

# Esempi di minimizzazione mediante Mappe di Karnaugh

# Comparatore (a==b) 1 bit

Prof. Giuseppe Ascia



Descrizione:

```
if ( a==b)
q= '1' ;
else q= '0' ;
```

Tabella della verità

a	b	q
0	0	1
0	1	0
1	0	0
1	1	1

Mappa di Karnaugh

		a	
		0	1
b	0	1	0
	1	0	1

L'espressione è già in forma minima

$$f(a,b) = a'b' + ab$$

# Comparatore (a<=b) 1 bit

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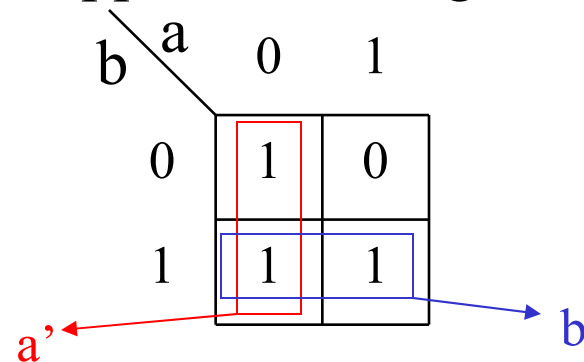
Descrizione:

```
if ( a<=b)
q= '1' ;
else q= '0' ;
```

Tabella della verità

a	b	q
0	0	1
0	1	1
1	0	0
1	1	1

Mappa di Karnaugh

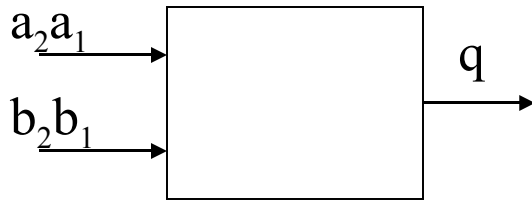


L'espressione minima è

$$f(a,b) = a' + b$$

# Comparatore (a==b) 2 bit

Prof. Giuseppe Ascia



Descrizione:

```
if ( a2==b2 && a1==b1 )
    q= '1' ;
else
    q= '0' ;
```

Tabella della verità

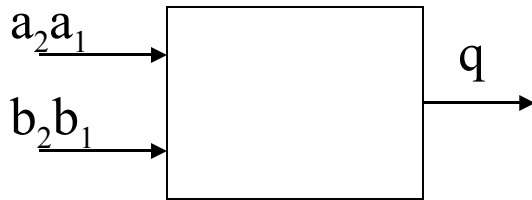
a <sub>2</sub>	a <sub>1</sub>	b <sub>2</sub>	b <sub>1</sub>	q
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

a <sub>2</sub> a <sub>1</sub> \ b <sub>2</sub> b <sub>1</sub>	00	01	11	10
00	1	0	0	0
01	0	1	0	0
11	0	0	1	0
10	0	0	0	1

$$f = a_2'a_1'b_2'b_1' + a_2'a_1b_2'b_1 + a_2a_1b_2b_1 + a_2a_1'b_2b_1'$$

# Comparatore (a<=b) 2 bit

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Descrizione:

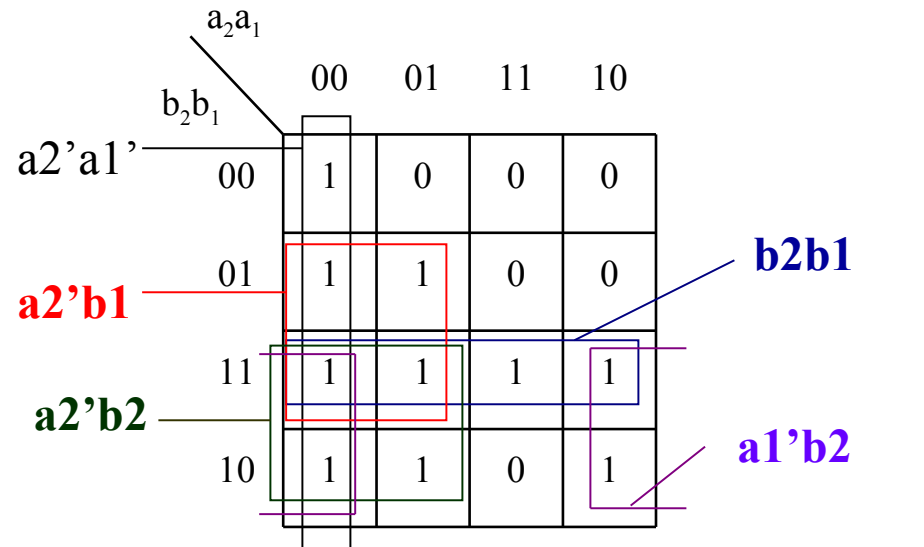
```
if (( a2==b2 && a1==b1) || a2<b2 ||
    (a2==b2 && a1<b1) )
```

```
    q='1' ;
```

```
else q='0' ;
```

