Ain Shams University
Faculty of Engineering

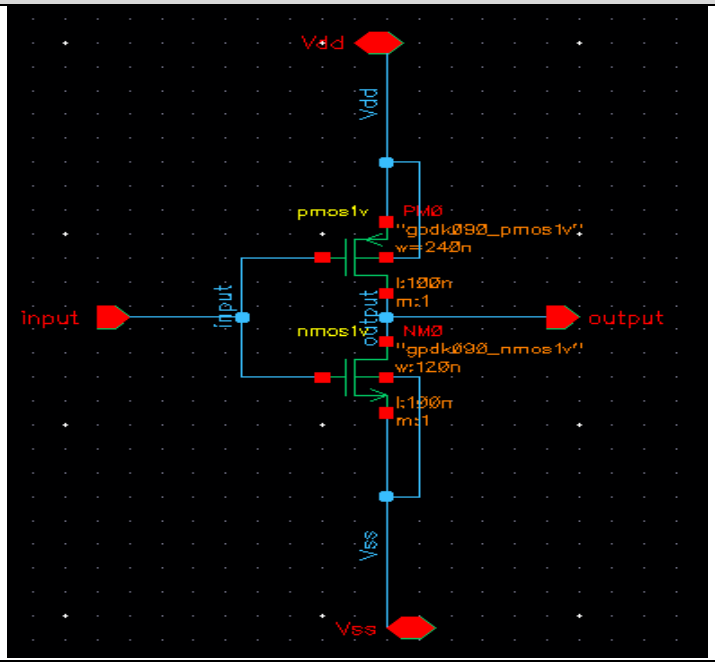
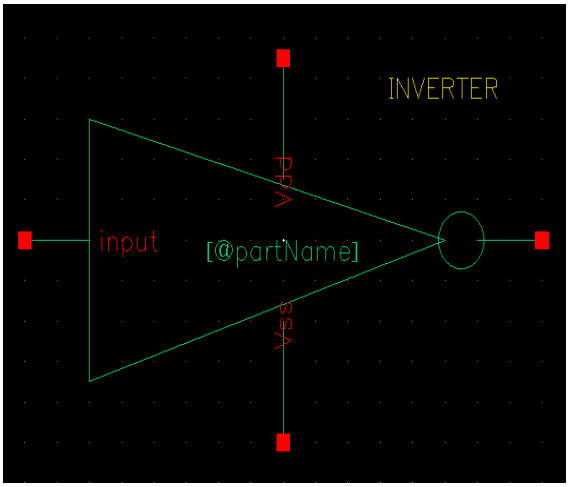
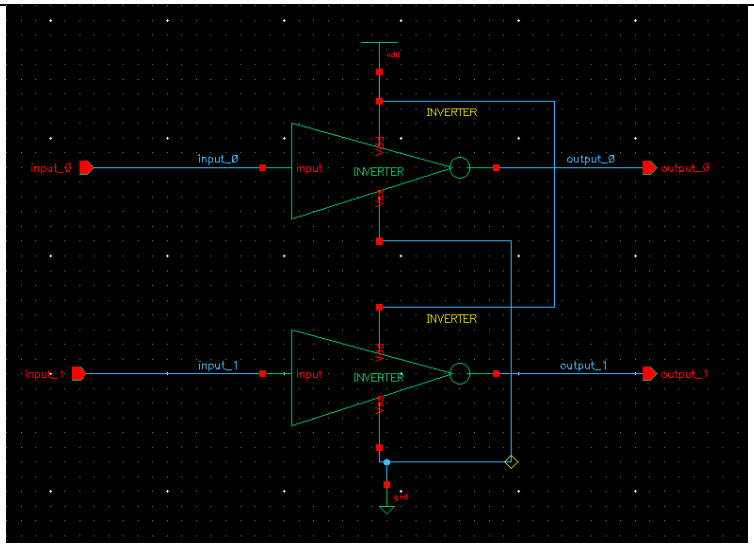
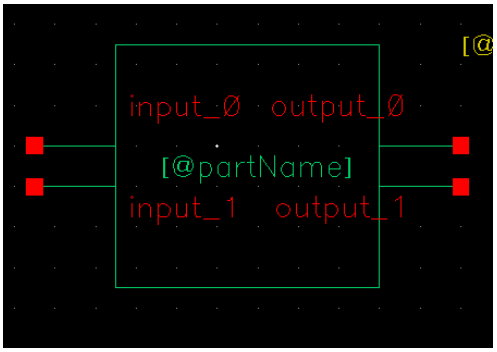
ECE212s: Digital Circuits
Electronics & communication Engineering
Fall 2023

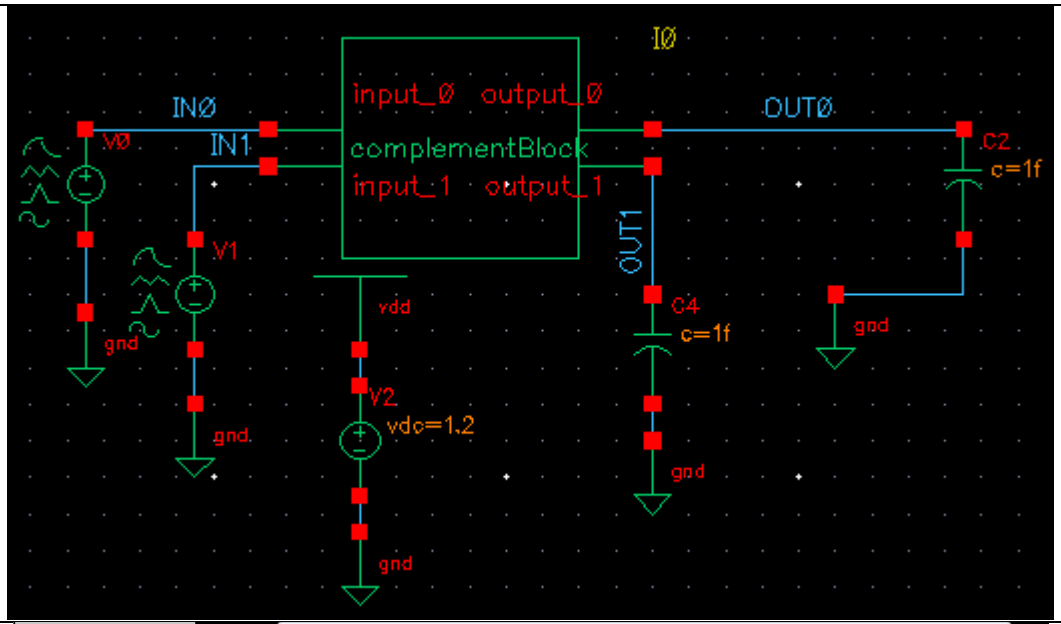
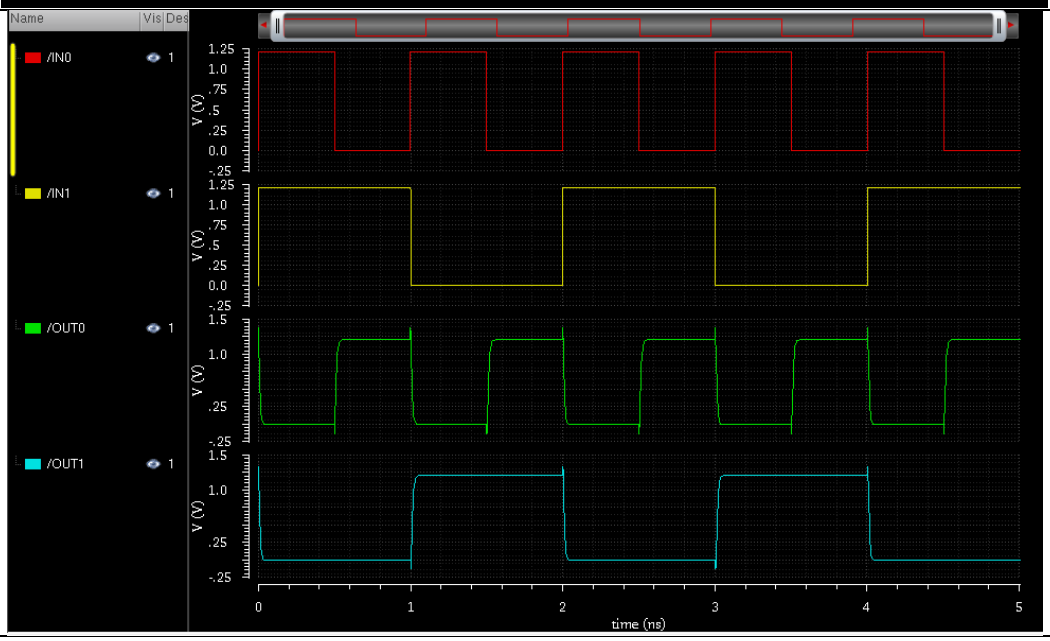
Name: Mariam Amr Esmail Abdelmoneim

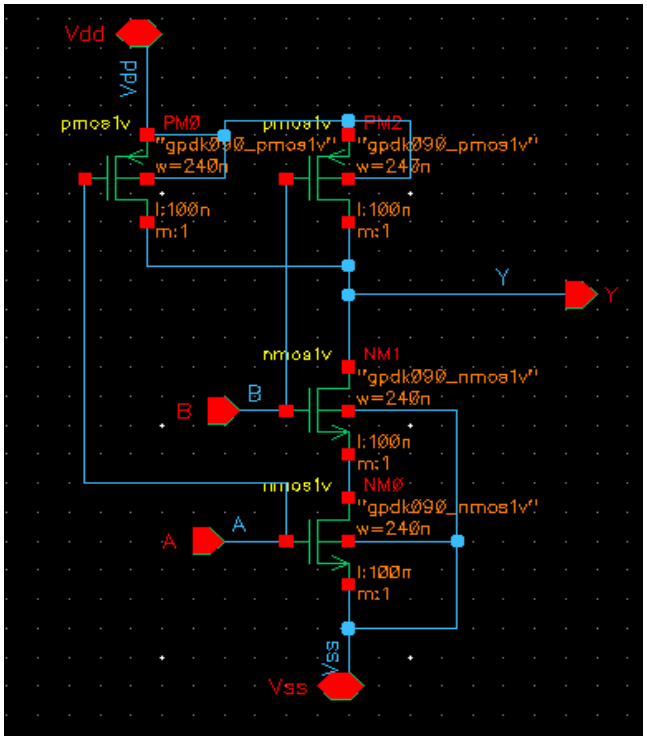
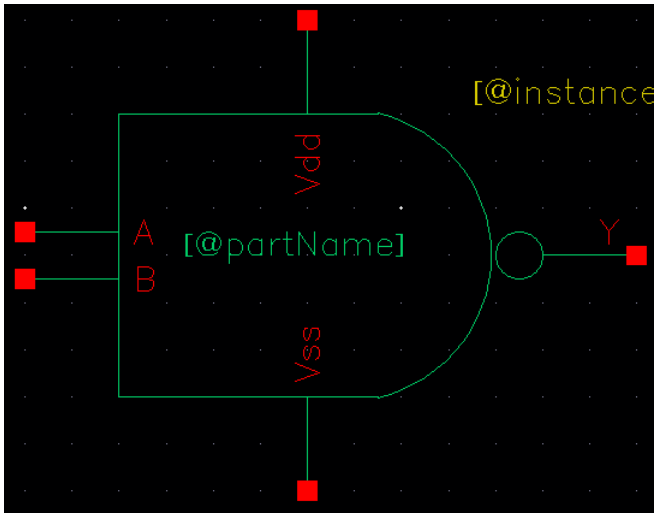
ID: 2001254

