

MR

Ahmed Mahdy



مدرس خصوصي

حضورى

اونلاين

لجصل الطالب علي

• مقاطع فيديو هات لشرح المقرر بشكل وافي

• ملخص للمادة Pdf للمذكرة واطراجة

• محاضرات مباشرة علي برنامج زووم

• مناقشة الأجزاء الغير مفهومة

• تواصل مستمر مع معلم المادة

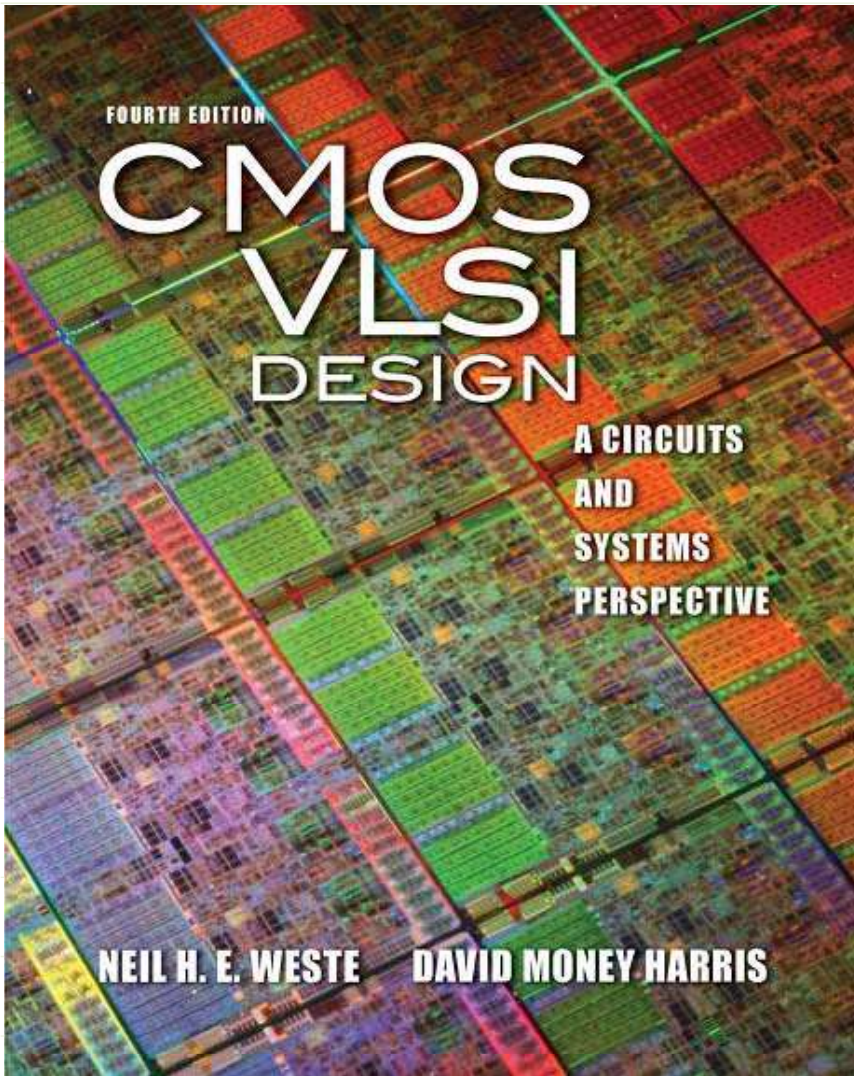
للتواصل

0567630097

0565657741

استاتيكا	فيزياء
الكثرونيات	دوائر كهربية
هيدروليكا	ميكانيكا الانشآت





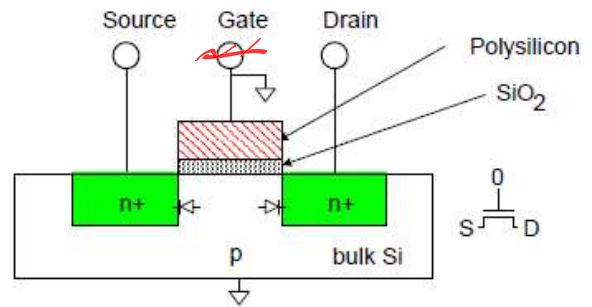
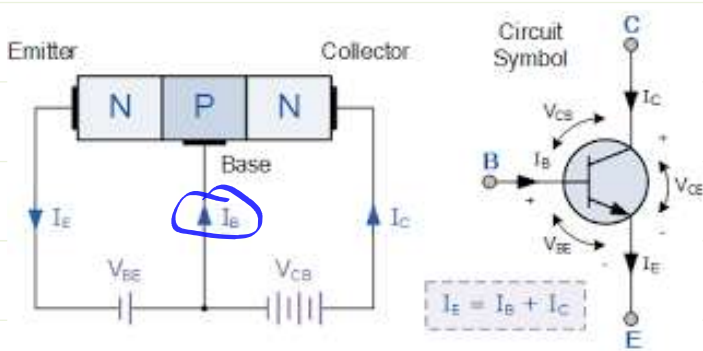
Lecture Week 3:
CMOS Combinational
Circuits Design

