Bilgisayar Mimarisi

KARNOUGH HARİTALARI

Lojik ifadelerin sadeleştirilmesinde Boolean Matematiği ve Karnaugh Haritaları kullanılır.

Kurallar:

1. Karnaugh Haritaları giriş değişkeni sayısına bağlı olarak standart sayıda kutudan oluşur. n=giriş değişkeni sayısı olmak üzere 2n formülüyle kutu sayısı belirlenir. 2,4,8,16… olmak üzere 2ⁿye katlanarak devam eder.

KARNOUGH HARİTALARI

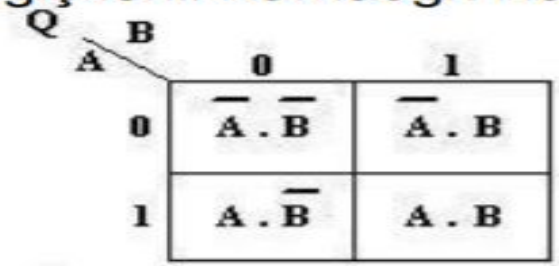
2. Karnaugh Haritalarında hedef en çok “1” i gruplamaktır. Kutuların içindeki “1” ler dikkate alınır. Boş olan kutu “0” demektir, dikkate alınmaz. 3. Gruplamalardaki kutu sayısı 1,2,4,8,16…. şeklinde olmalıdır.

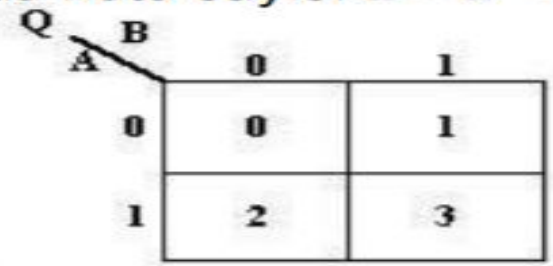
4. Her bir grup çıkış ifadesinde giriş değişkenleri çarpım (AND) şeklinde ifade edilir. Birden fazla gruba sahip Karnaugh Haritasının çıkış ifadesinde gruplar toplama (OR) işlemine tabi tutulur.

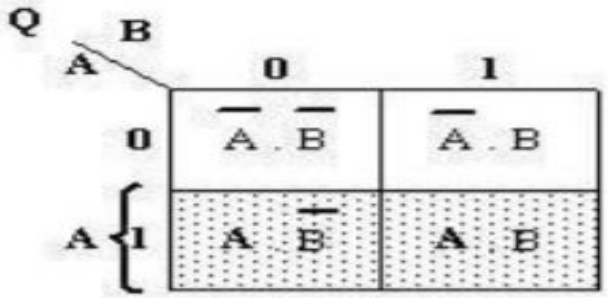
5. Karnaugh Haritasında tüm kutular “1” ise çıkış “1” , tüm kutular “0” ise çıkış “0” dır.

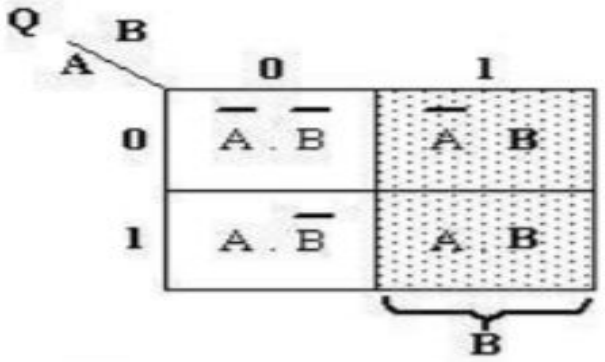
İKİ DEĞİŞKENLİ KARNAUGH HARİTALARI

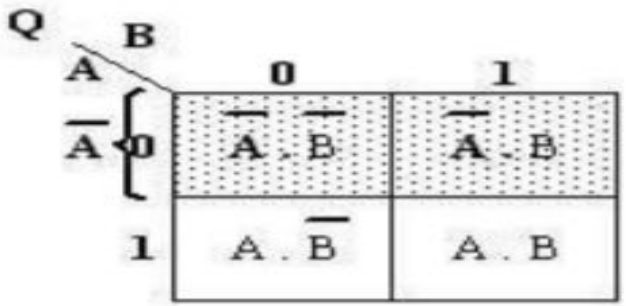
İki değişkenli Karnaugh Haritasında kutu sayısı $2^n=2^2=4$ tür.

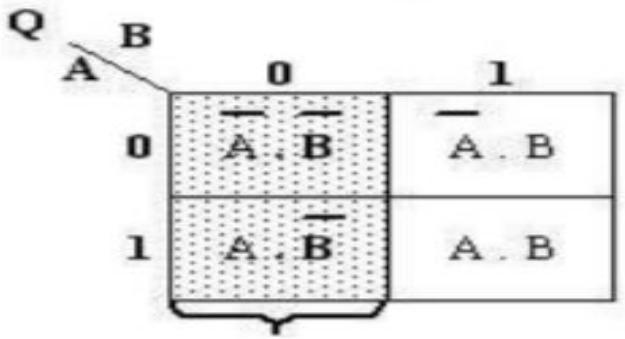












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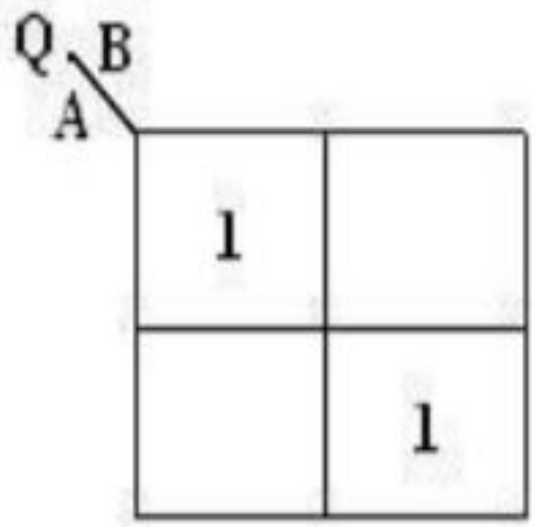