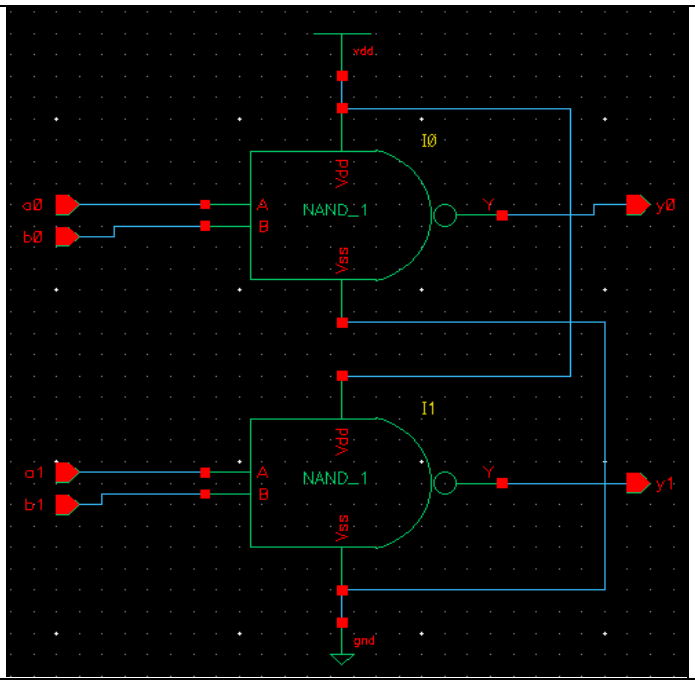
Technology used: **gpdk090**

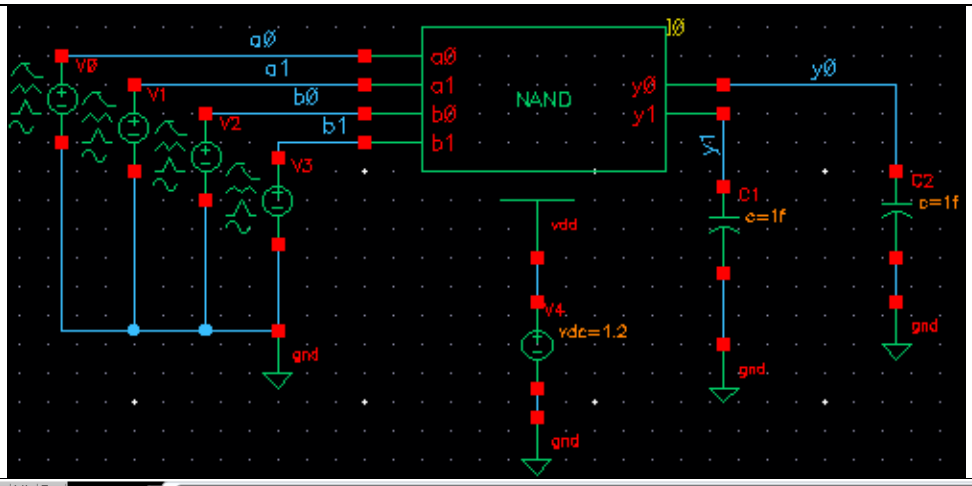
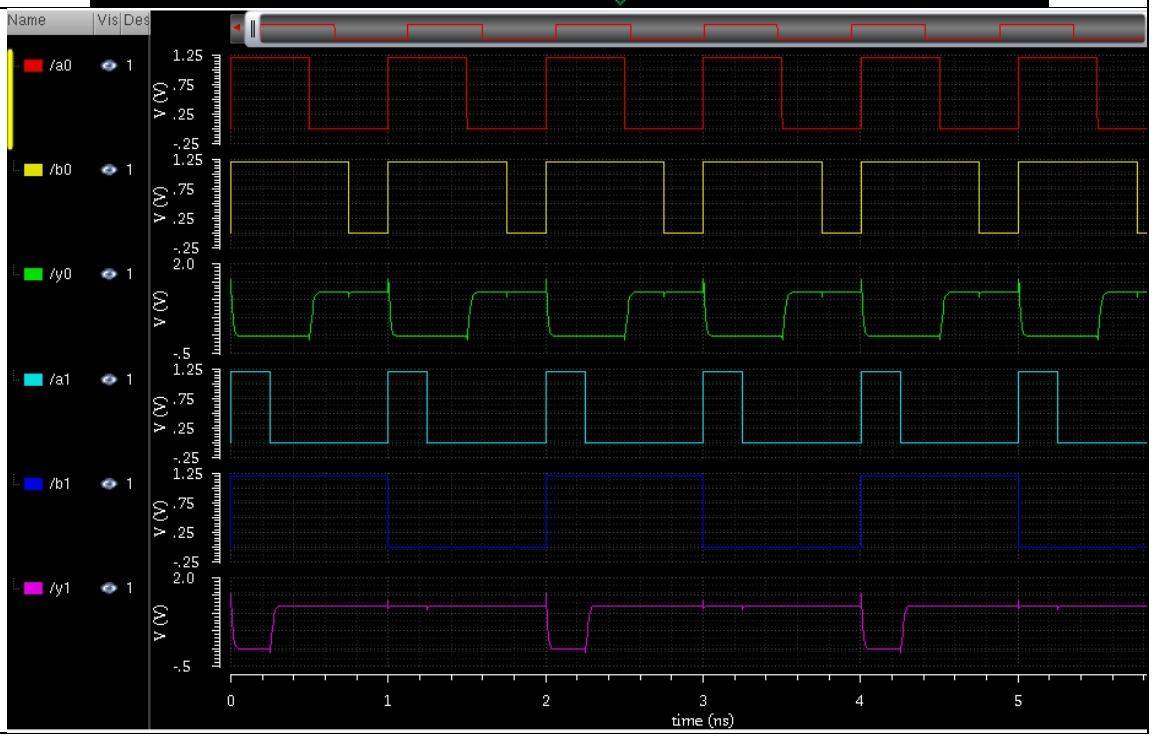
Logical Unit Blocks

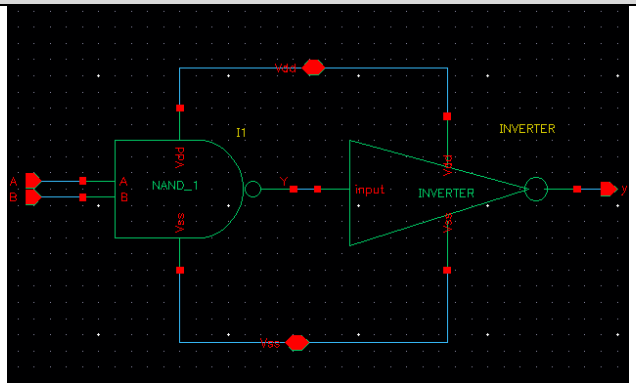
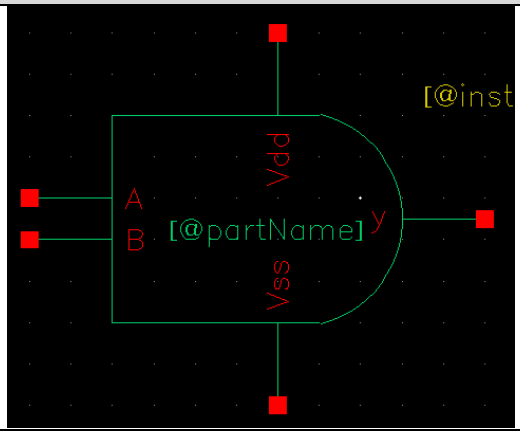
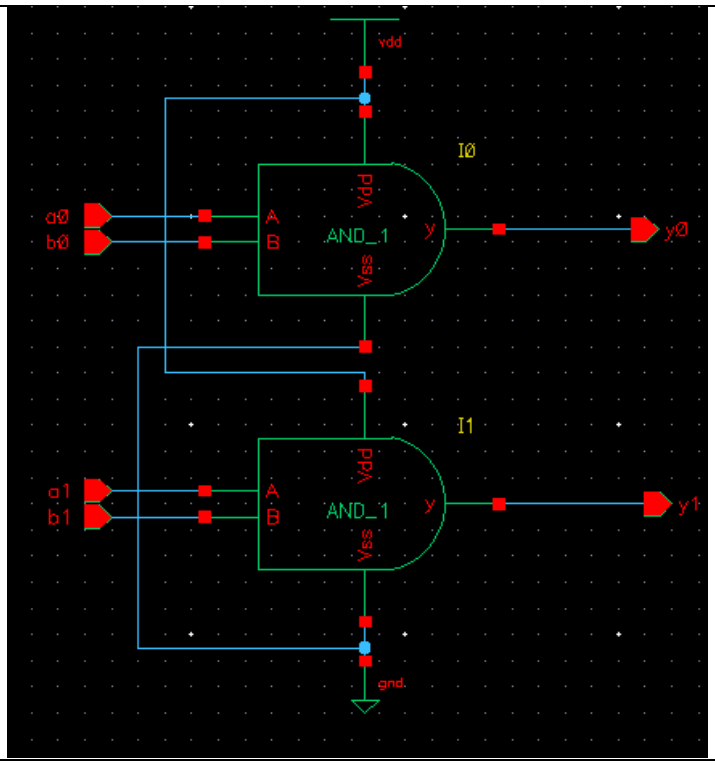
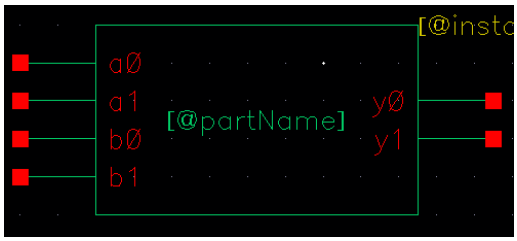
	Schematic	Symbol
Inverter		
Complement block		