- ❑ A Brief History
- ❑ CMOS Gate Design
- ❑ Pass Transistors
- ❑ CMOS Latches & Flip-Flops

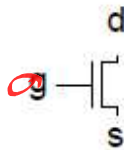
Transistor Types

Bipolar transistor

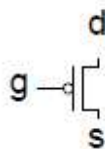
MOSFET



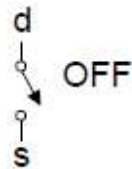
nMOS



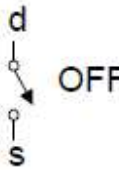
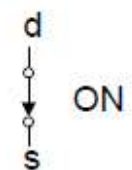
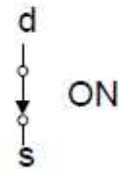
pMOS



$g = 0$

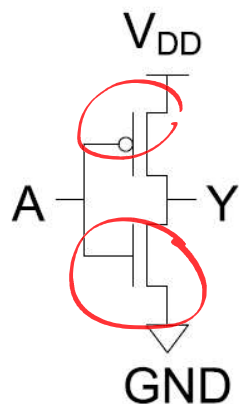
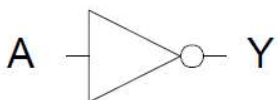


$g = 1$



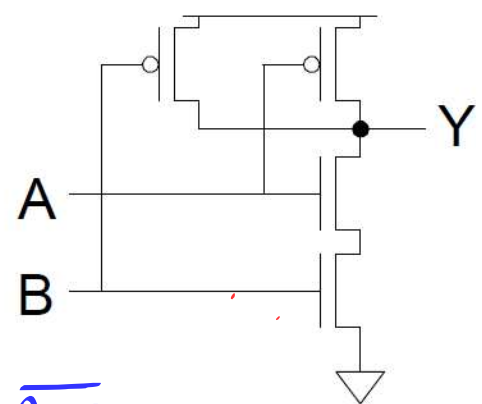
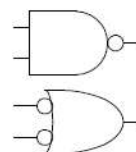
CMOS Inverter

A	Y
1	0
0	1



CMOS NAND Gate

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

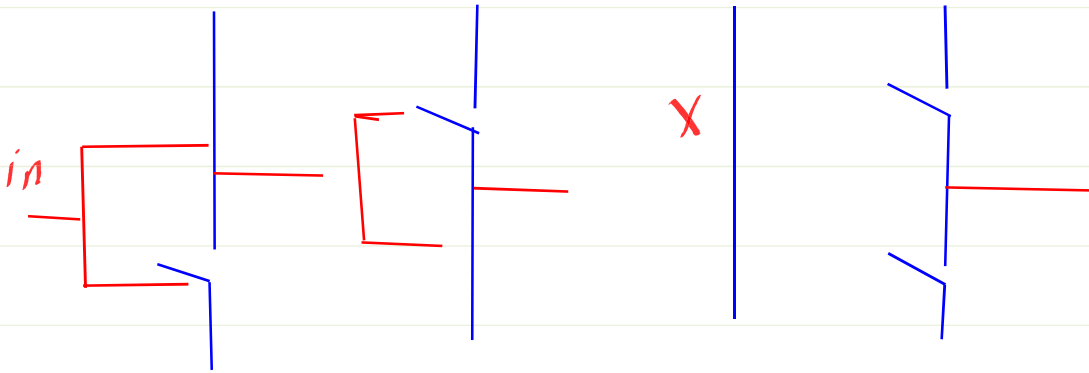
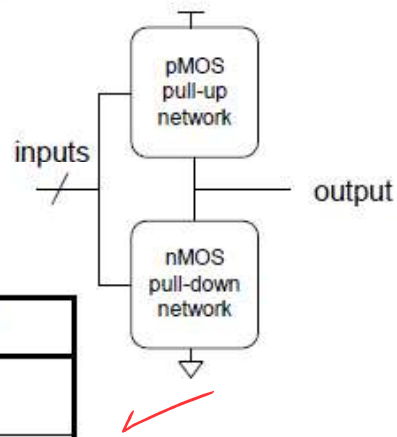