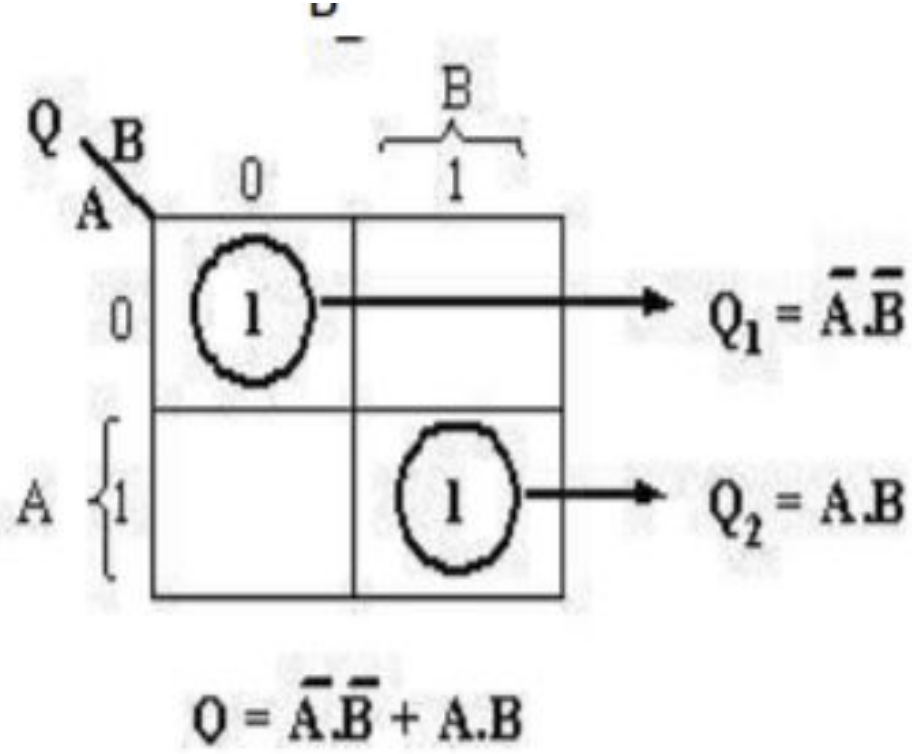

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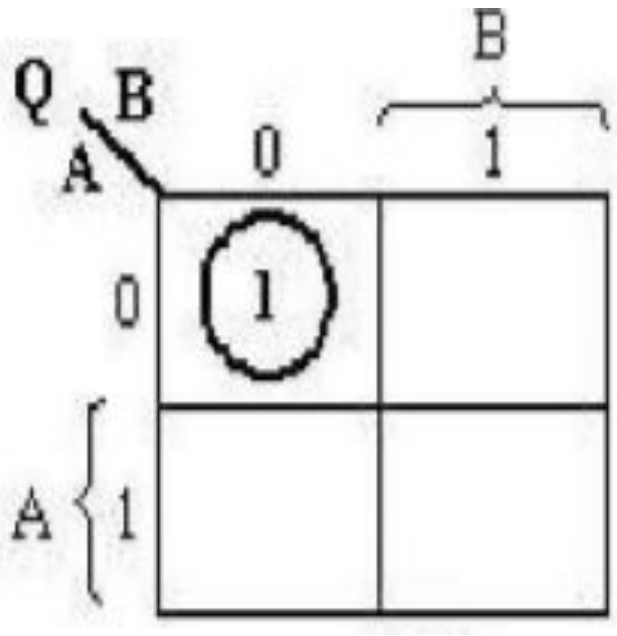