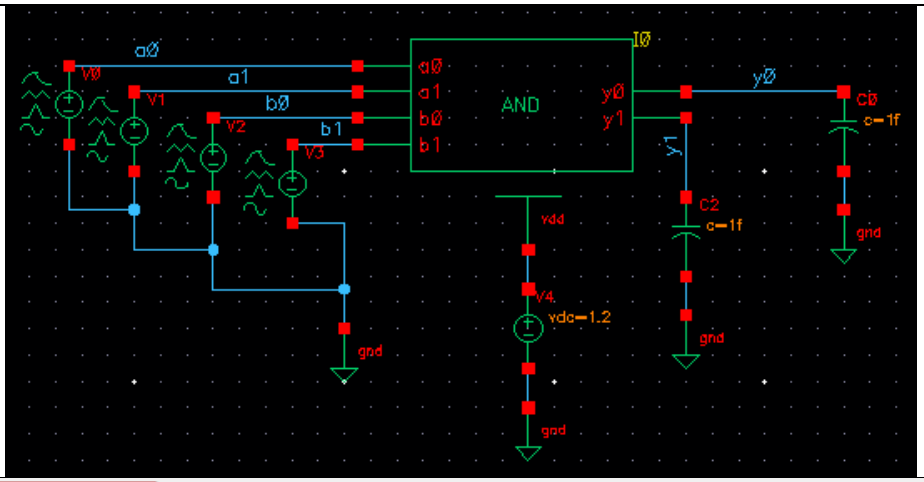
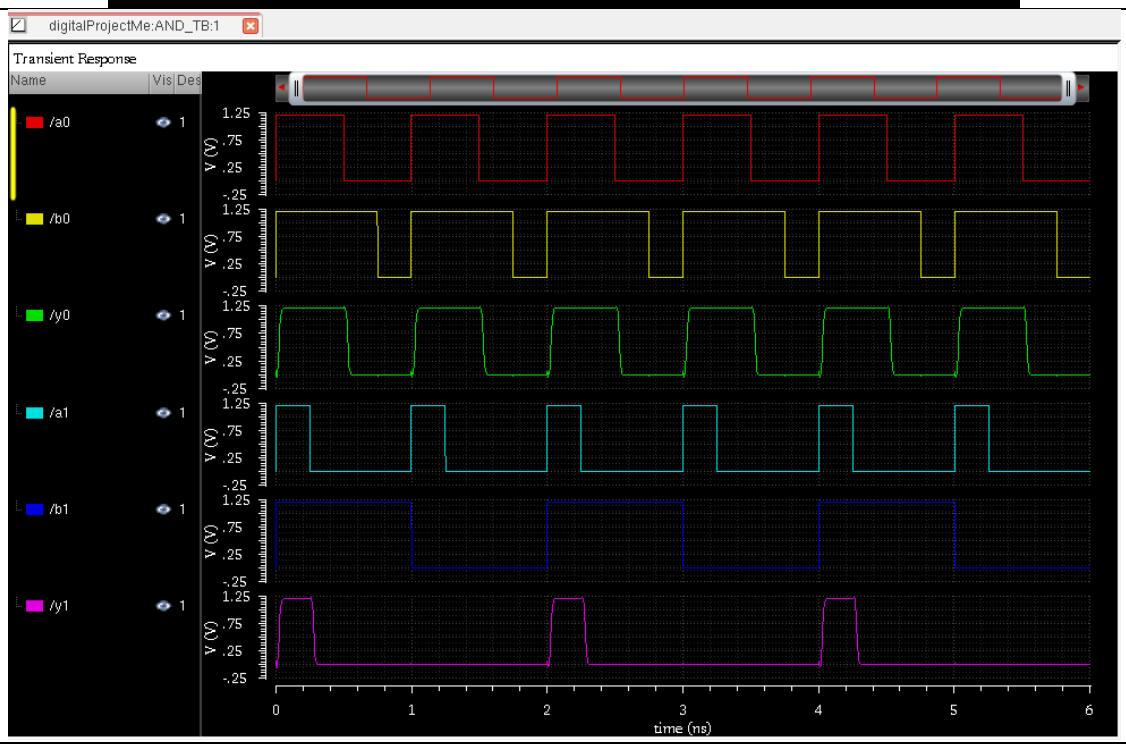
TB schematic	
Inverter 2-bit Wave forms	

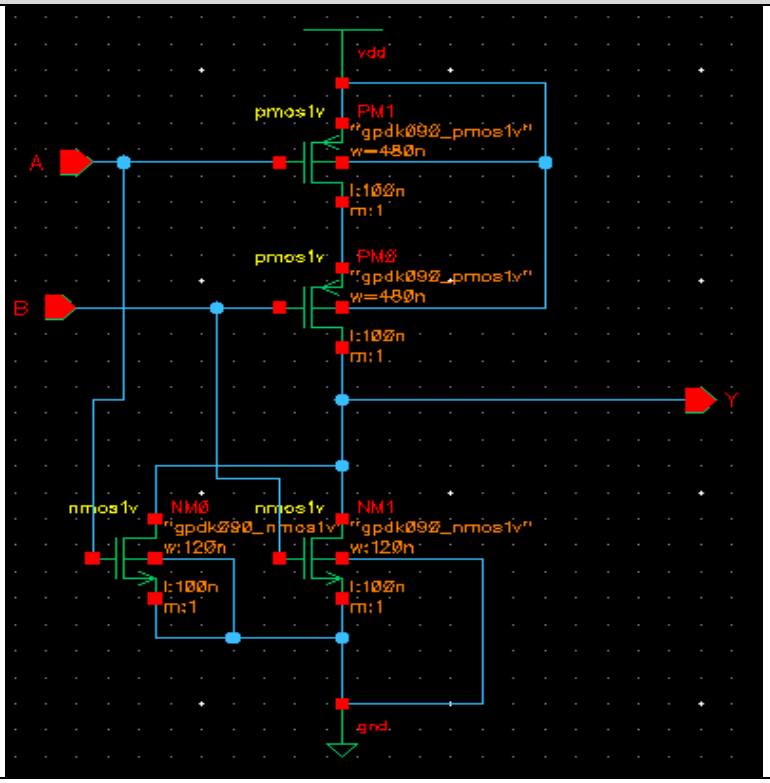
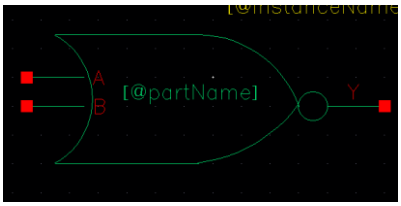
	Schematic	Symbol
NAND		

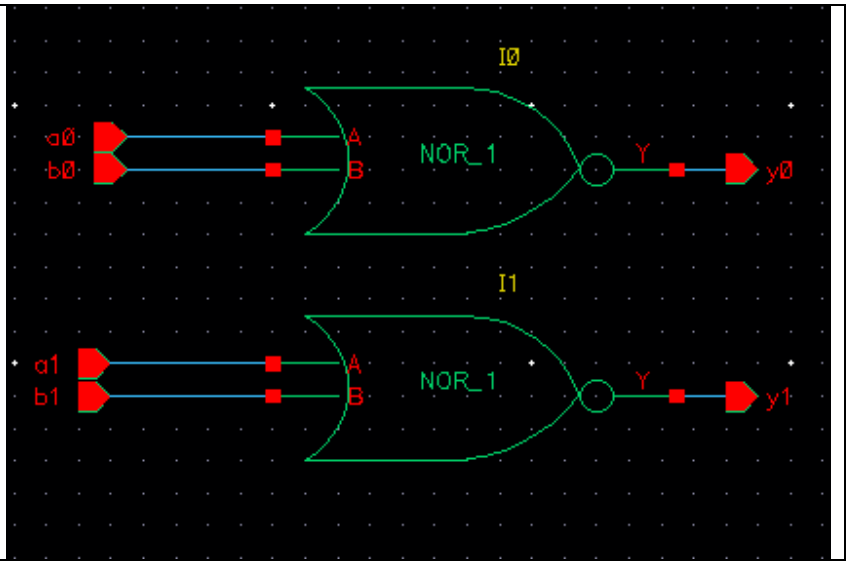
NAND 2-bit		

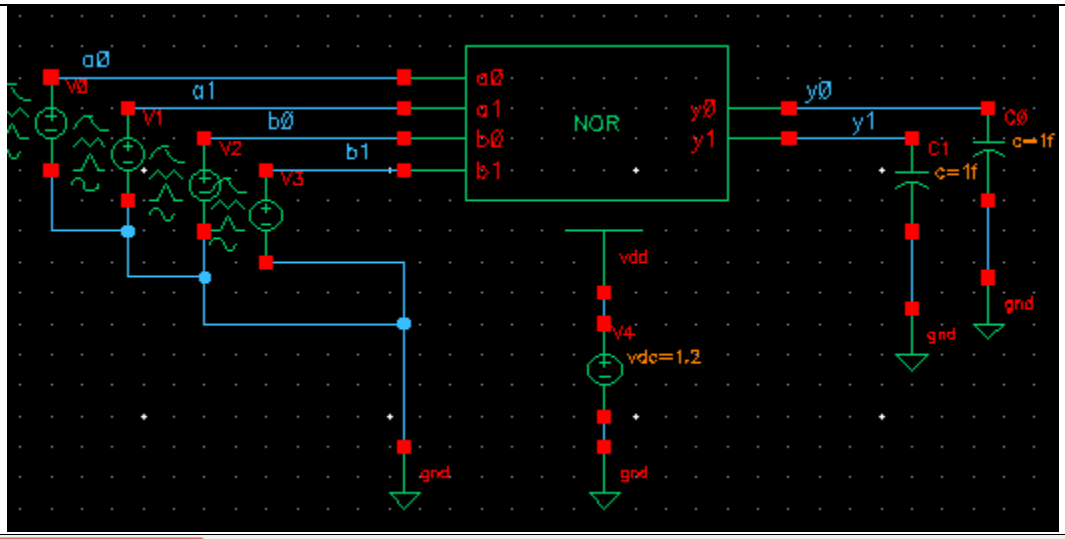
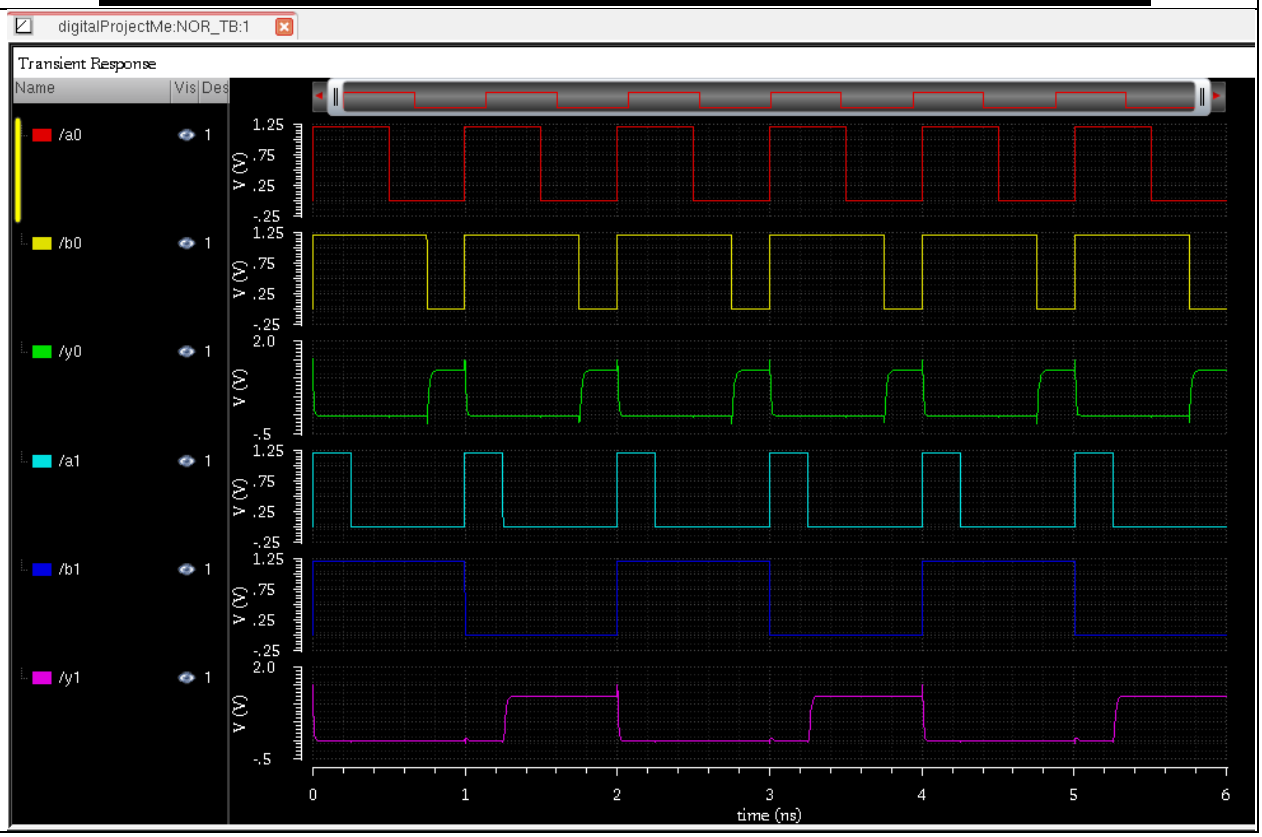
TB schematic	
NAND 2-bit Waveforms	

