8. Boolean Algebra

Bazı Kurallar

$$A + AB = A$$

İspat:

A (1 + B) // (1 +B) ifadesinin her durumda 1 e eşit olduğunu hatırlayın

= A (1) = A

Bazı Kurallar

$$A + \bar{A}B = A + B$$

İspat:

A + A'B = A + B

A + AB + A'B = A + B

// A yerine A + AB yazabileceğimizi hatırlayın

A + B (A + A') = A + B

// (A + A') yerine 1 yazabiliriz

= A + B (1) = A + B

Bazı Kurallar

$$(A + B)(A + C) = A + BC$$

İspat:

$(A + B)(A + C) = AA + AC + BA + BC$,

// AA = A olduğunu hatırlayın

$= A + AC + BA + BC$

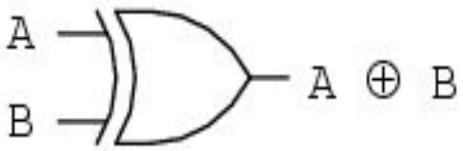
// A + AC = A olduğundan

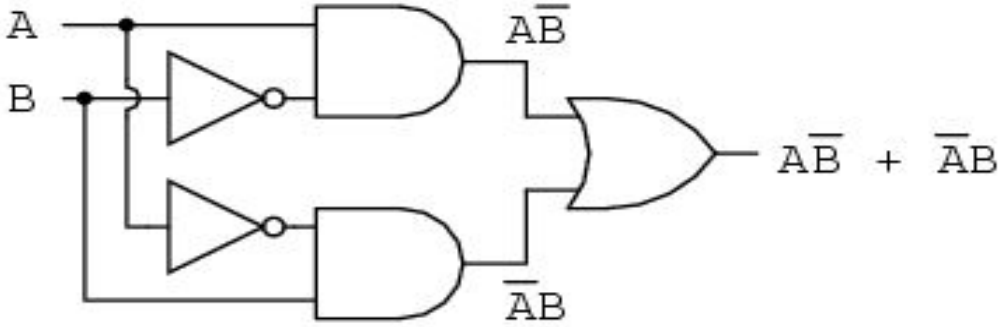
$= A + AB + BC$

// yine A + AB = A olduğundan

$= A + BC$

Exclusive OR (Özel Veya) işlemi



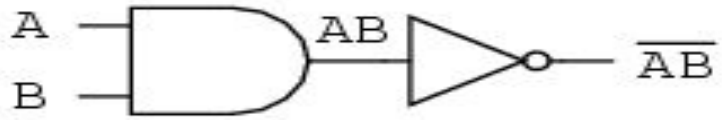


$$A \oplus B = A\overline{B} + \overline{A}B$$

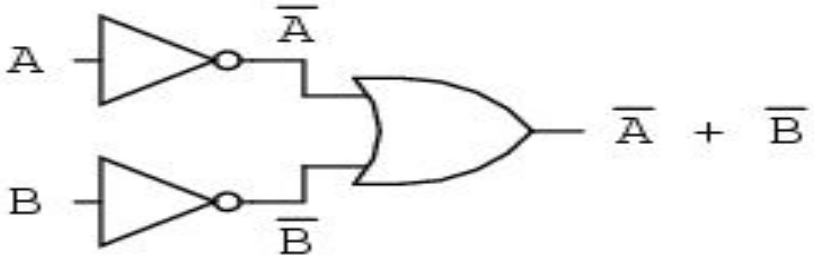
De Morgan Teoremleri

Teorem-1	$\overline{\overline{A.B}} = \overline{A} + \overline{B}$
Teorem-2	$\overline{A + B} = \overline{A}.\overline{B}$

De Morgan Teoremleri - 1



. . . is equivalent to . . .

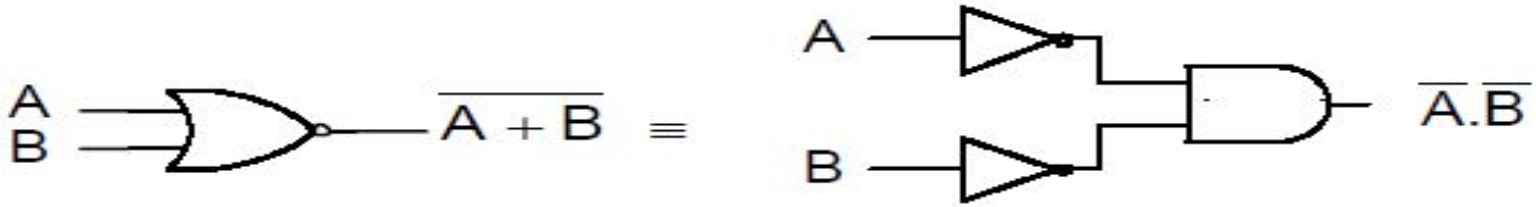


$$\overline{AB} = \overline{A} + \overline{B}$$

A	B	$\overline{A.B}$	$\overline{A} + \overline{B}$
0	0	1	1
0	0	1	1
1	0	1	1
1	1	0	0