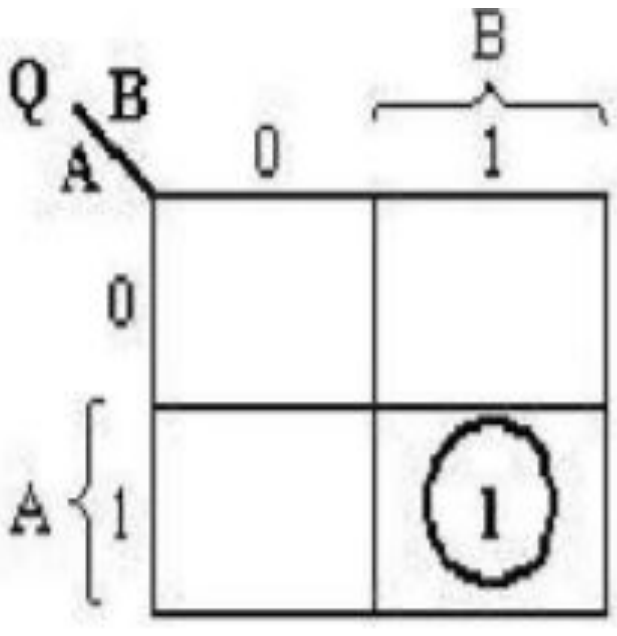

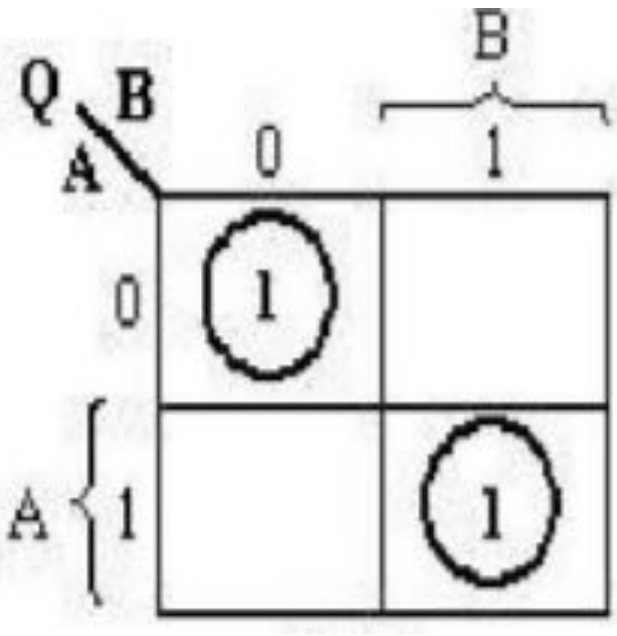

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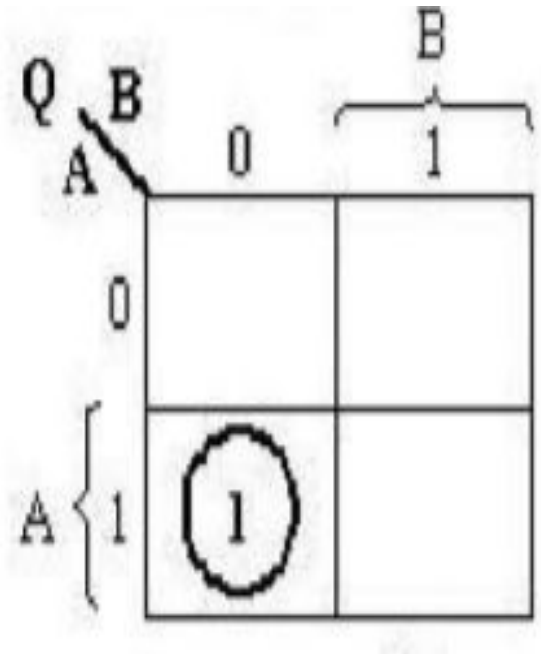

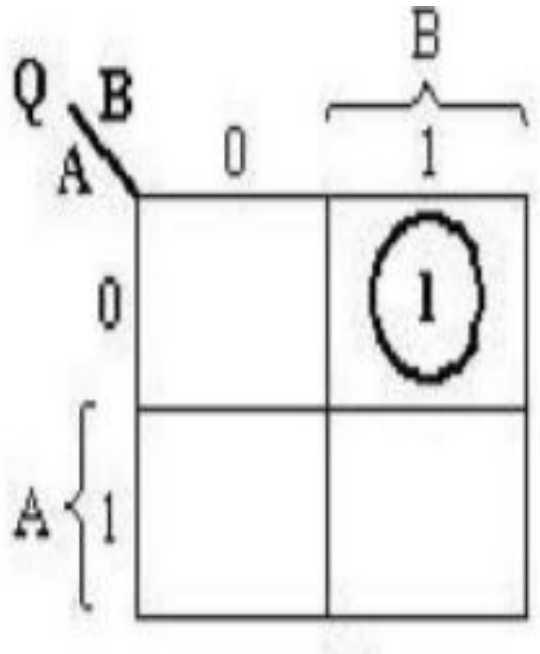

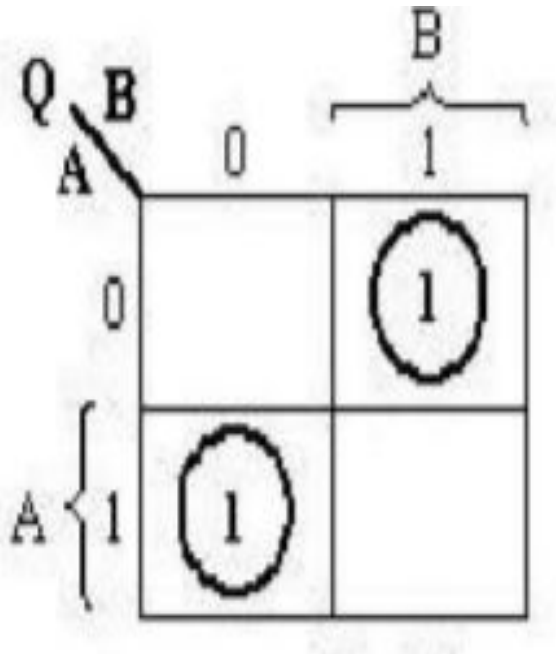

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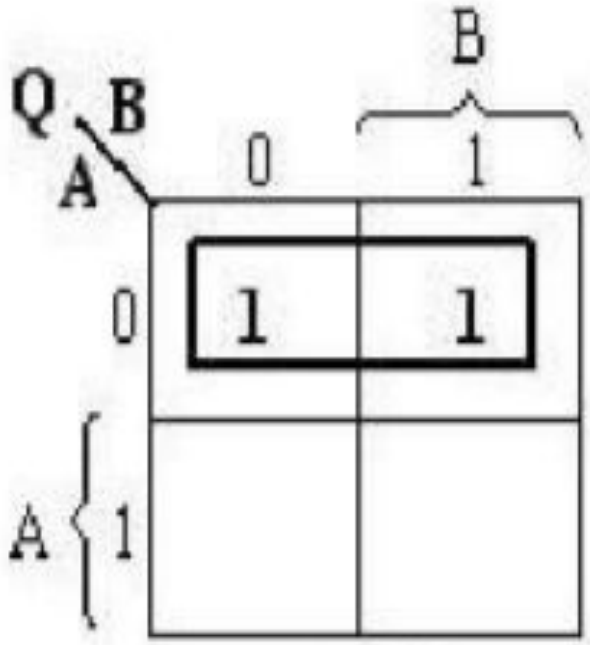