Tabella della verità

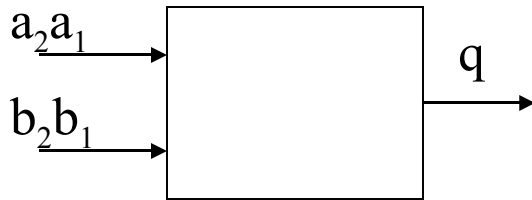
a2	a1	b2	b1	q
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1



$$f = a2'a1' + a2'b1 + a2'b2 + b2b1 + a1'b2$$

# Comparatore (a<=b) 2 bit

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Descrizione:

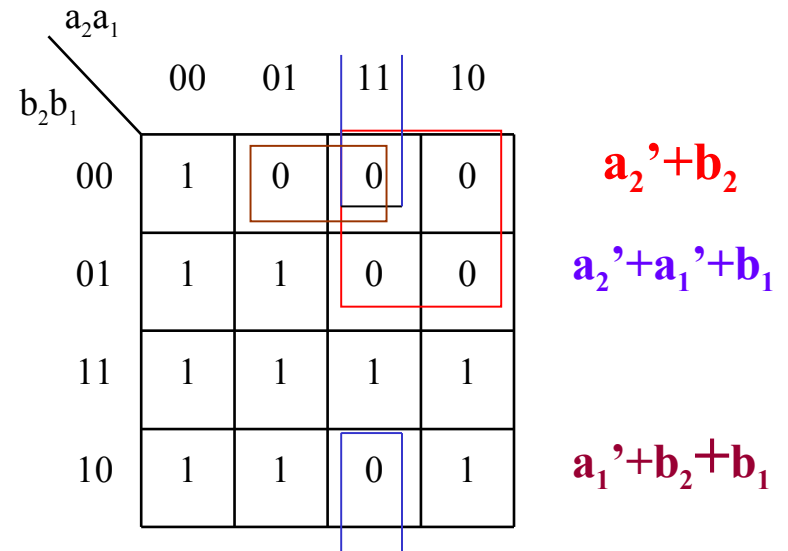
```
if (( a2==b2 && a1==b1) || a2<b2 ||
    (a2==b2 && a1<b1) )
```

q='1' ;

else q='0' ;

Tabella della verità

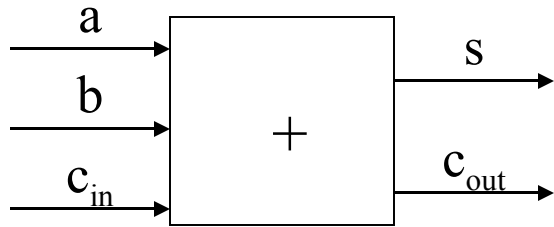
a2	a1	b2	b1	q
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1



$$f = (a_2' + b_2)(a_2' + a_1' + b_1)(a_1' + b_2 + b_1)$$

# Sommatore 1 bit

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a	b	c <sub>in</sub>	s	c <sub>out</sub>
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

		s			
		00	01	11	10
c <sub>in</sub>	0	0	1	0	1
	1	1	0	1	0

$$s = a'b'c_{in} + a'bc_{in}' + abc_{in} + ab'c_{in}'$$

		c <sub>out</sub>			
		00	01	11	10
c <sub>in</sub>	0	0	0	1	0
	1	0	1	1	1

$$c_{out} = bc_{in} + ab + ac_{in}$$