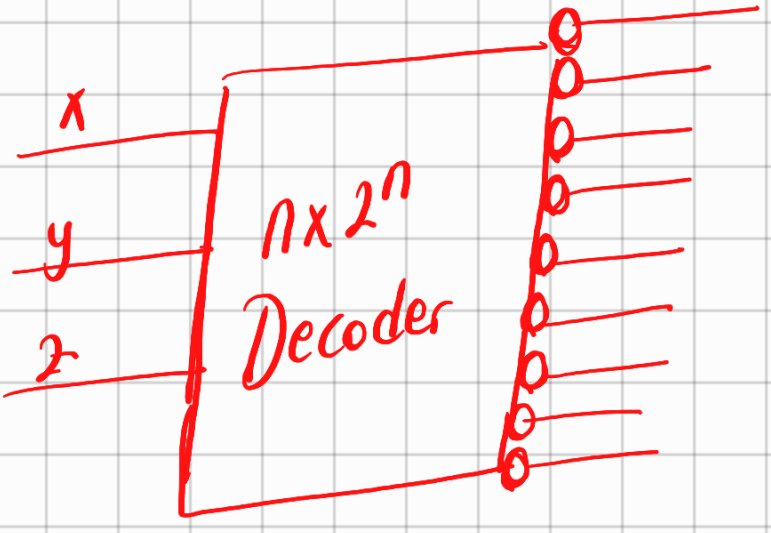
$n=3$

X	y	z	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0

110 / 10111111

tümleyen çıkışlı





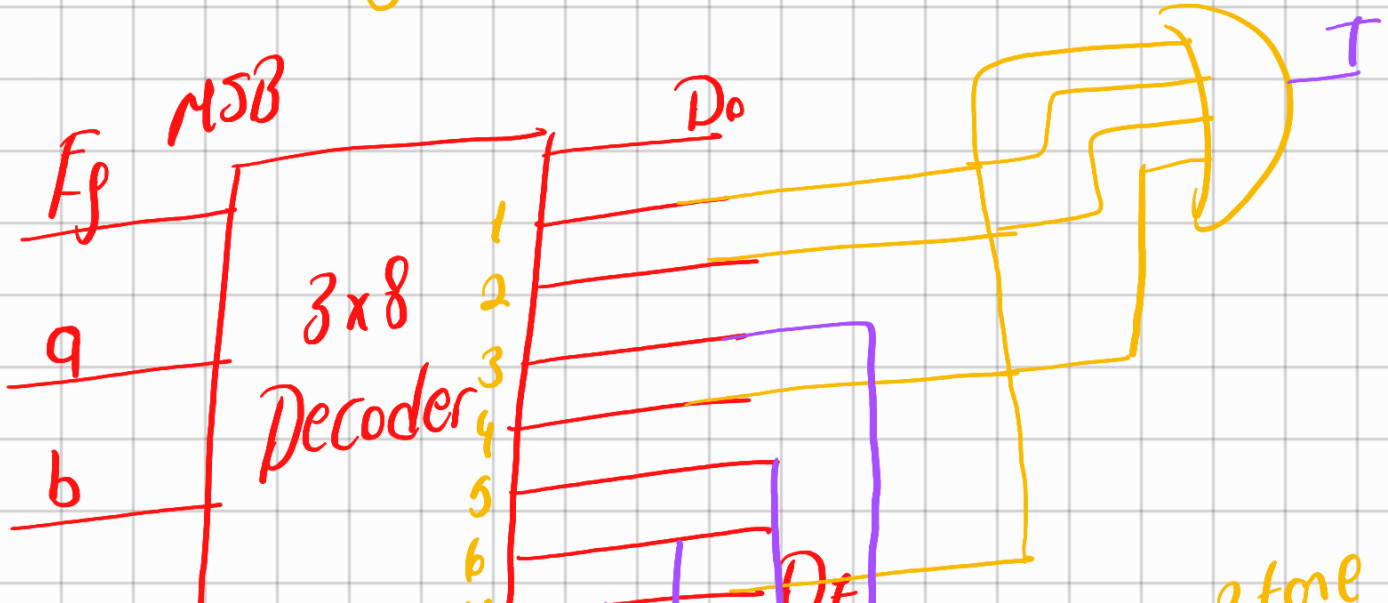
tümleyen çıkışlı

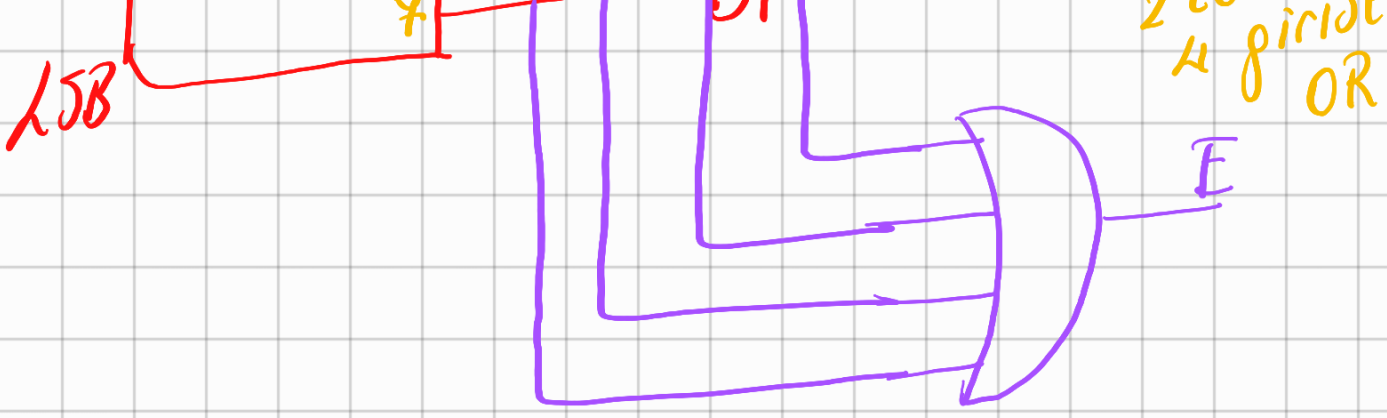