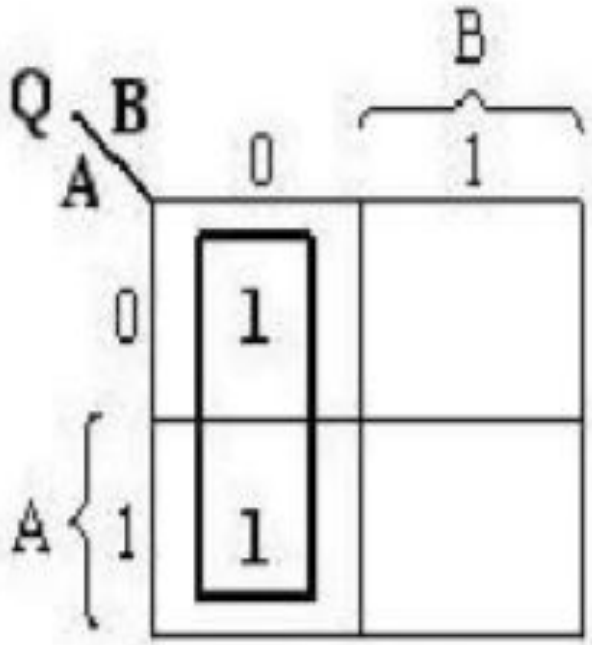

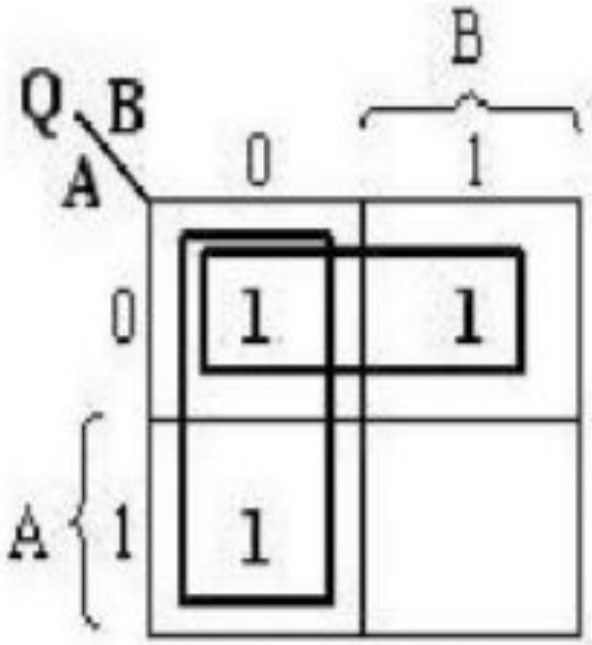

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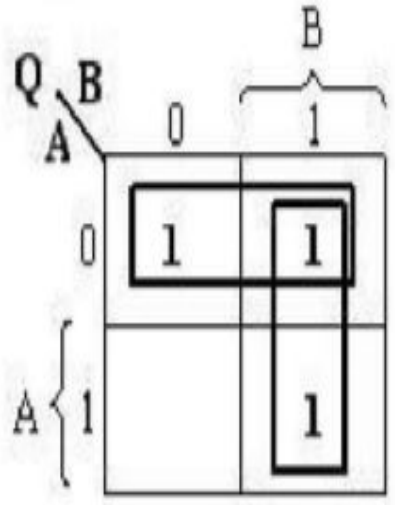