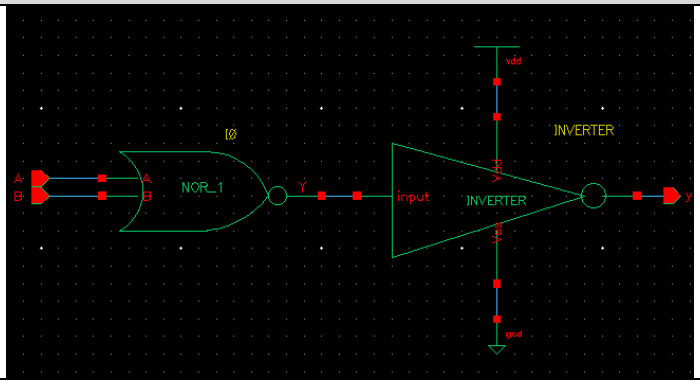
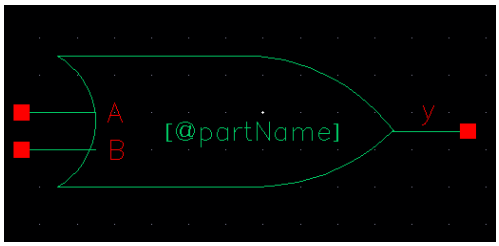
gate	Schematic	Symbol
AND		
AND 2-bit		

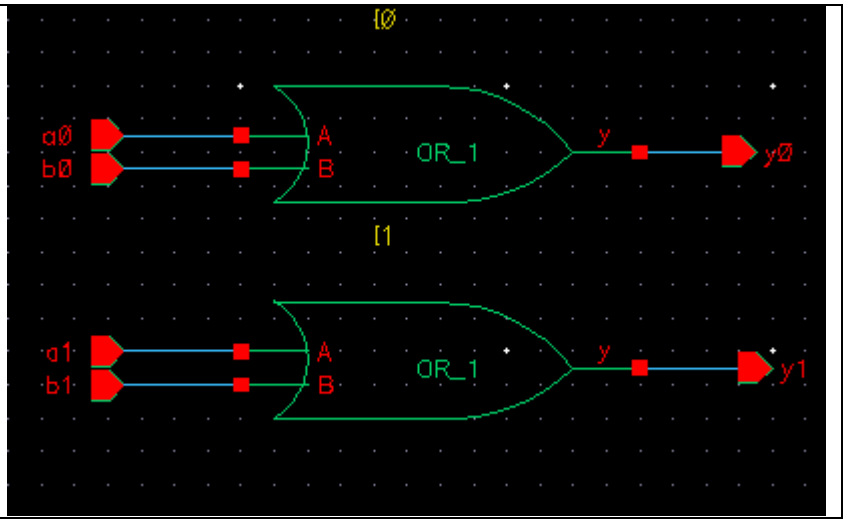
TB AND 2-bit	
AND 2-bit **Wave forms**	

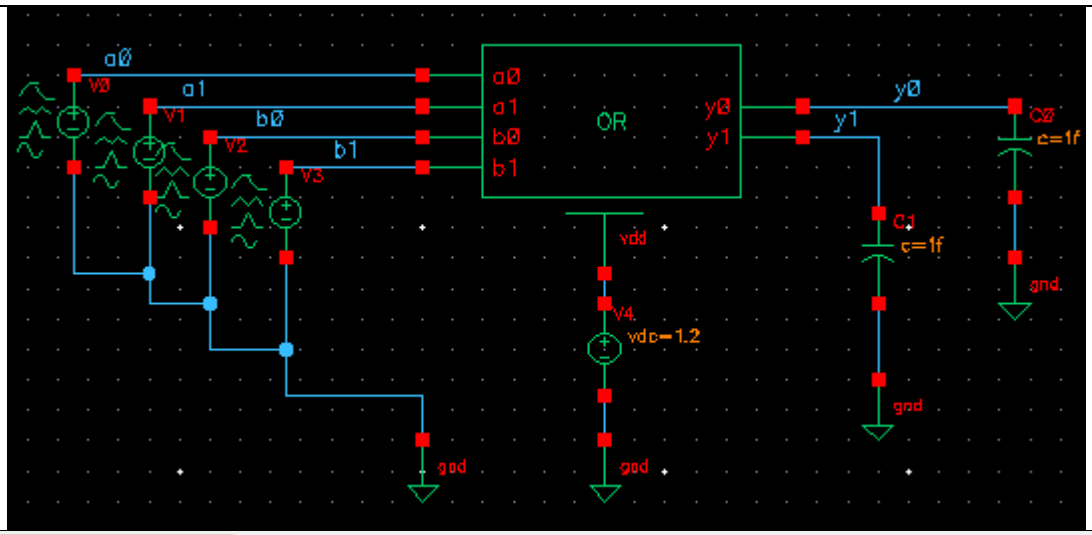
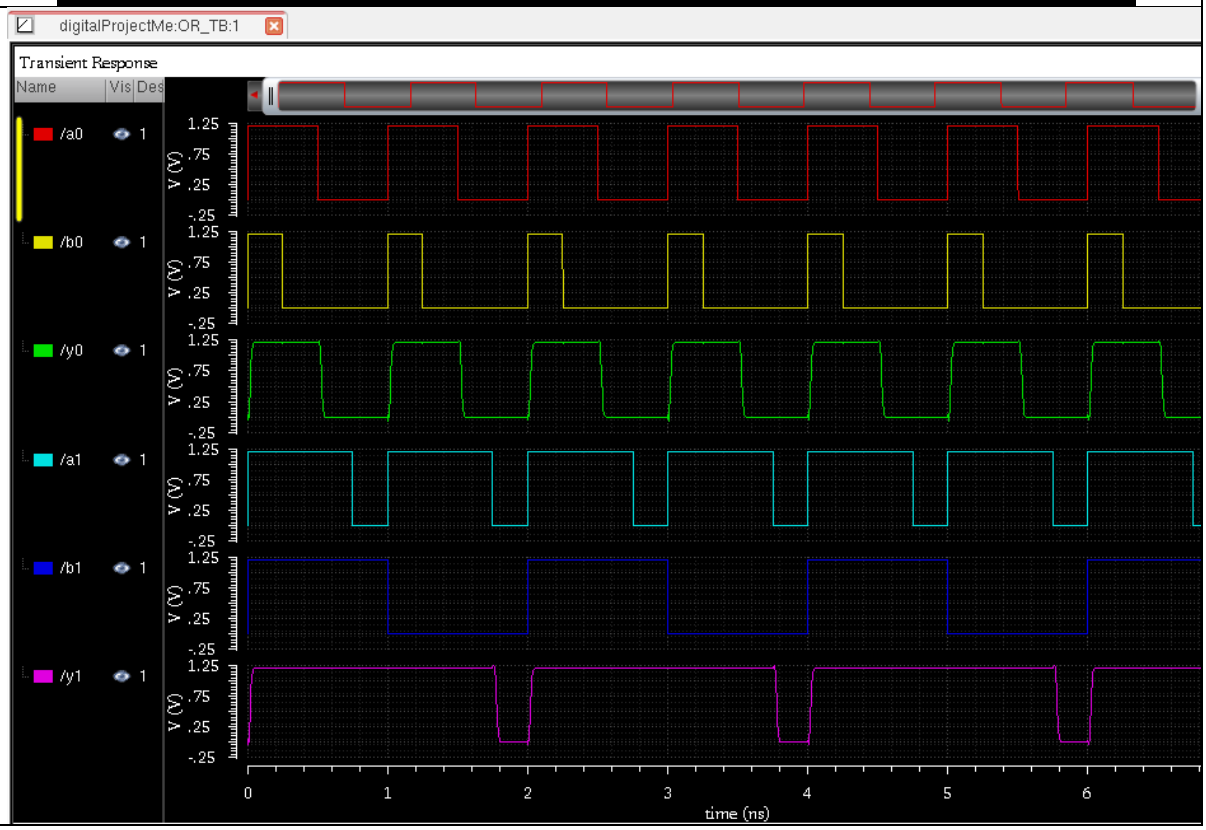
gate	Schematic	Symbol
NOR		