$\overline{A \cdot B}$

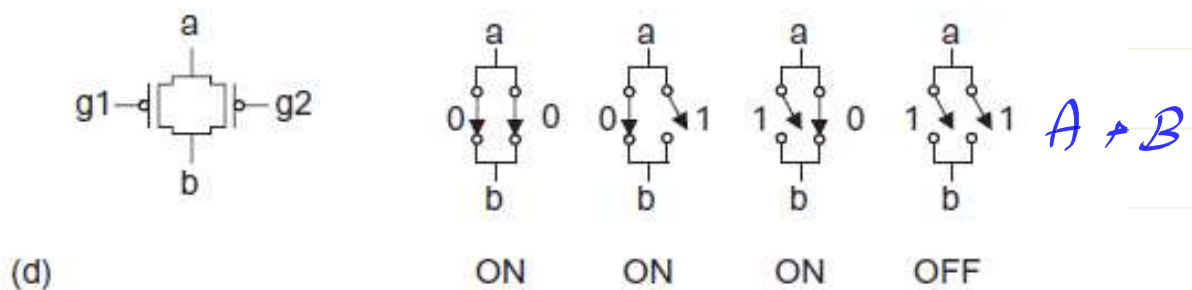
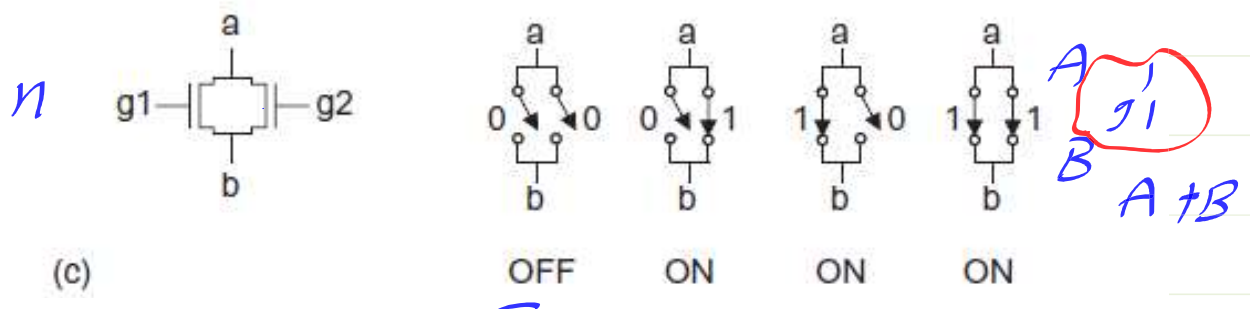
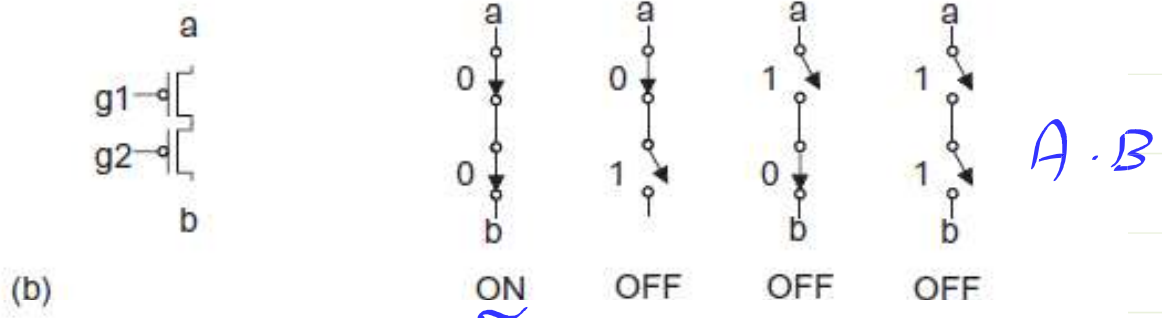
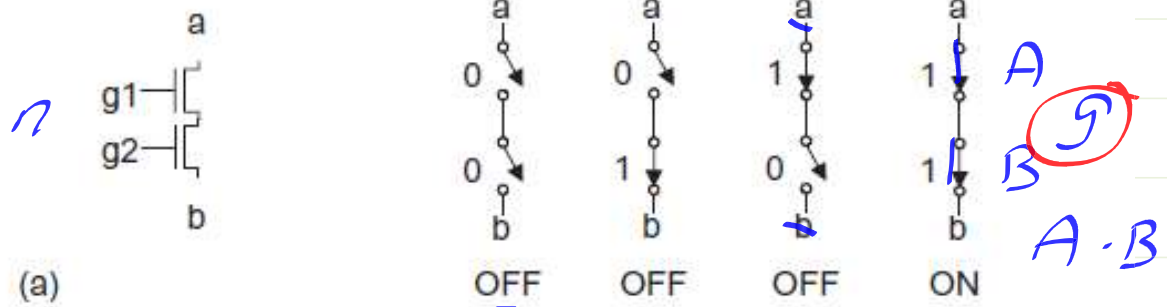
Complementary MOS logic gates