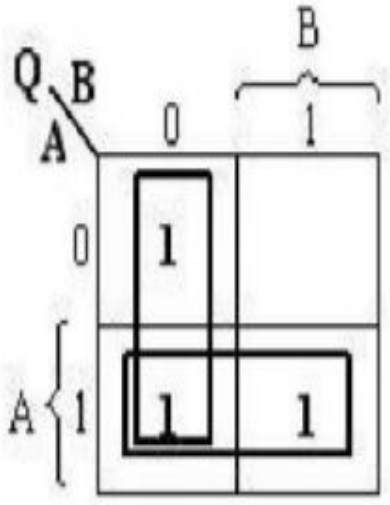

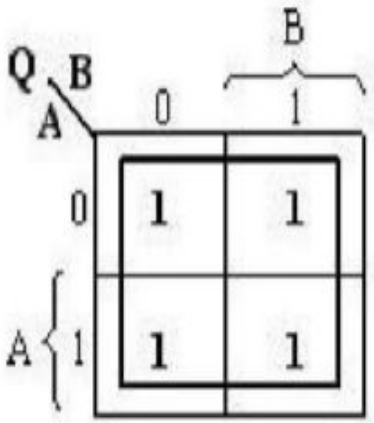

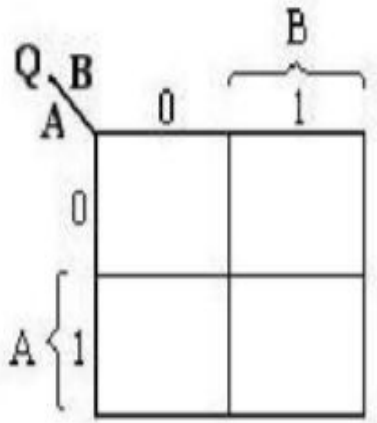

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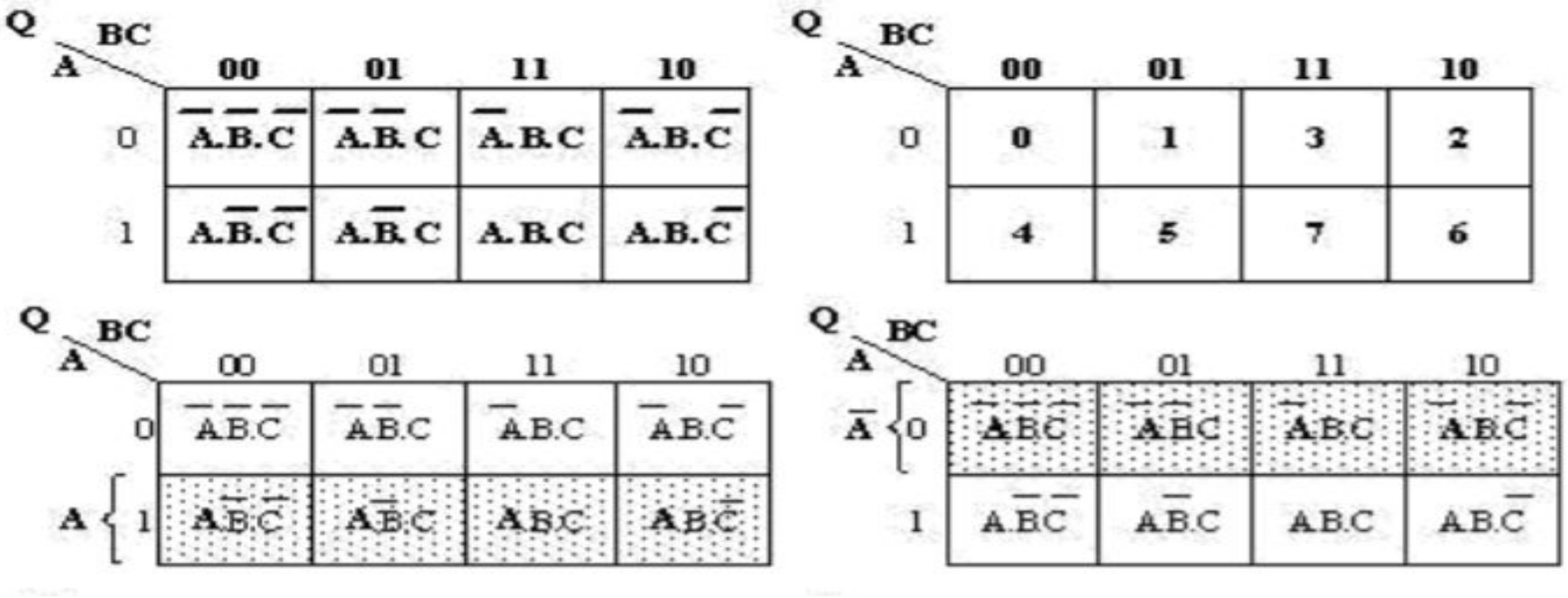

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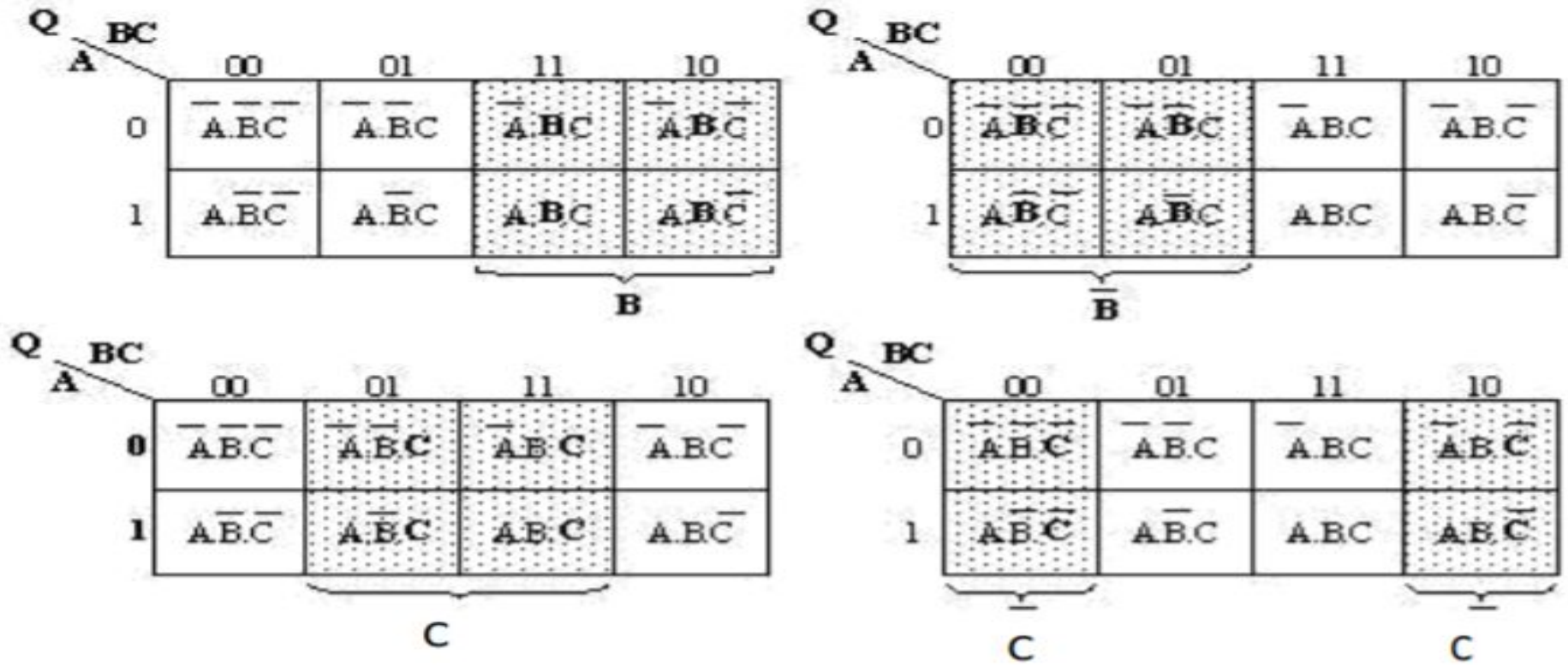