Ör Tam toplayıcıyı Kod çözücü kullanarak tasarlayınız

E_g	a	b	T	E
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$$T(E_g, a, b) \rightarrow \sum (1,2,4,7)$$

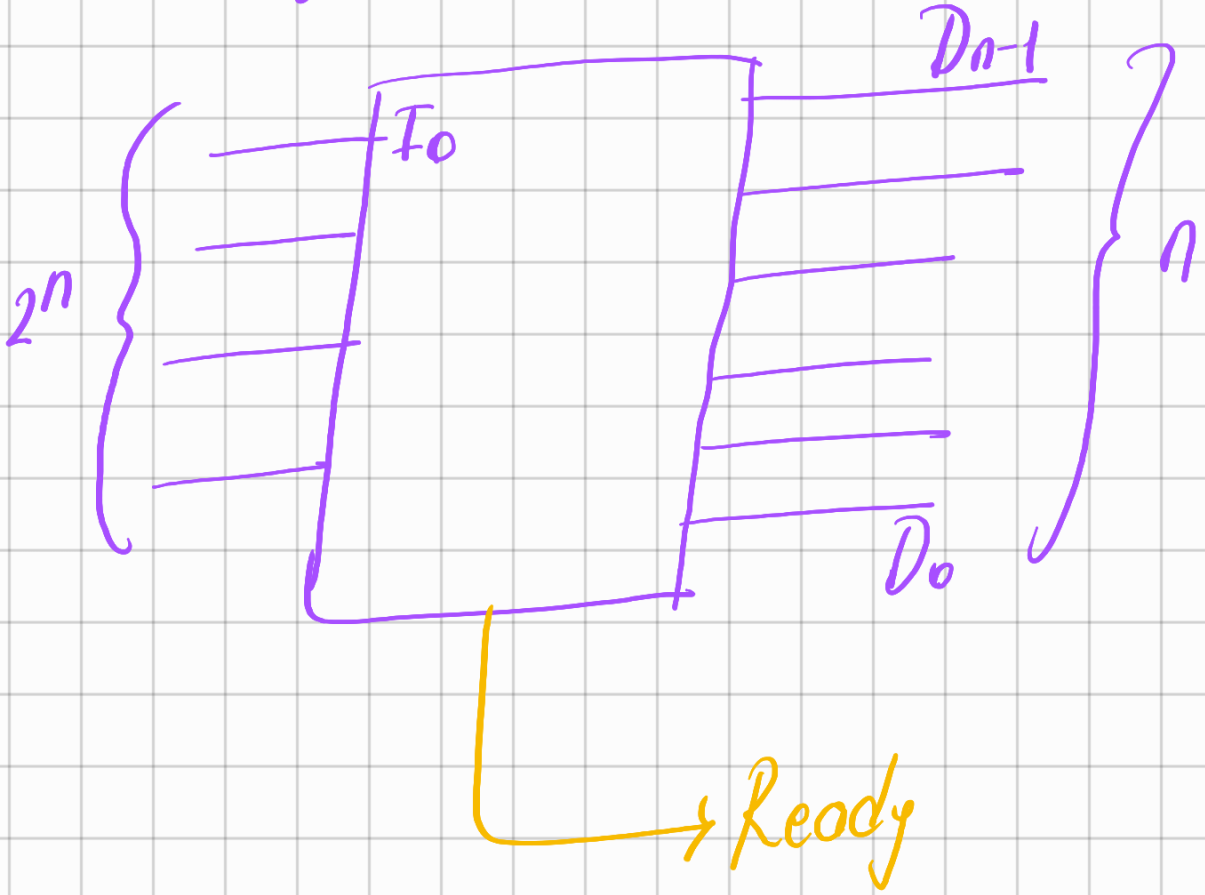
$$E(E_g, a, b) \rightarrow \sum (3,5,6,7)$$





