CPE 133 Final Exam Cheat Sheet v1.03

A B	(NAND) !(A•B)	(NOR) !(A+B)	(XNOR) !(A XOR B)
0 0	1	1	1
0 1	1	0	0
1 0	1	0	0
1 1	0	0	1

A B	(AND) A•B	(OR) A+B	(XOR) A XOR B
0 0	0	0	0
0 1	0	1	1
1 0	0	1	1
1 1	1	1	0

$F(A,B,C) = \overline{\overline{(\overline{A}C)}\,\overline{(\overline{A}B)}}$ (reduced NAND/NAND)

$F(A,B,C) = \overline{(A)+\overline{(B+C)}}$ (reduced NOR/NOR)

15a	$\overline{(x \cdot y)} = \overline{x} + \overline{y}$	15b	$\overline{(x + y)} = \overline{x} \cdot \overline{y}$	DeMorgan's

$A \oplus B = \overline{A}B + A\overline{B}$ (XOR)

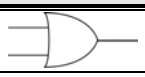
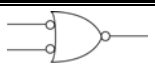
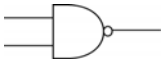
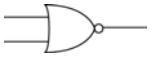
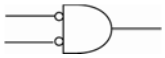
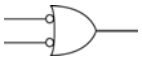
$\overline{A \oplus B} = \overline{A}\overline{B} + AB$ (XNOR)

$A(H) = \overline{A}(L) \qquad A(L) = \overline{A}(H)$

Equivalent Signals

A B	(AND) A•B	(OR) A+B	(XOR) A XOR B
0 0	0	0	0
0 1	0	1	1
1 0	0	1	1
1 1	1	1	0

A B	(NAND) !(A•B)	(NOR) !(A+B)	(XNOR) !(A XOR B)
0 0	1	1	1
0 1	1	0	0
1 0	1	0	0
1 1	0	0	1

AND functions	OR functions
	
AND form of **AND** gate	**OR** form of **OR** gate
	
AND form of **OR** gate	**OR** form of an **AND** gate
	
AND form of **NAND** gate	**OR** form of **NOR** gate
	
AND form of **NOR** gate	**OR** form of **NAND** gate

$T_{\min} = t_{NS\_dec} + t_{slop} + t_{setup} + t_{pd\_ff}$

$Frequency_{\max} = 1 / T_{\min}$

t_{NS_dec}: time delay in next state decoder
t_{slop}: time delay for safety margin
t_{setup}: time delay for setup time
t_{pd_ff}: time for propagation delay in flip-flop