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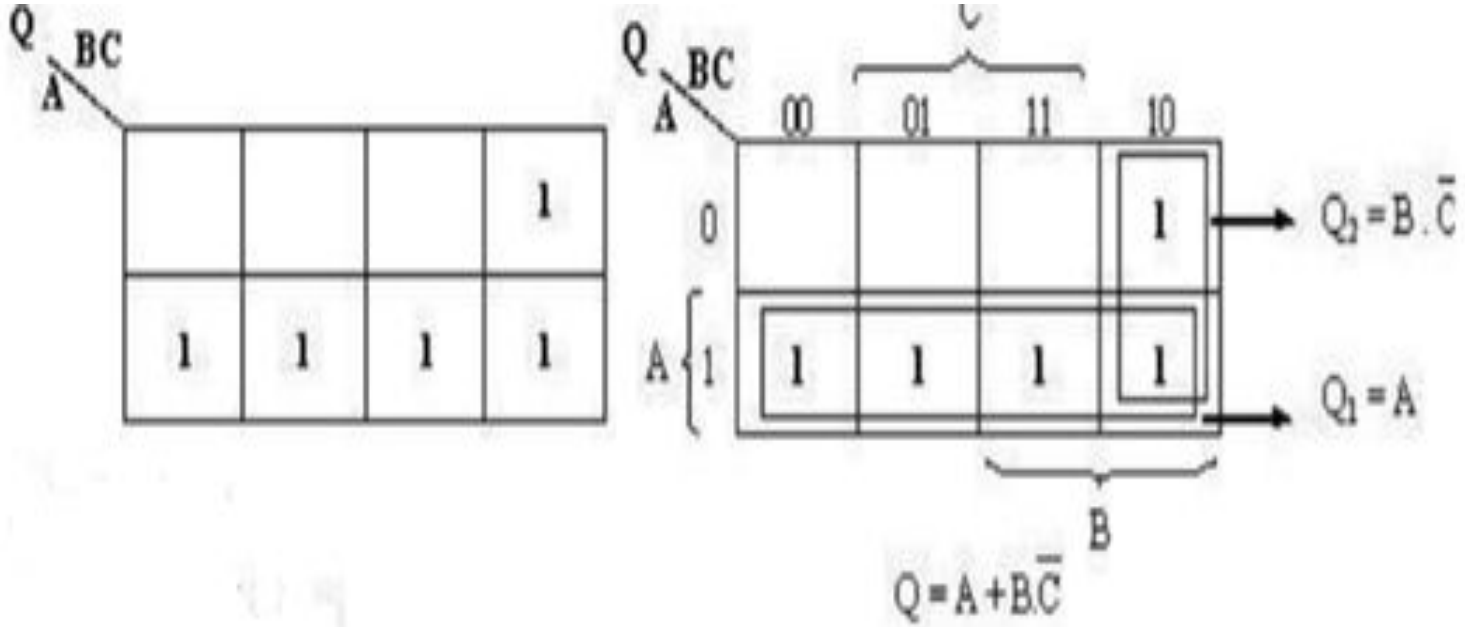

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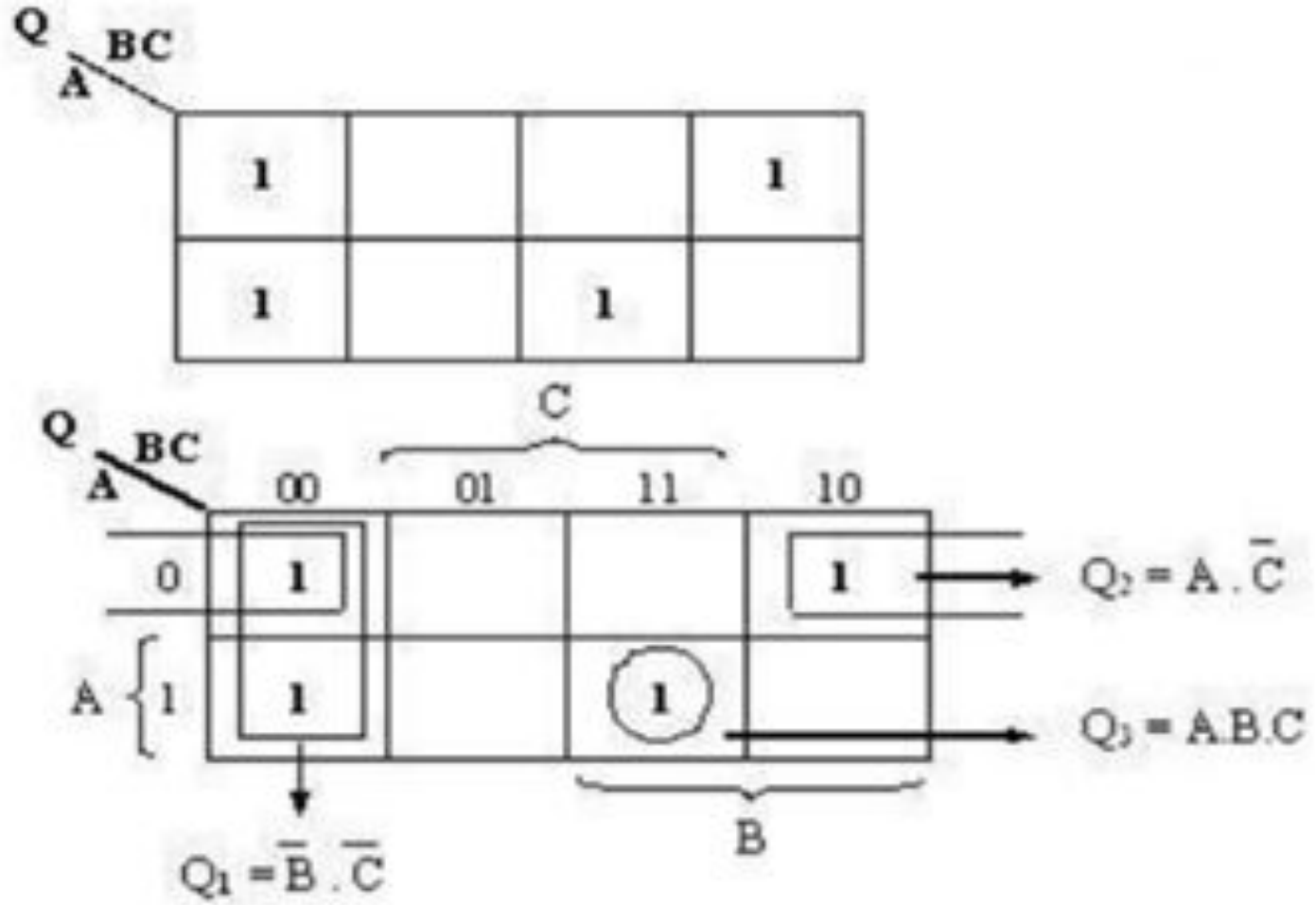