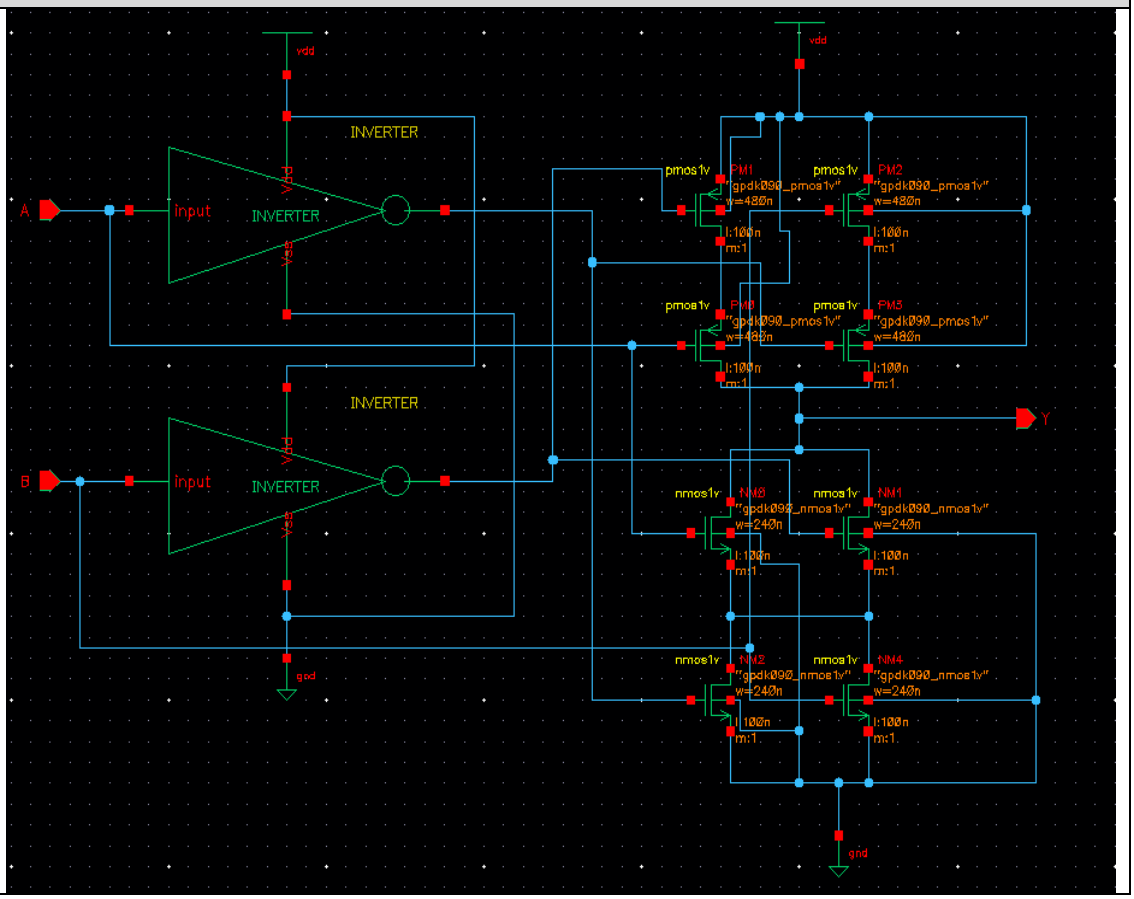
NOR 2-bit	

TB NOR	
NOR 2-bit Wave form s	

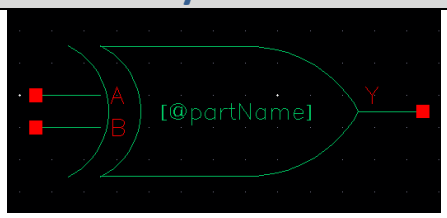
gate	Schematic	Symbol
OR		

OR 2-bit	

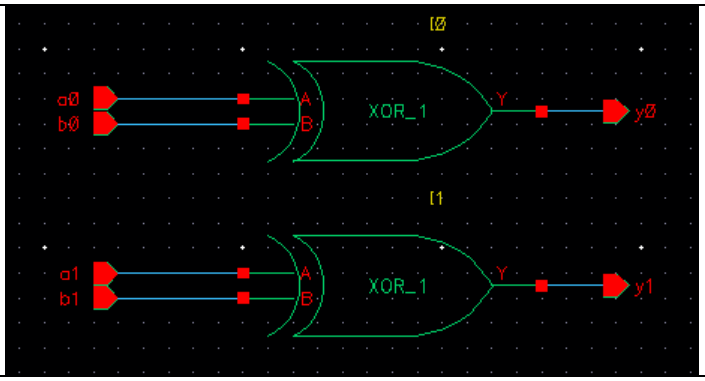
TB OR 2-bit	
OR 2-bit Waveforms	

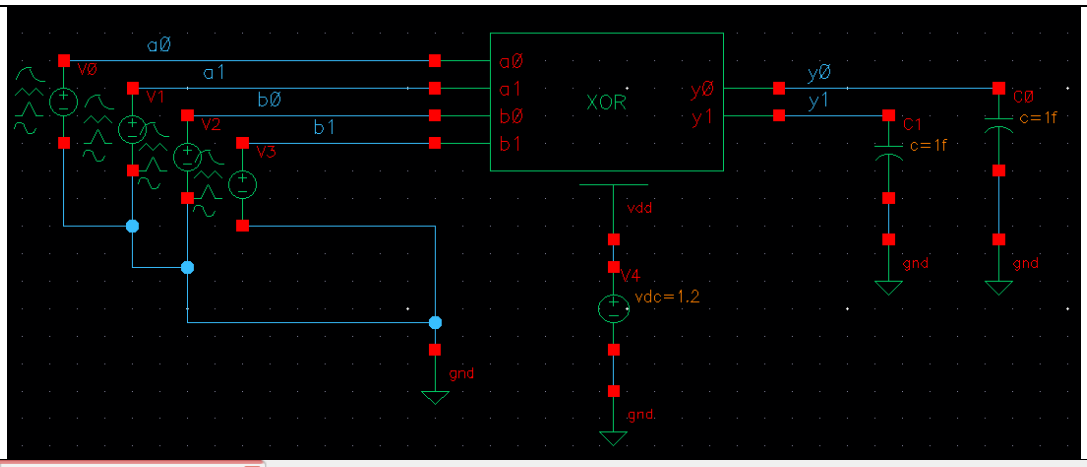
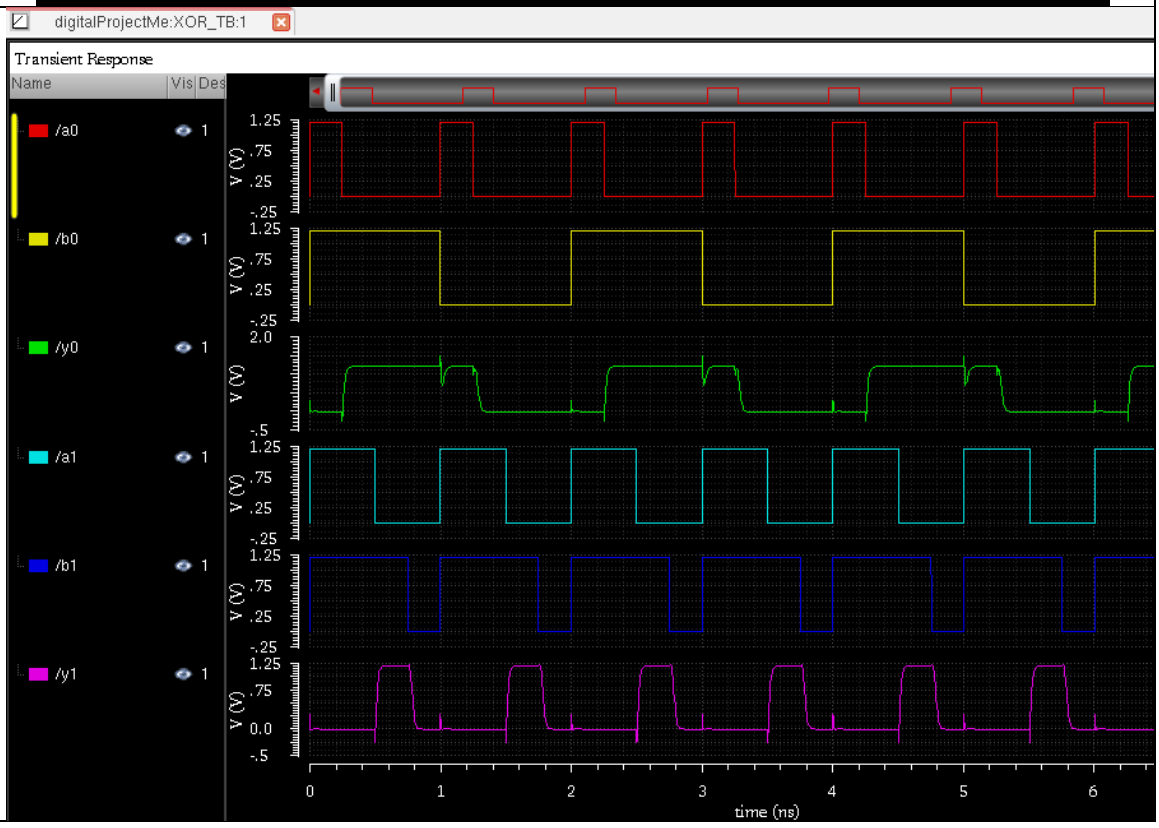
Gate	Schematic
XOR	