De Morgan Teoremleri - 2

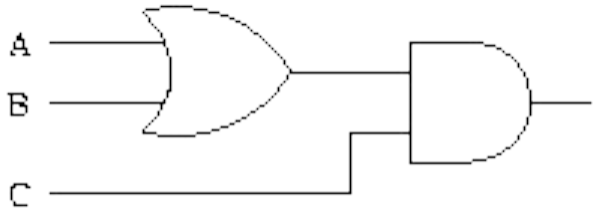
$$\overline{A+B} = \overline{A}.\overline{B}$$



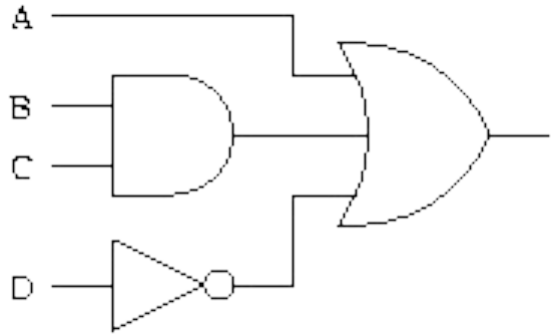
A	B	$\overline{A+B}$	$\overline{A}.\overline{B}$
0	0	1	1
0	0	0	0
1	0	0	0
1	1	0	0

Örnek-Logic Devre Çizim

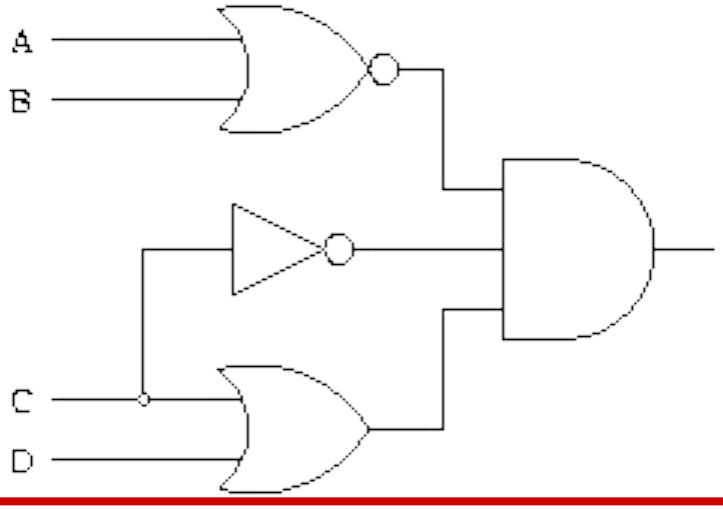
- $(A+B)C$



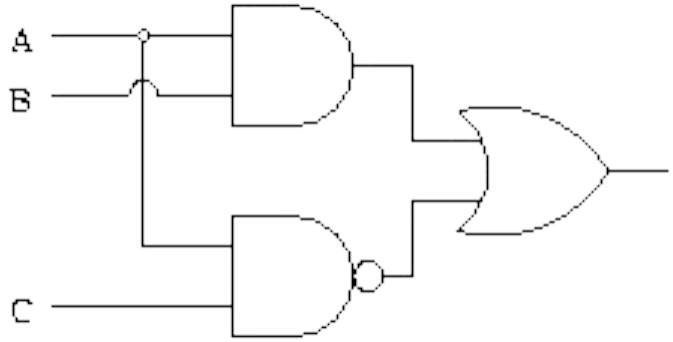
- $(A+BC)+\overline{D}$.



