

Computer Science CSCI 355

Digital Logic and Computer Organization

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CMOS Logic Design

○ Nor Gate

a	b	f
0	0	1
0	1	0
1	0	0
1	1	0

f	0	1
0	1	0
1	0	0

f (p-type) = $a'b'$ (SOP)

f'	0	1
0	0	1
1	1	1

f' (n-type) = $a + b$ (POS)

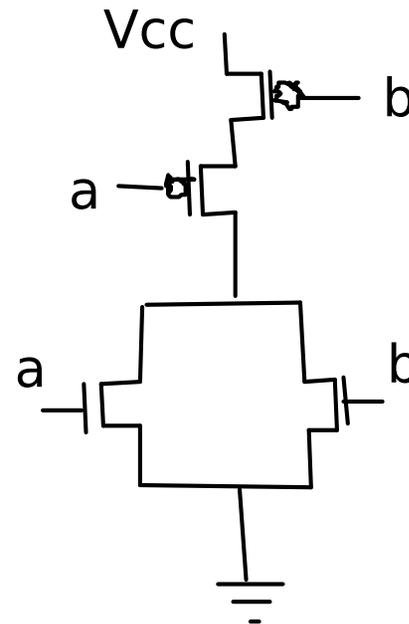
CMOS Logic Design cont.

○ Nor Gate

a	b	f
0	0	1
0	1	0
1	0	0
1	1	0

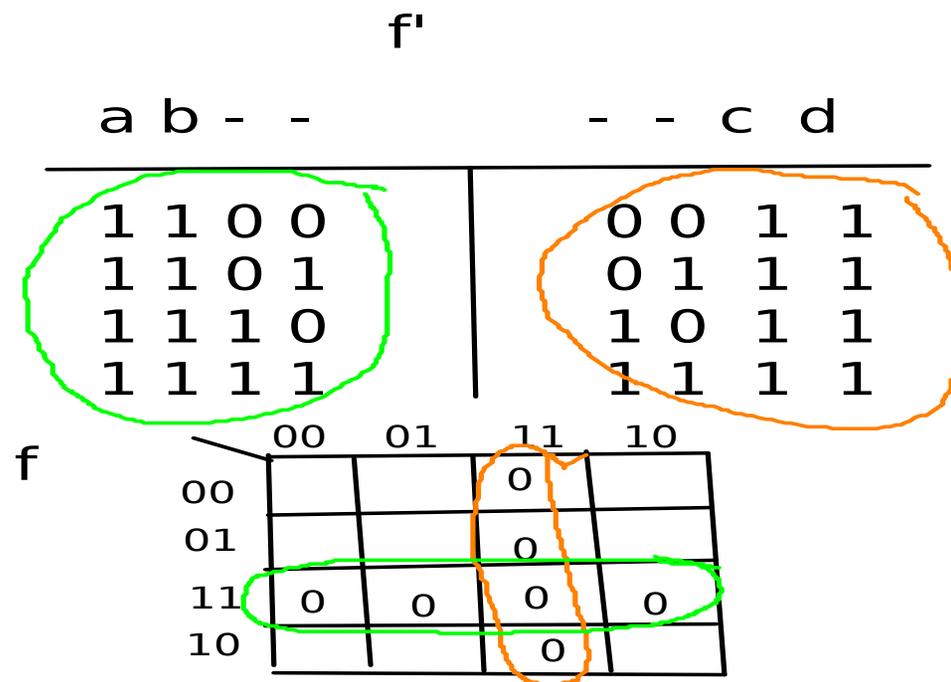
$$f \text{ (p-type)} = a'b' \text{ (SOP)}$$

$$f' \text{ (n-type)} = a + b \text{ (POS)}$$



Implement f in CMOS

○ $f = \overline{ab + cd}$



Implement f in CMOS cont.

○ $f = \sum m (0, 1, 2, 4, 5, 6, 8, 9, 10)$

		c d				
		00	01	11	10	
f	a b	00	1	1	0	1
		01	1	1	0	1
		11	0	0	0	0
		10	1	1	0	1

		c d				
		00	01	11	10	
f'	a b	00	0	0	1	0
		01	0	0	1	0
		11	1	1	1	1
		10	0	0	1	0

f (SOP) = ?

