

Logic Simplification (not full list!):

OR rules: $a+1=1$, $a+0=a$, $a+a=a$

AND rules: $a1=a$, $a0=0$, $aa=a$

Distributive: $a(b+c)=ab+ac$, $a+bc=(a+b)(a+c)$

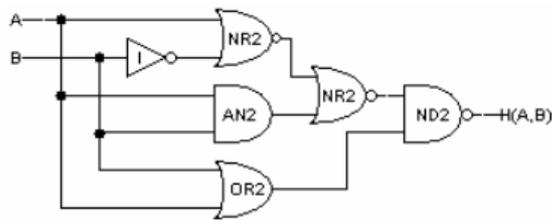
Complements: $a+\bar{a}=1$, $a\bar{a}=0$

Absorption: $a+ab=a$, $a+\bar{a}b=a+b$, $a(a+b)=a$, $a(\bar{a}+b)=ab$

Reduction: $ab+\bar{a}b=b$, $(a+b)(\bar{a}+b)=b$

DeMorgan's Law: $\overline{\bar{a}+b}=ab$, $\overline{a\bar{b}}=a+b$

Problem 1:

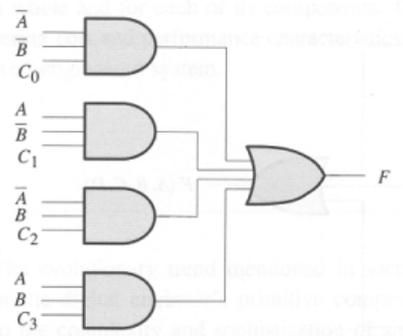


gate	t_{CD}	t_{PD}	t_R	t_F
I	3	15	8	5
ND2	5	30	11	7
AN2	12	50	13	9
NR2	5	30	7	11
OR2	12	50	9	13

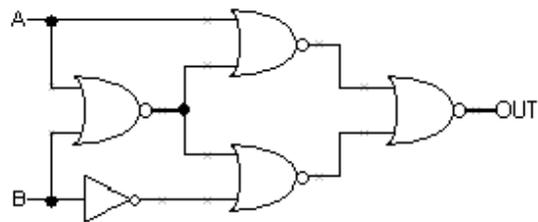
(time in ps)

Problem 2

Part B



Problem 4



inverter: $t_{cd} = 0.5\text{ns}$, $t_{pd} = 1.0\text{ns}$,

$t_r = t_f = 0.7\text{ns}$

2-input NAND: $t_{cd} = 0.5\text{ns}$, $t_{pd} = 2.0\text{ns}$,

$t_r = t_f = 1.2\text{ns}$

2-input NOR: $t_{cd} = 0.5\text{ns}$, $t_{pd} = 2.0\text{ns}$,

$t_r = t_f = 1.2\text{ns}$

Problem 2, Part E

A	B	C	$F(A, B, C)$
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

A	B	C	$G(A, B, C)$
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1