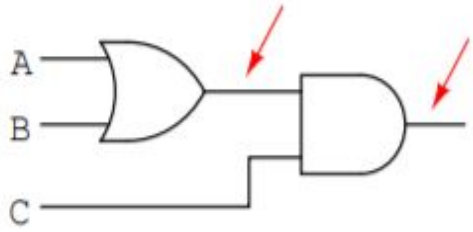
- $\overline{(A + B)}(C + D)\overline{C}$

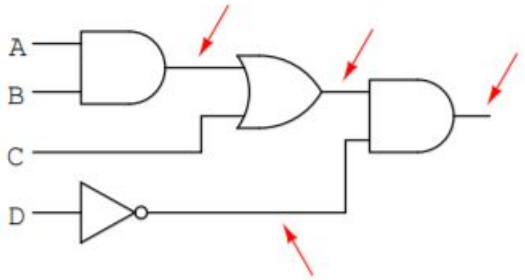


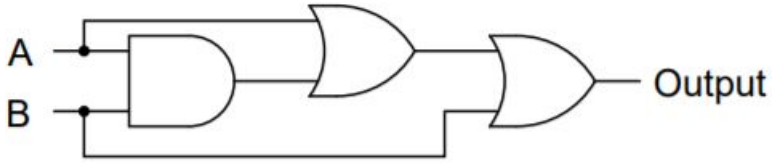
- $AB+\overline{AC}$

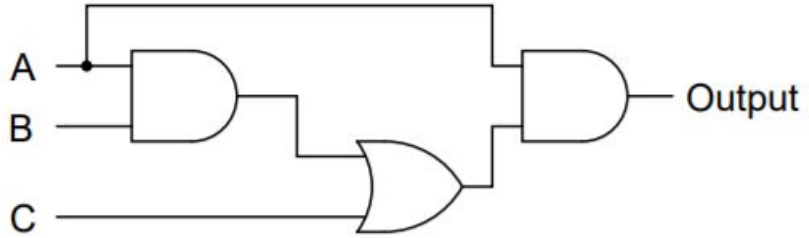


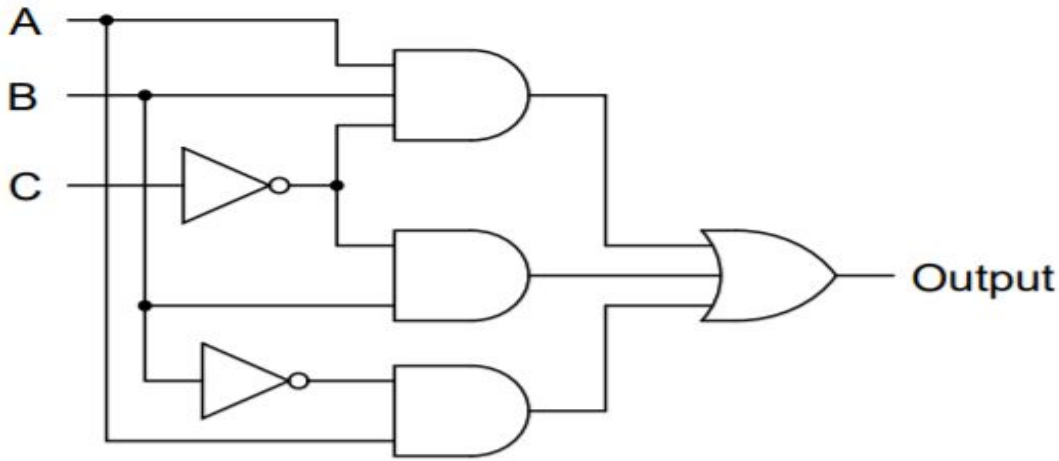
Örnek-Logic Devre Çizim











Örnek-Logic Devre Çizim

$$A\overline{B} + \overline{C}(A + B)$$

$$\text{Output} = \overline{A} + B$$

A	B	Output
0	0	
0	1	
1	0	
1	1	

$$\text{Output} = A + \overline{A}B$$

A	B	Output
0	0	
0	1	
1	0	
1	1	

Örnek-Logic Devre Çizim

$$\text{Output} = \overline{A} + \overline{B} + C$$

A	B	C	Output
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

$$\text{Output} = A(B + AC + \overline{A})$$

A	B	C	Output
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Örnek

- Bir otomotiv mühendisi, sürücü kontağını "marş" konumuna getirirken sürücü debriyaj pedalına basmadıkça, motorun çalıştırılmasını engelleyen bir mantık devresi tasarlamak ister.

- Doğruluk tablosunu oluşturun.
- Fonksiyonu Yazın.
- Logic devresini çizin.

Örnek

- Bir odada 3 tane kapı ve her kapının yanında 1 tane anahtar var.

