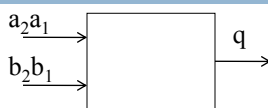


Esempi di minimizzazione mediante mappe di Karnaugh

Esempio 1

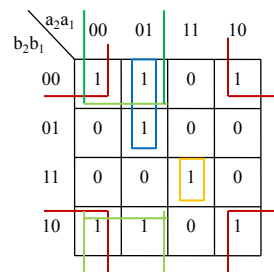


Descrizione:

On-set (m0, m2, m4, m5, m6, m8, m10, m15)
 $f(a_2, a_1, b_2, b_1) = \sum(0, 2, 4, 5, 6, 8, 10, 15)$

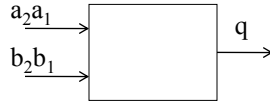
Tabella della verità

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



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

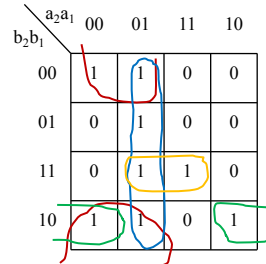
Esempio 2



Descrizione:

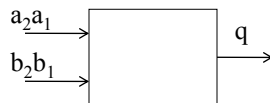
On-set (m0, m2, m4, m5, m6, m7, m10, m15)
 $f(a_2, a_1, b_2, b_1) = \sum(0, 2, 4, 5, 6, 8, 10, 15)$

	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



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

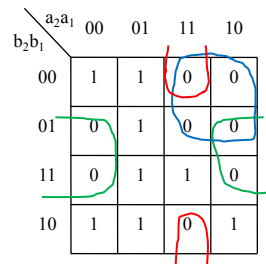
Esempio 3



Descrizione:

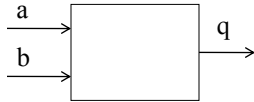
Off-set (M1, M3, M8, M9, M11, M12, M13, M14)

	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

	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



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

	a	0	1
b	0	1	0
	1	1	1

L'espressione minima è

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

Comparatore (a==b) 2 bit

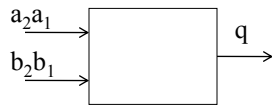


Tabella della verità

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 ₂ a ₁ \ b ₂ b 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)

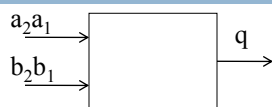


Tabella della verità

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;

```

a ₂ a ₁ \ b ₂ b ₁	00	01	11	10
00	1	0	0	0
01	1	1	0	0
11	1	1	1	1
10	1	1	0	1

$a_2'a_1'$ (row 00)
 $a_2'b_1$ (row 01)
 $a_2'b_2$ (row 11)
 b_2b_1 (column 01)
 $a_1'b_2$ (column 10)

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

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

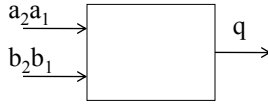


Tabella della verità

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:

```

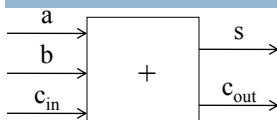
if (a2=b2 and a1=b1) or a2<b2 or
(a2=b2 and a1<b1) then
  q <= '1';
else q <= '0';
end if;

```

a2a1 \ b2b1	00	01	11	10
00	1	0	0	0
01	1	1	0	0
11	1	1	1	1
10	1	1	0	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

c _{in} \ ab	00	01	11	10
0	0	1	0	1
1	1	0	1	0

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

c _{in} \ ab	00	01	11	10
0	0	0	1	0
1	0	1	1	1

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