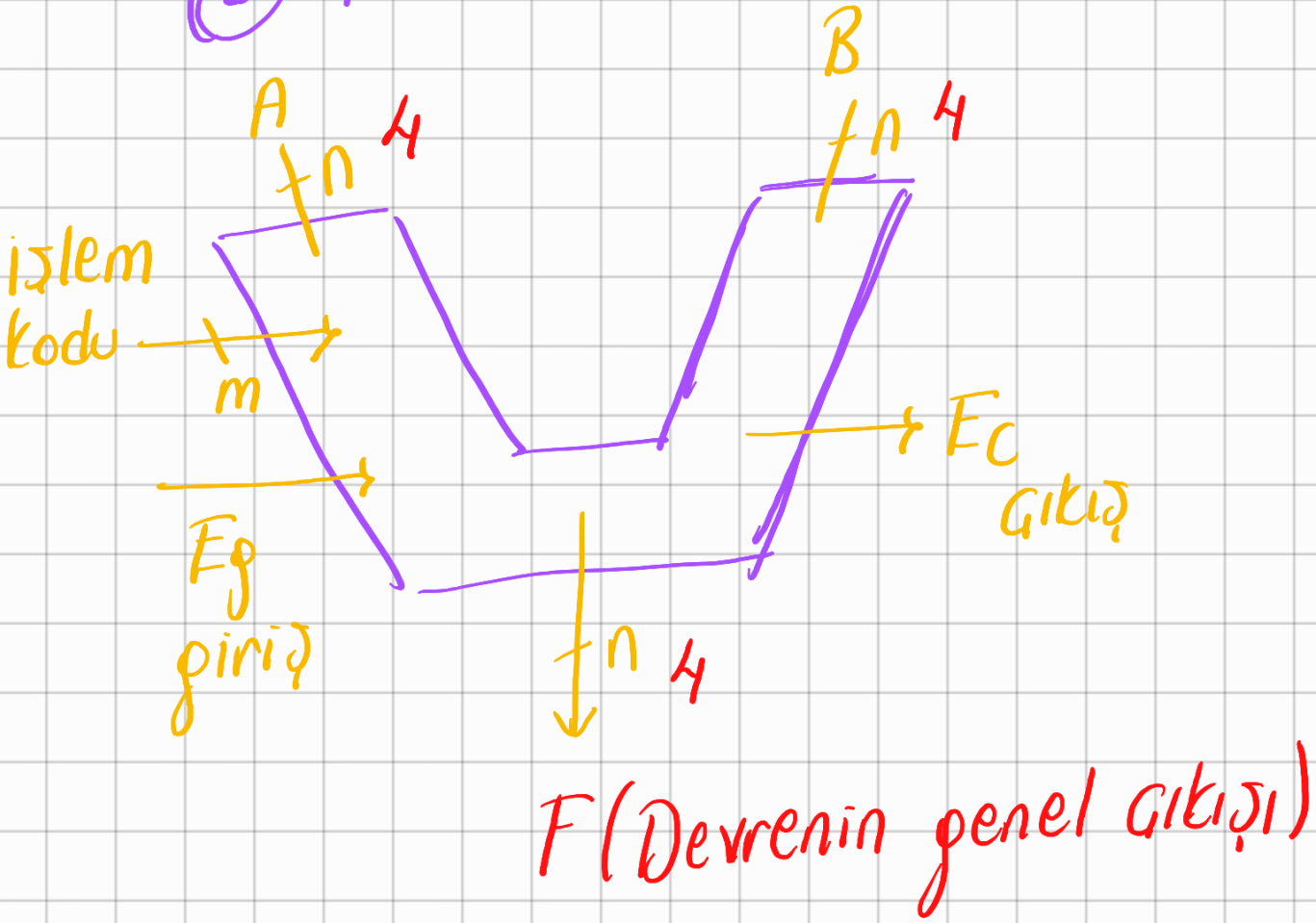
⑤ Kodlayıcı (Encoder)

2^n giriş, n çıkış



I_3 I_2 I_1 I_0	D_1 D_2	Ready
0 0 0 0	Ø Ø	0
0 0 0 1	0 0	1
0 0 1 Ø	0 1	1
0 1 Ø Ø	1 0	1
1 Ø Ø Ø	1 1	1

⑥ ALU (Arithmetic Logic UNIT)



F (Devrenin genel çıkışı)