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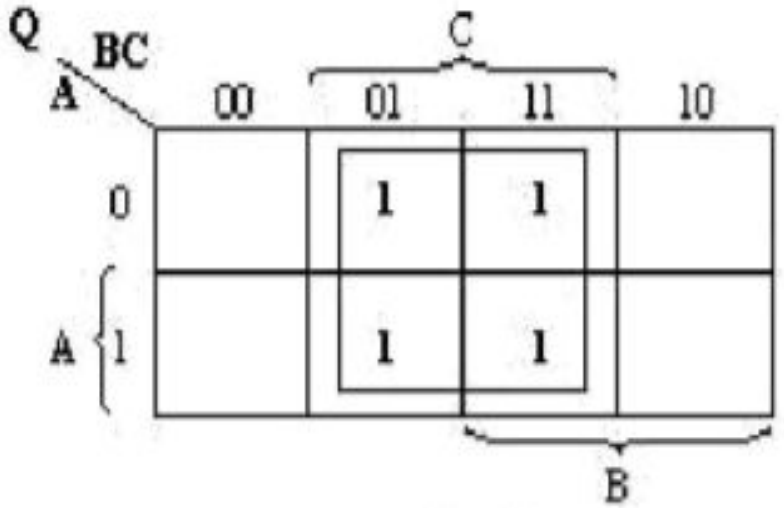
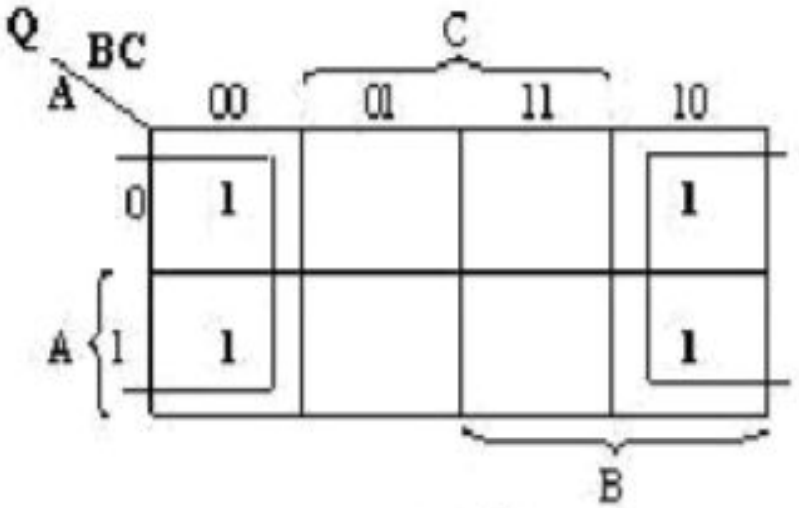
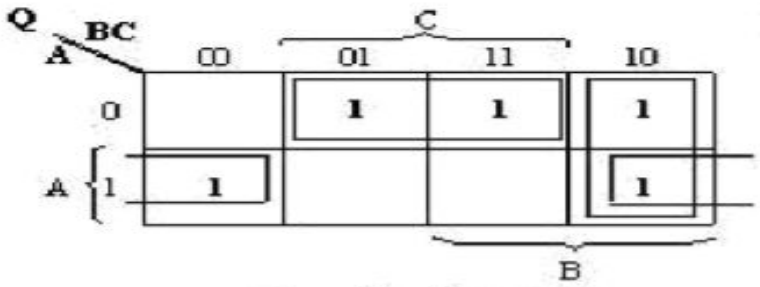