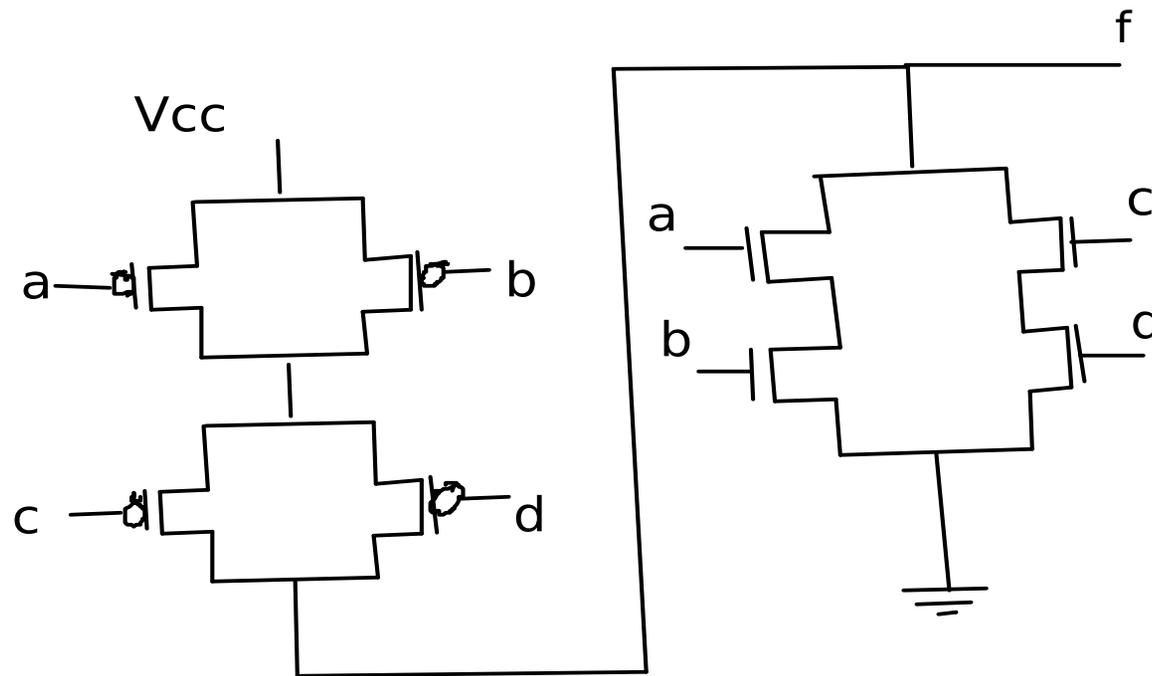
f' (SOP) = $ab + cd$

f (POS) = $(a' + b')(c' + d')$

f' (POS) = ?

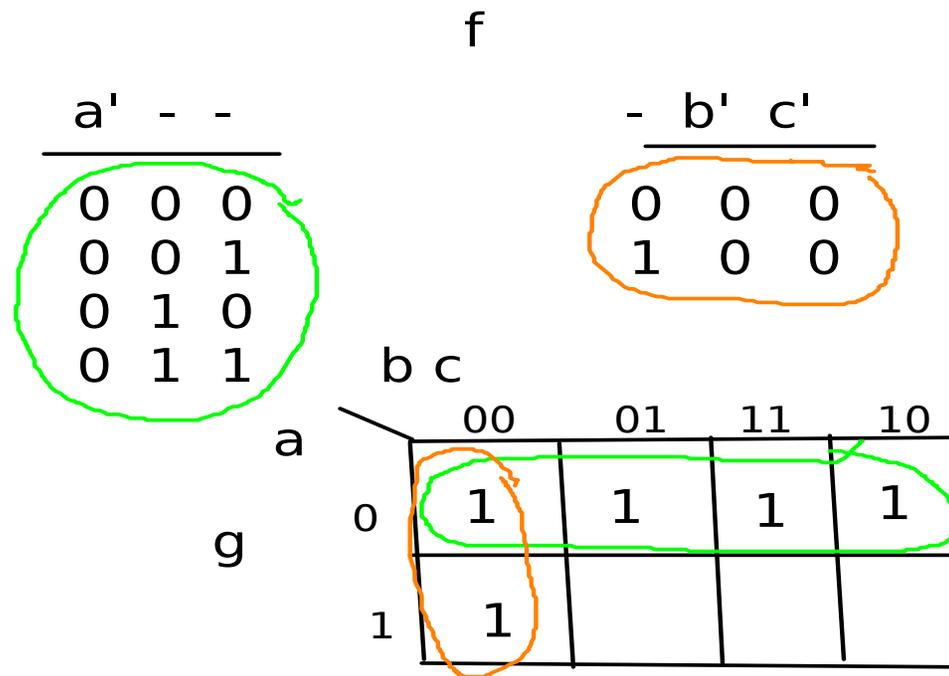
Implement f in CMOS cont.

○ $f = (\bar{a} + \bar{b})(\bar{c} + \bar{d}) \quad \bar{f} = ab + cd$



Implement g in CMOS

○ $f = \bar{a} + \bar{b}\bar{c}$



Implement g in CMOS cont.

○ $f = \sum m (0, 1, 2, 3, 4)$

g

		b c			
		00	01	11	10
a	0	1	1	1	1
	1	1			

$g(\text{SOP}) = a' + b'c'$

$g(\text{POS}) = ?$

g'

		b c			
		00	01	11	10
a	0	0	0	0	0
	1	0			

$g'(\text{SOP}) = ?$

$g'(\text{POS}) = (a)(b + c)$

Implement g in CMOS cont.

○ $f = \Sigma m(0, 1, 2, 3, 4)$