- nMOS *pull-down network*
- pMOS *pull-up network*

	Pull-up OFF	Pull-up ON
<u>Pull-down OFF</u>	Z (float) X	<u>1</u>
Pull-down ON	<u>0</u>	<u>X (crowbar)</u>



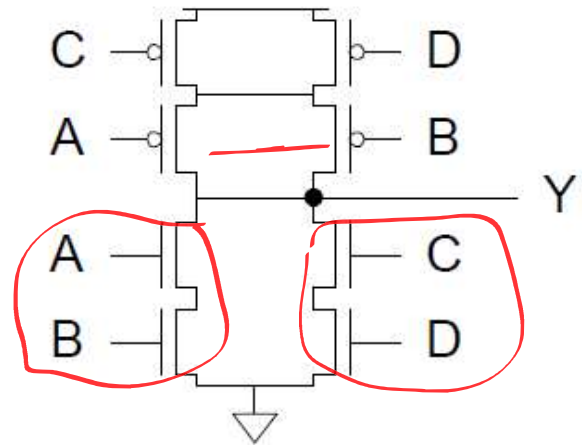
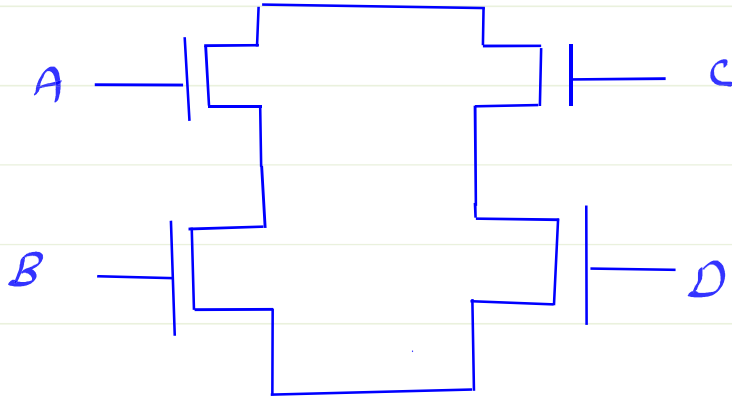
Series and Parallel



Compound Gates

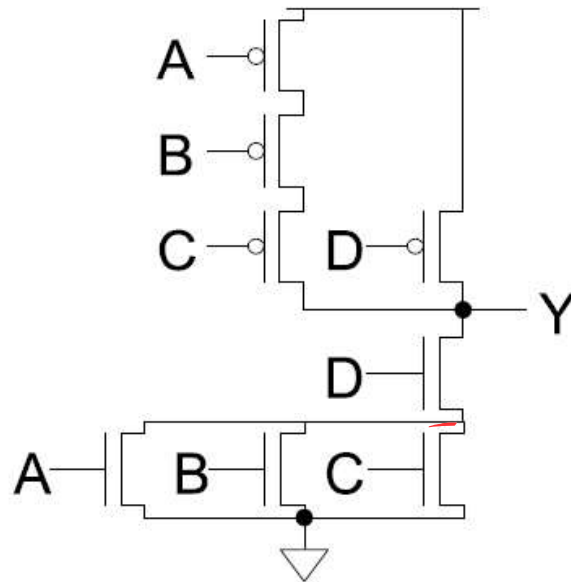
Compound gates can do any inverting function

$$y = \overline{A \cdot B + C \cdot D} \quad \text{AND AND or invert AOI 22}$$



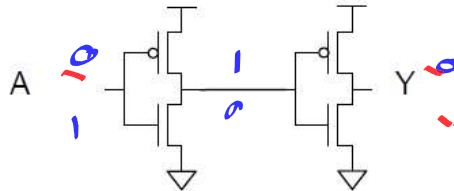
Example: O3AI

$$\square Y = \overline{(A+B+C)} \cdot D$$



Buffer

- ❑ A buffer can be constructed with 2 stages of inverting gates



Tristates

- ❑ *Tristate inverter* produces *Z* when not enabled

EN	A	Y
0	0	
0	1	
1	0	
1	1	