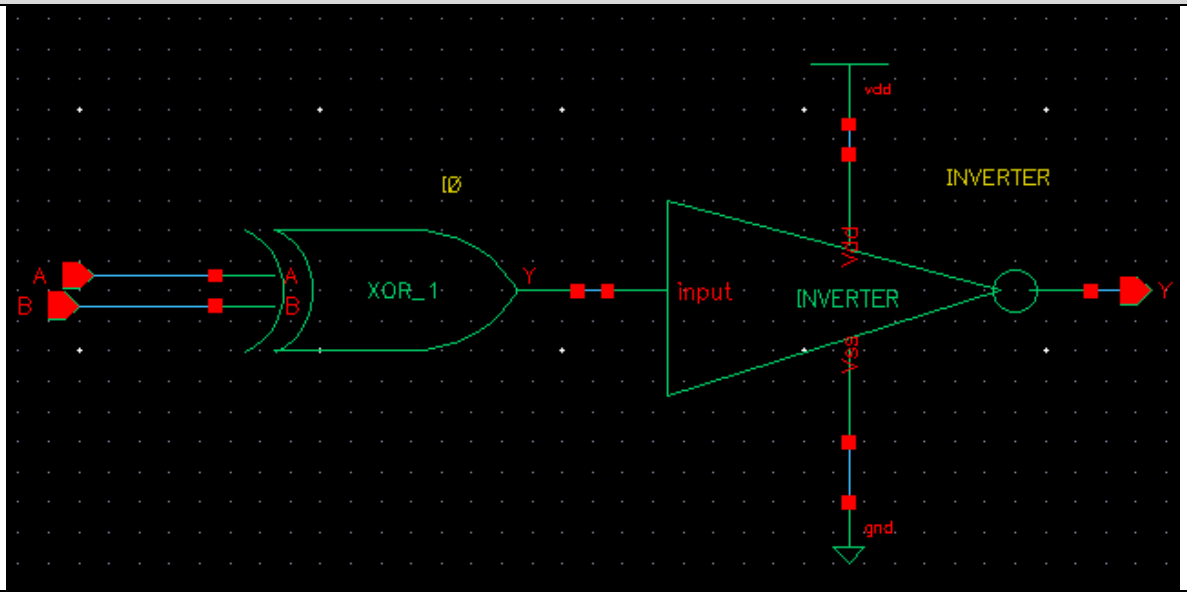
Symbol



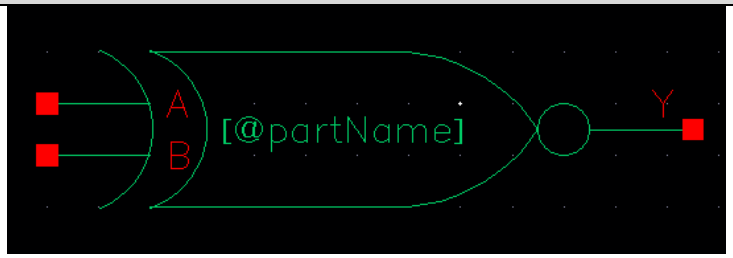
XOR 2-bit	

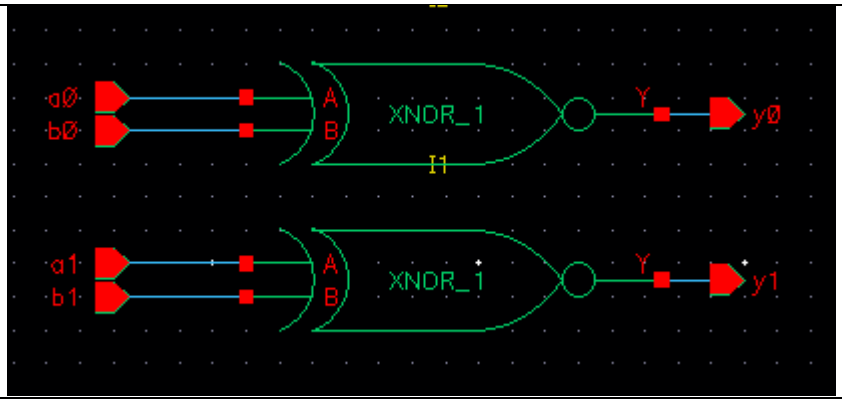


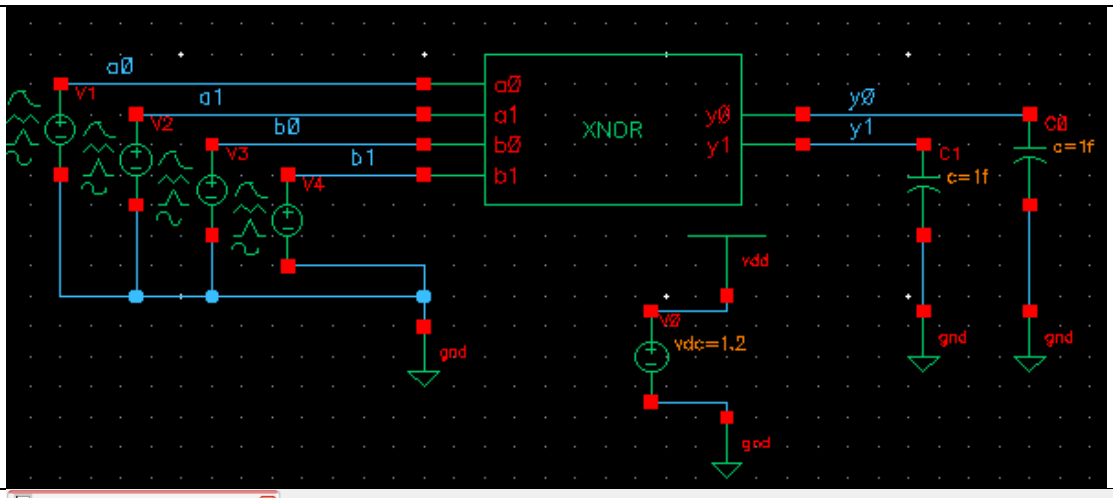
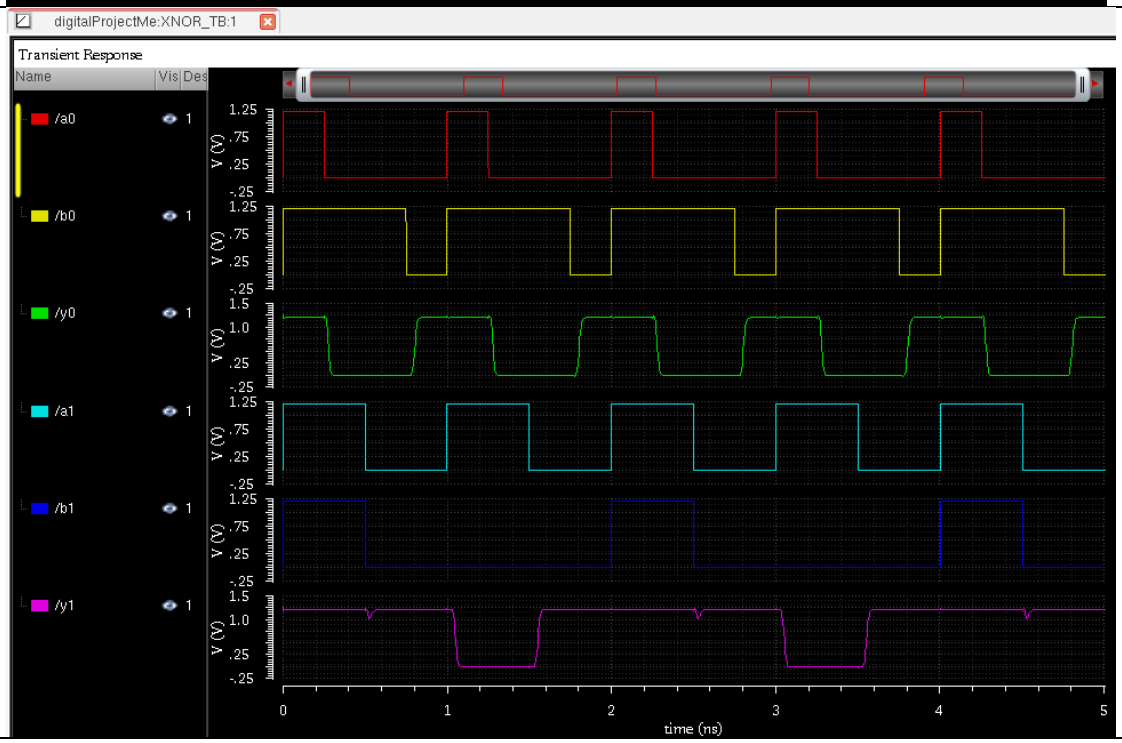
XOR 2-bit TB	
XOR 2-bit waveforms	