Q= C

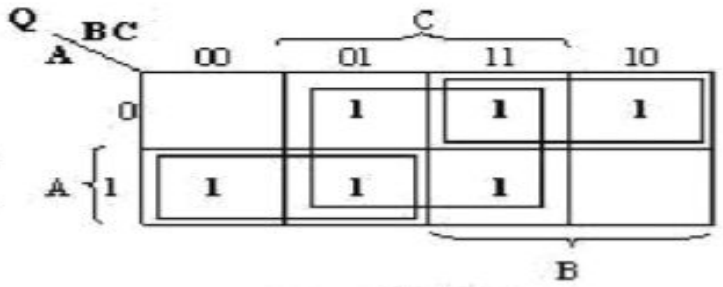


Q= $\overline{C}$

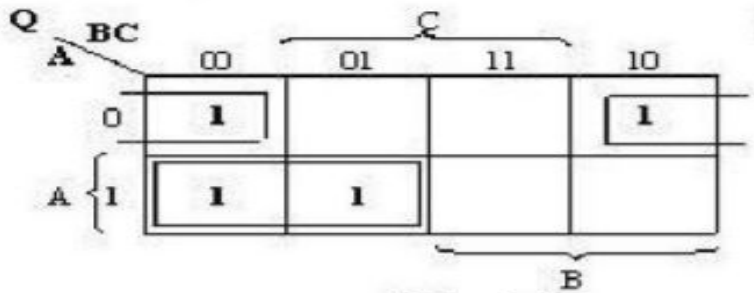
ÜÇ DEĞİŞKENLİ KARNAUGH HARİTALARI



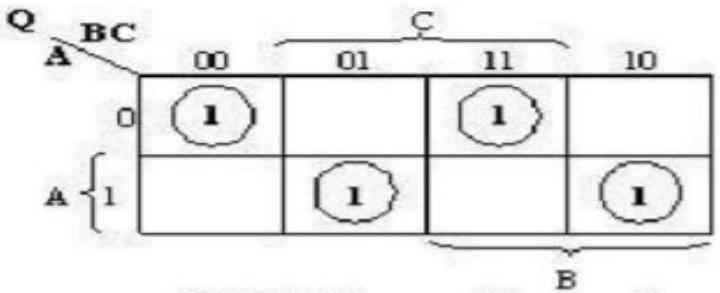
$Q = A\bar{C} + \bar{A}C + B\bar{C}$



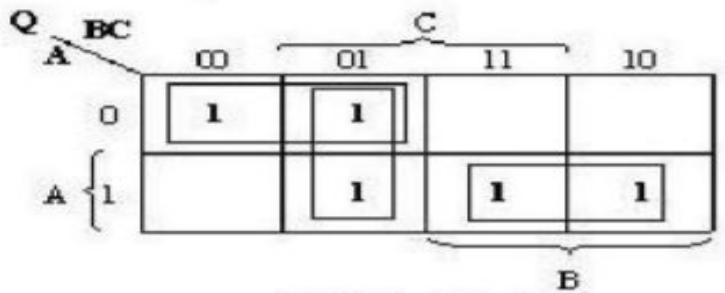
$Q = A\bar{B} + \bar{A}B + C$



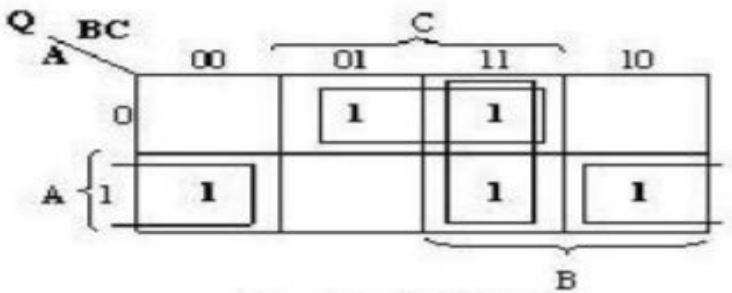
$Q = \bar{A}\bar{C} + A\bar{B}$



$Q = \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + AB\bar{C}$



$Q = \bar{A}\bar{B} + AB + \bar{B}C$



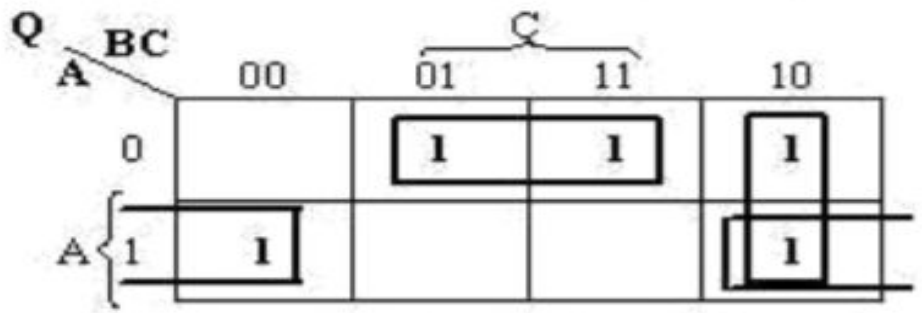
$Q = A\bar{C} + \bar{A}C + BC$

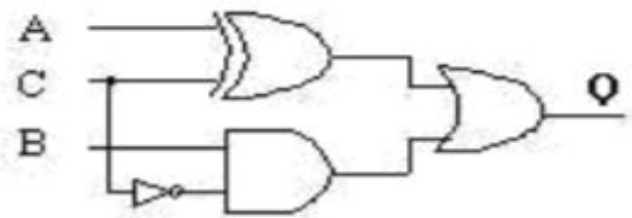
Örnek Problemler

- Oktal kodu için sırasıyla 0,1,1,1,1,0,1,0 çıkışlarını veren lojik devreyi en sade şekliyle düzenleyiniz.

Çözüm

GİRİŞ			ÇIKIŞ
A	B	C	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0





$$Q = \bar{A}.C + A.\bar{C} + B.\bar{C} \quad = \quad (A \oplus C) + B.\bar{C}$$

Soru

İki bitlik binary sayının iki katını veren devreyi düzenleyiniz.

Çözüm

İki bitlik binary sayının iki katını veren devreyi düzenleyiniz.

GİRİŞ	ÇIKIŞ
0	0
1	2
2	4
3	6

GİRİŞ		ÇIKIŞ		
A	B	Q_2	Q_1	Q_0
0	0	0	0	0
0	1	0	1	0
1	0	1	0	0
1	1	1	1	0

$Q_0 = 0$

$Q_1 = \bar{A}.B + A.B$

$Q_2 = A.\bar{B} + A.B$

Q_2

A \ B	0	1
0		
1	1	1

$Q_2 = A$

Q_1

A \ B	0	1
0		1
1		1

$Q_1 = B$