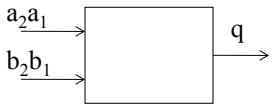
Esempi di minimizzazione mediante mappe di Karnaugh

Esempio 1



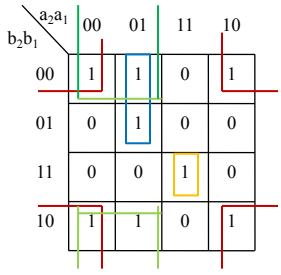
Descrizione:

On-set (m0,m2,m4,m5,m6,m8, m10, m15)

$f(a_2,a_1,b_2,b_1)=\sum(0,2,4,5,6,8,10,15)$

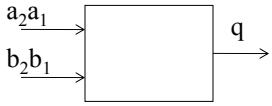
Tabella della verità

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



f= $a_1'b_1'+a_2'b_1'+a_2'a_1b_1'+a_2a_1b_2b_1$

Esempio 2

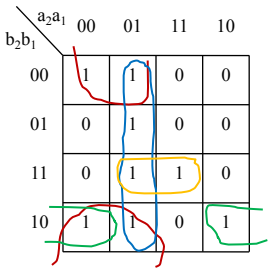


Descrizione:

On-set (m0,m2,m4,m5,m6,m7, m10, m15)

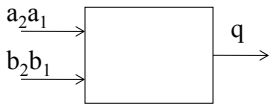
$f(a_2,a_1,b_2,b_1)=\sum(0,2,4,5,6,8,10,15)$

	a_2a_1	b_2b_1
m0	0 0	0 0
m2	0 0	1 0
m4	0 1	0 0
m5	0 1	0 1
m6	0 1	1 0
m7	0 1	1 1
m10	1 0	1 0
m15	1 1	1 1



f= $a_2'b_1'+a_1'b_2b_1'+a_2'a_1+a_1b_2b_1$

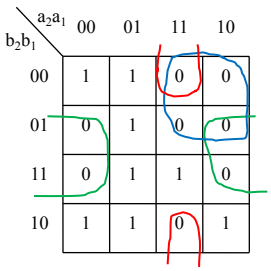
Esempio 3



Descrizione:

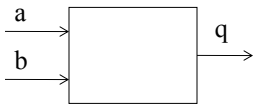
Off-set (M1,M3,M8,M9,M11,M12, M13, M14)

	a_2a_1	b_2b_1
M1	0 0	0 1
M3	0 0	1 1
M8	1 0	0 0
M9	1 0	0 1
M11	1 0	1 1
M12	1 1	0 0
M13	1 1	0 1
M14	1 1	1 0



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

Comparatore (a==b) 1 bit



Descrizione:

```
if a=b then
        q <='1';
else   q<='0';
end if;
```

Tabella della verità

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

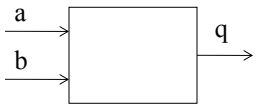
Mappa di Karnaugh

b \ a	0	1
0	1	0
1	0	1

L'espressione è già in forma minima

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

Comparatore (a<=b) 1 bit



Descrizione:

```
if a<=b   then
        q <='1';
else   q <='0';
end if;
```

Tabella della verità

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

Mappa di Karnaugh

b \ a	0	1
0	1	0
1	1	1

L'espressione minima è

f(a,b)= a'+b

Comparatore (a==b) 2 bit

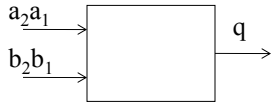


Tabella della verità

a2	a1	b2	b1	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

Descrizione:

```
if a2=b2 and a1=b1 then
        q <='1';
else    q <='0';
end if;
```

a_2a_1 / b_2b_1	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 (SP)

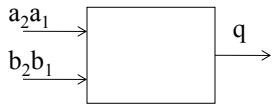
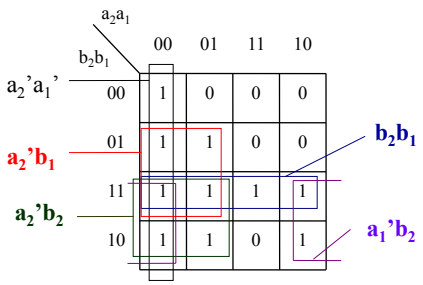


Tabella della verità

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

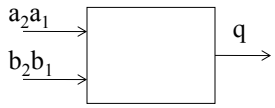
Descrizione:

```
if (a2=b2 and a1=b1) or a2<b2 or
(a2=b2 and a1<b1)  then
      q <='1';
else q <='0';
end if;
```



$f = a_2'a_1' + a_2'b_1 + a_2'b_2 + b_2b_1 + a_1'b_2$

Comparatore (a<=b) 2 bit (PS)

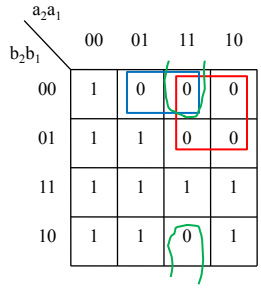


Descrizione:

```
if (a2=b2 and a1=b1) or a2<b2 or
(a2=b2 and a1<b1)  then
      q <='1';
else q <='0';
end if;
```

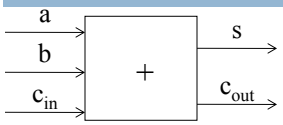
Tabella della verità

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

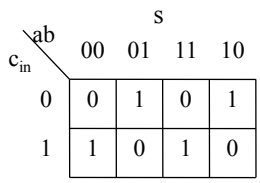


f= $(a_2'+b_2)\,(a_1'+b_2+b_1)\,(a_2'+a_1'+b_1)$

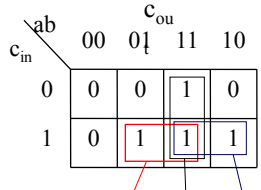
Sommatore 1 bit



a	b	c_{in}	s	c_{out}
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



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



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