Gate	Schematic
XNOR	

Symbol

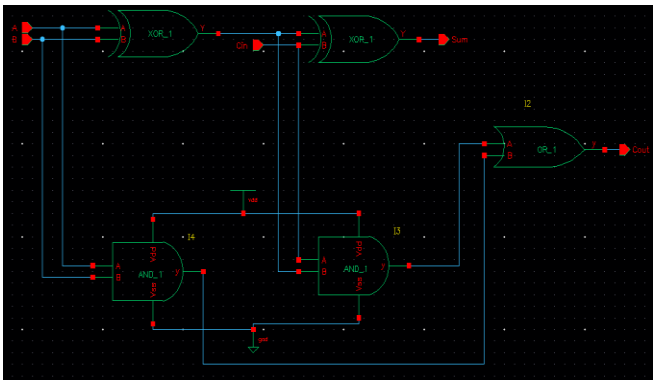


XNOR 2-bit	

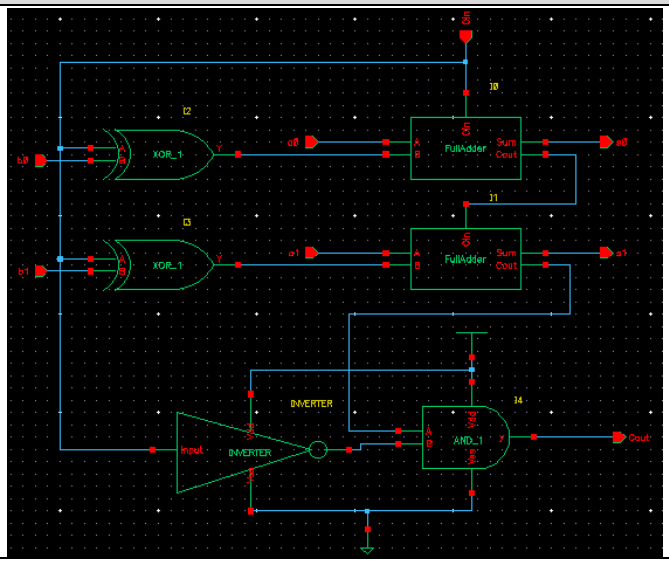
XNOR 2-bit TB	
XNOR 2-bit Waveform	

Arithmetic Unit Blocks

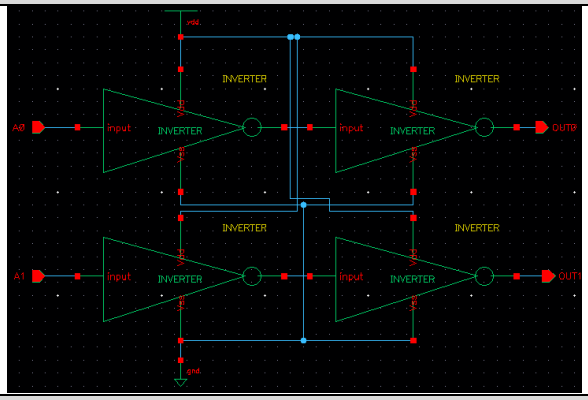
1-bit Full adder schematic



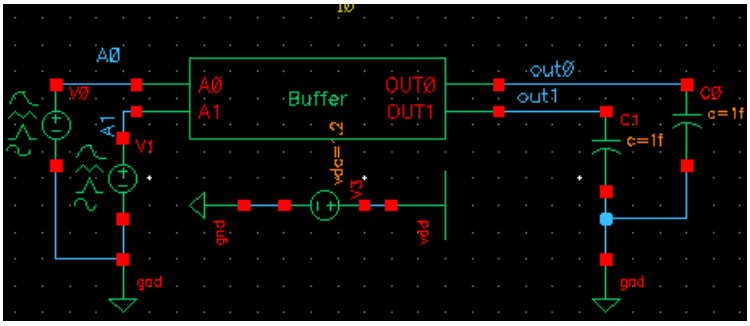
2-bit Full adder / Subtractor schematic



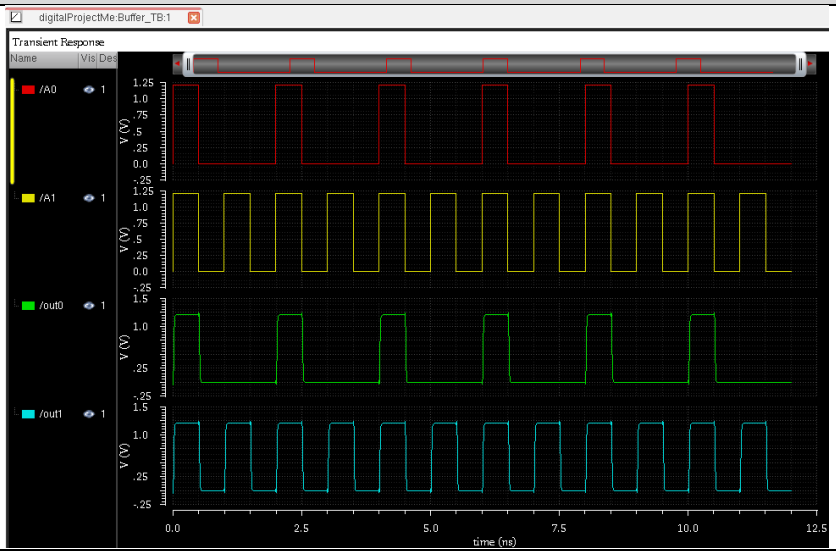
2-bit Buffer Schematic



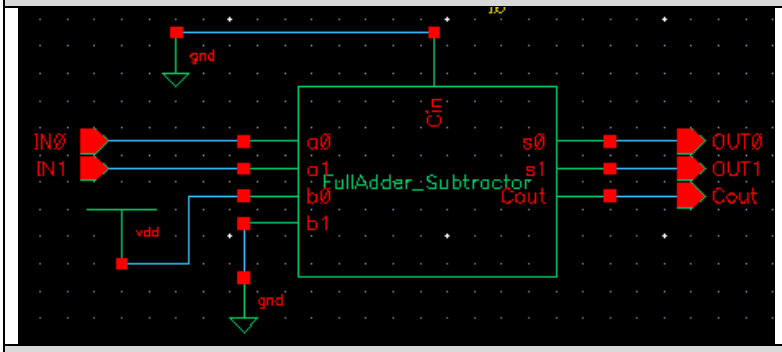
Testbench



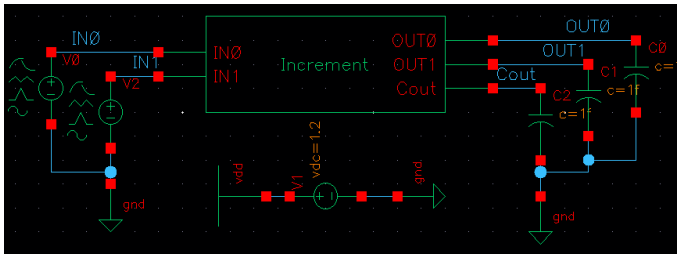
2-bit Buffer Waveforms