1. Bütün anahtarlar açıkken lamba yanmasın.
2. Sadece bir anahtar kapalıyken lamba yansın.
3. Herhangi 2 anahtar kapalıyken lamba yanmasın.
4. 2 anahtar kapalıyken 3. anahtar da kapatılırsa lamba yansın.

- Doğruluk tablosunu oluşturun.
- Fonksiyonu Yazın.
- Logic devresini çizin.

Örnek

- Elimizde 3 adet buton var. Bu butonlardan herhangi 2 tanesine aynı anda basılınca bir led yanmalıdır. Üçüne aynı anda bastığımızda yanmasın. Hiç birine basmadığımız zamanda yanmasın. Gerekli lojik devreyi tasarlayın.

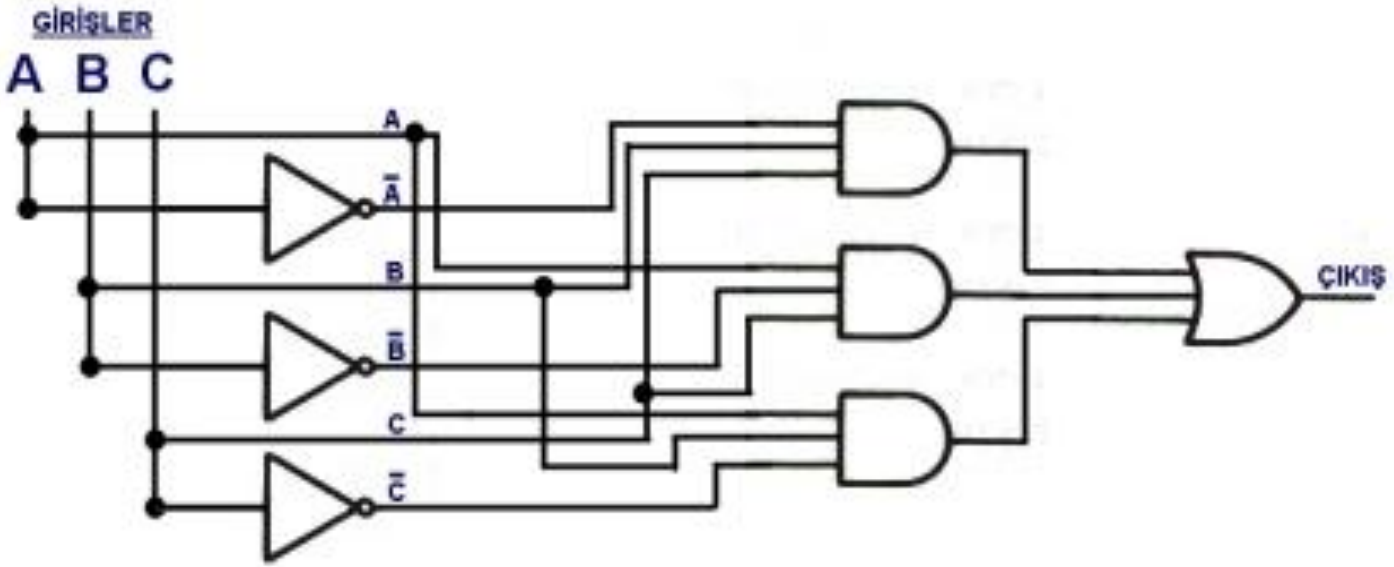
Doğruluk Tablosu

DURUM	A	B	C	Çıkış
1	0	0	0	0
2	0	0	1	0
3	0	1	0	0
4	0	1	1	1
5	1	0	0	0
6	1	0	1	1
7	1	1	0	1
8	1	1	1	0

Örnek Devrenin BOOLE Cebiri ile gösterilişi

$$Z = \underbrace{(\bar{A}.B.C)}_{\text{4.DURUM}} + \underbrace{(A.\bar{B}.C)}_{\text{6.DURUM}} + \underbrace{(A.B.\bar{C})}_{\text{7.DURUM}}$$

ÖRNEK DEVRENİN MANTIK KAPILARI İLE GÖSTERİLİŞİ



Örnek Devrenin BOOLE Cebiri ile gösterilişi

$$Z = \underbrace{(\bar{A}.B.C)}_{\text{4.DURUM}} + \underbrace{(A.\bar{B}.C)}_{\text{6.DURUM}} + \underbrace{(A.B.\bar{C})}_{\text{7.DURUM}}$$

Teşekkür Ederim