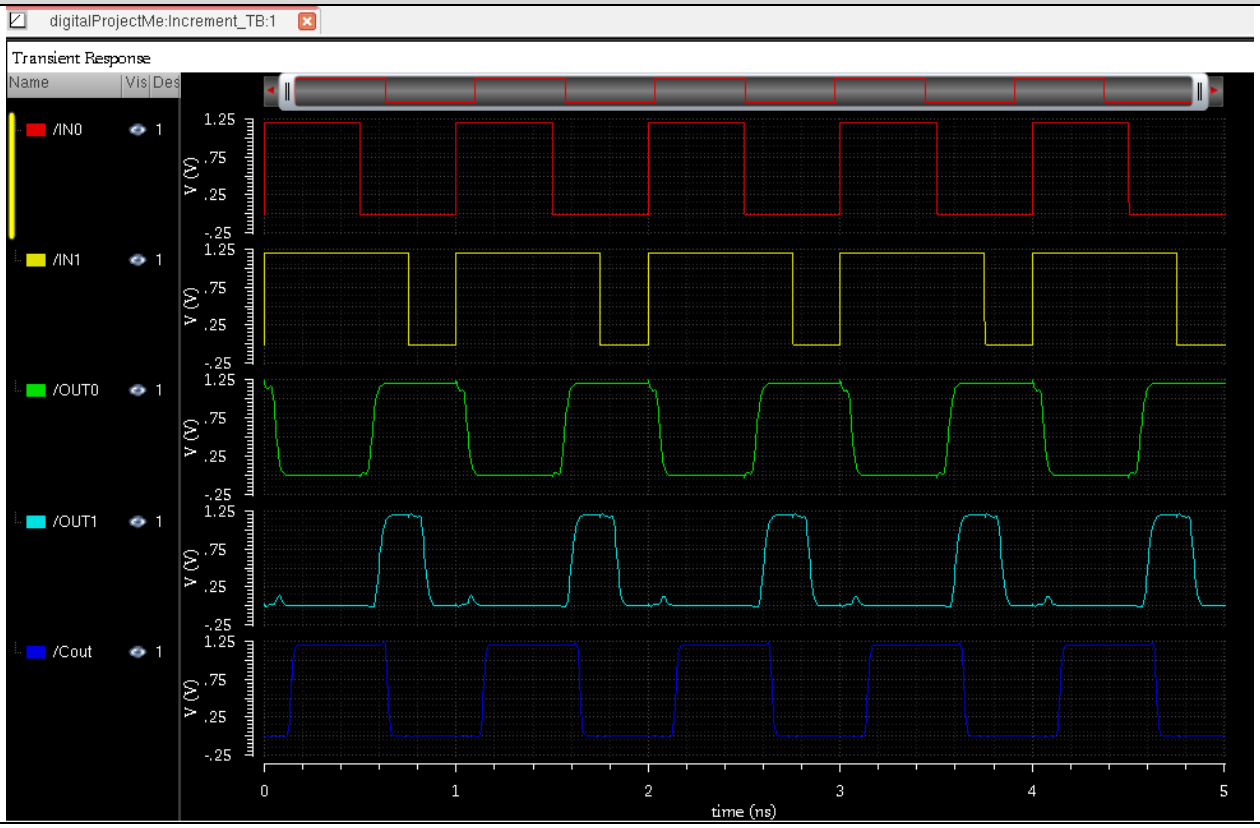
Increment Schematic



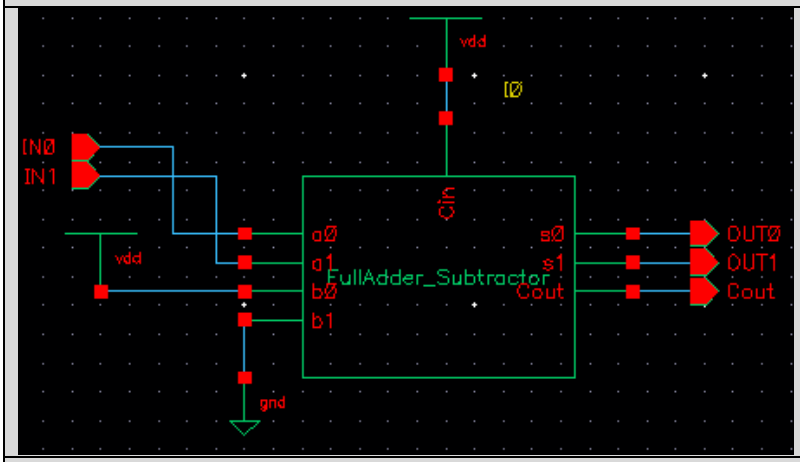
Increment Testbench



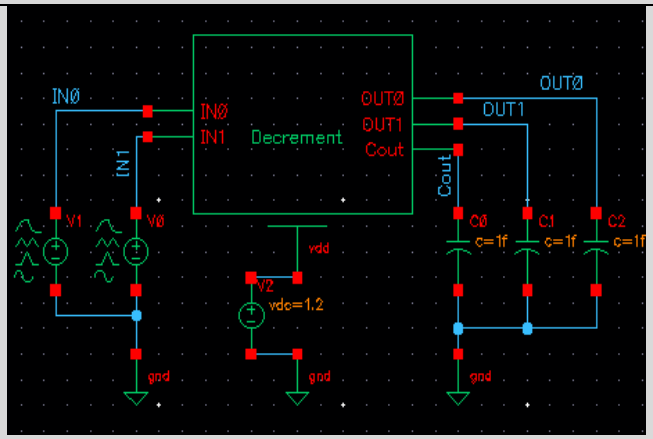
Increment waveforms



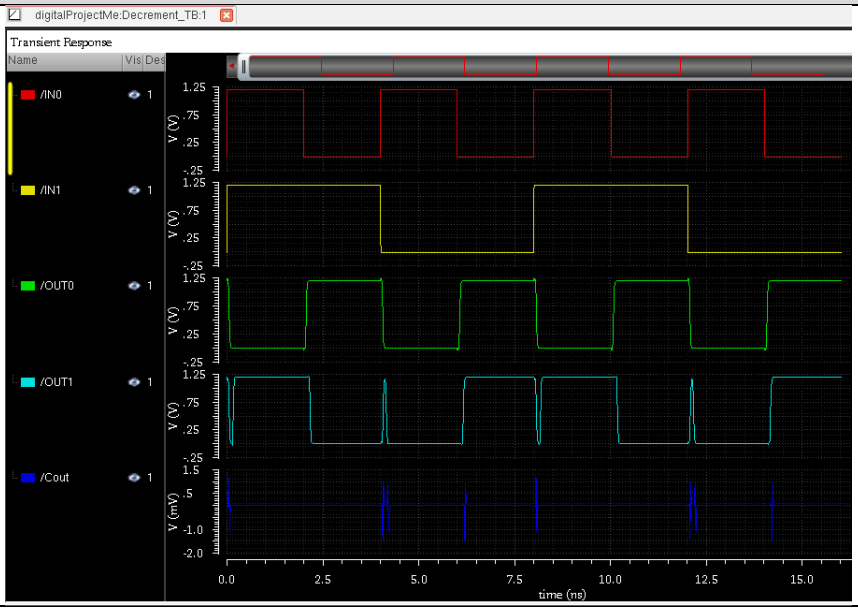
Decrement Schematic



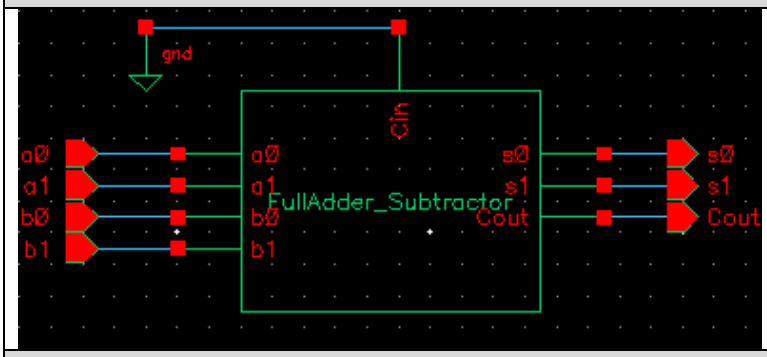
Decrement Testbench



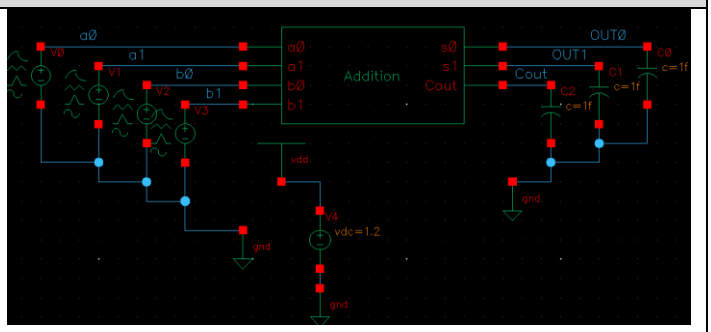
Decrement Waveforms



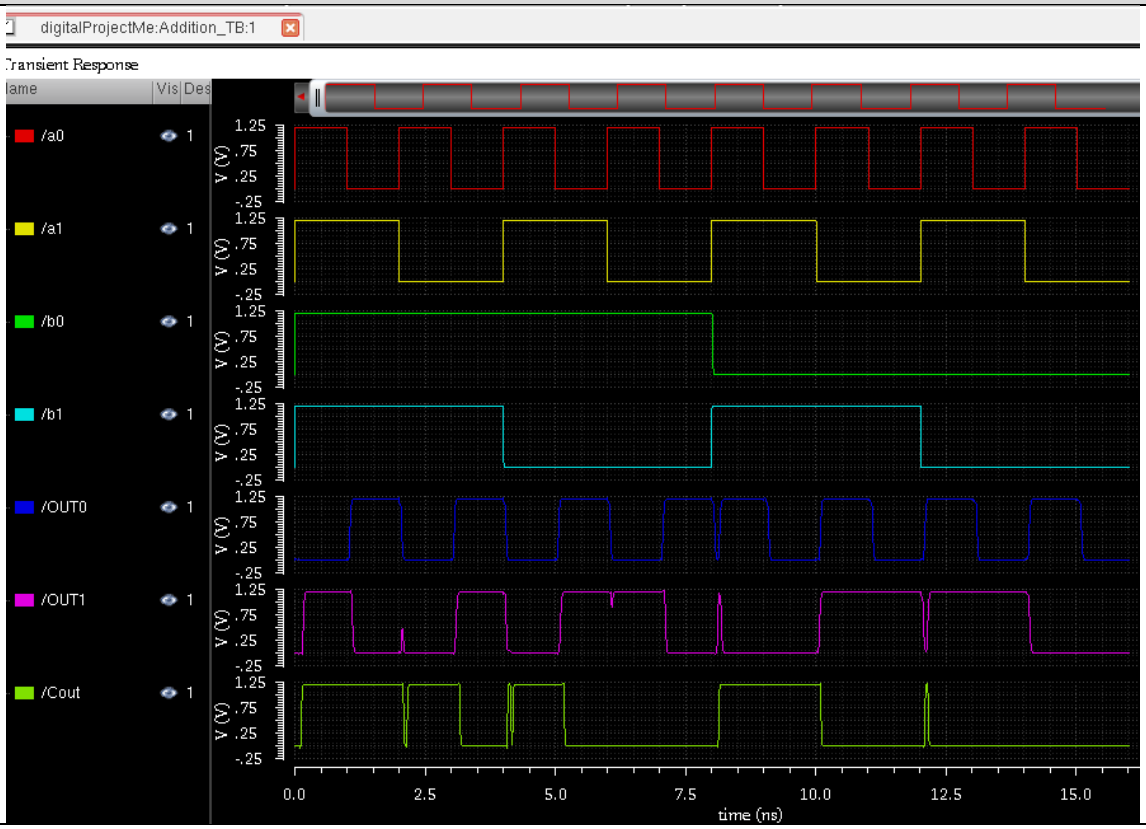
a+b schematic



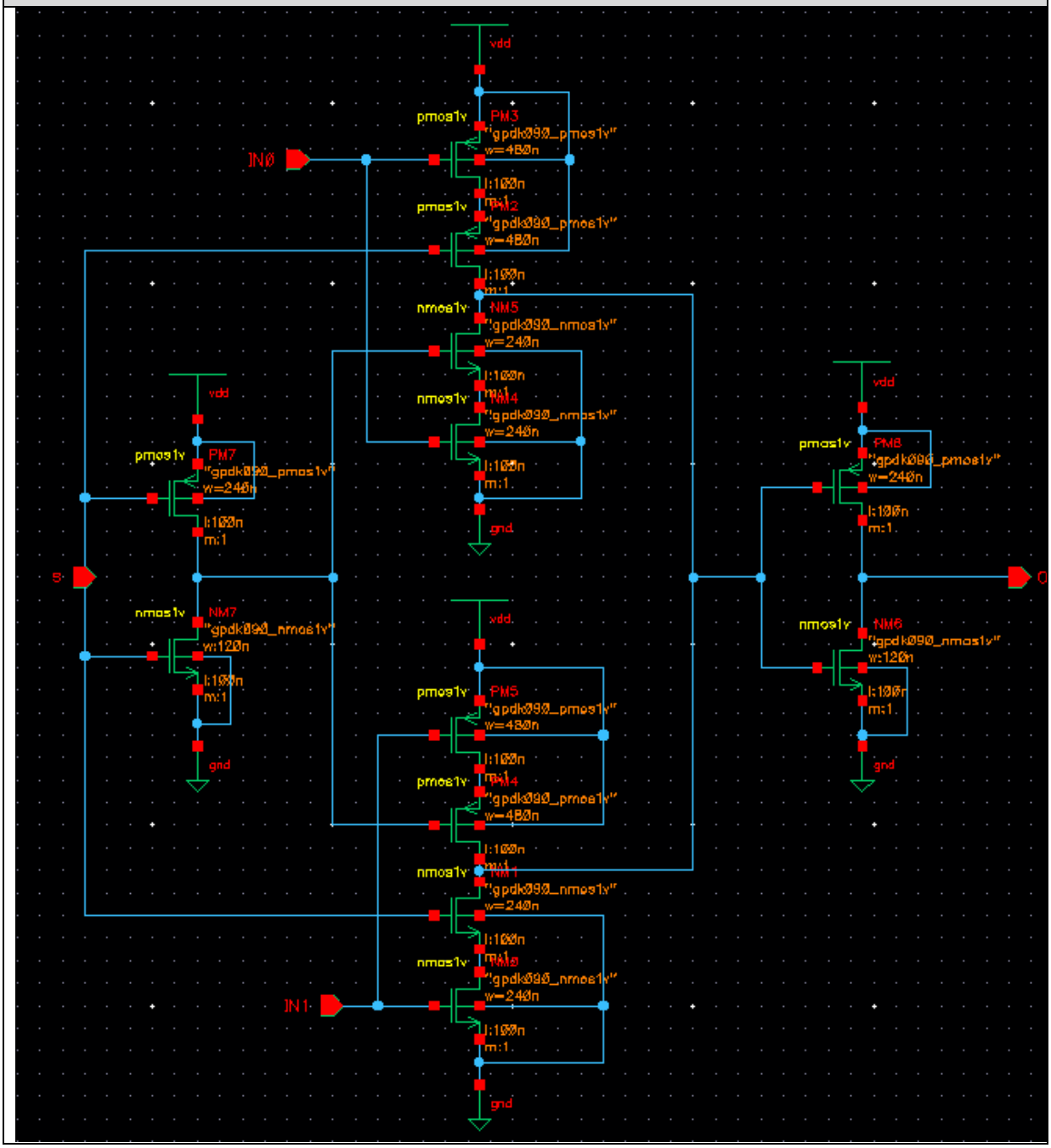
a+b Testbench



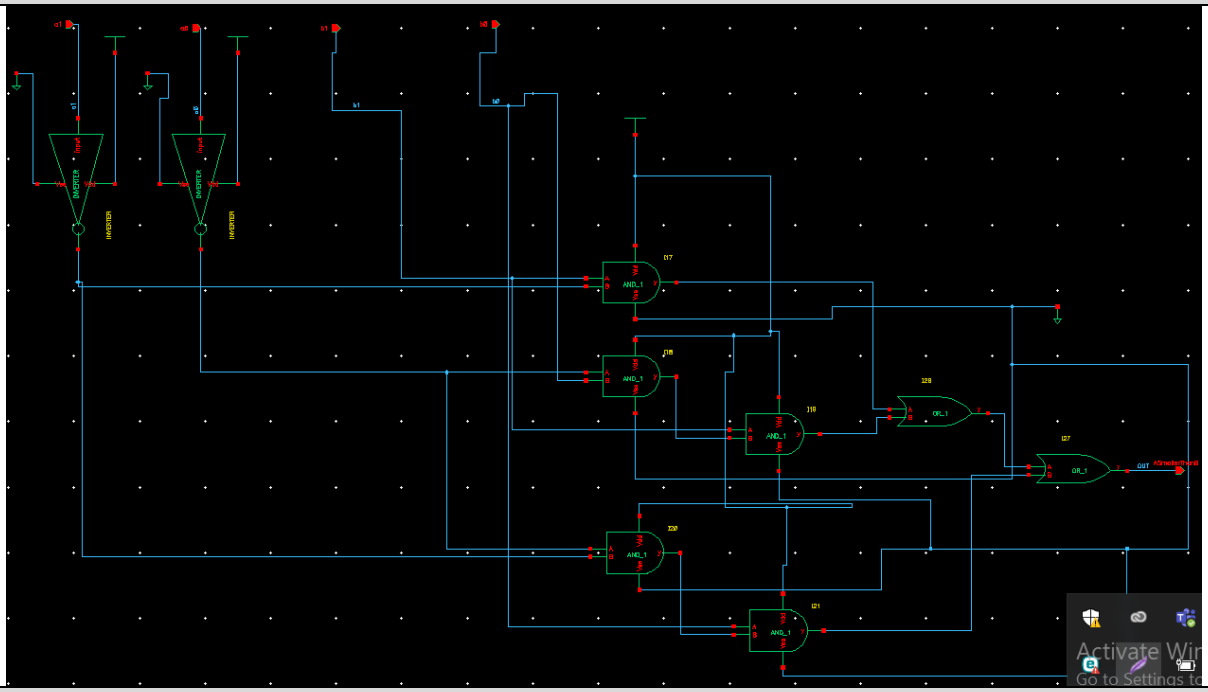
a+b Waveforms



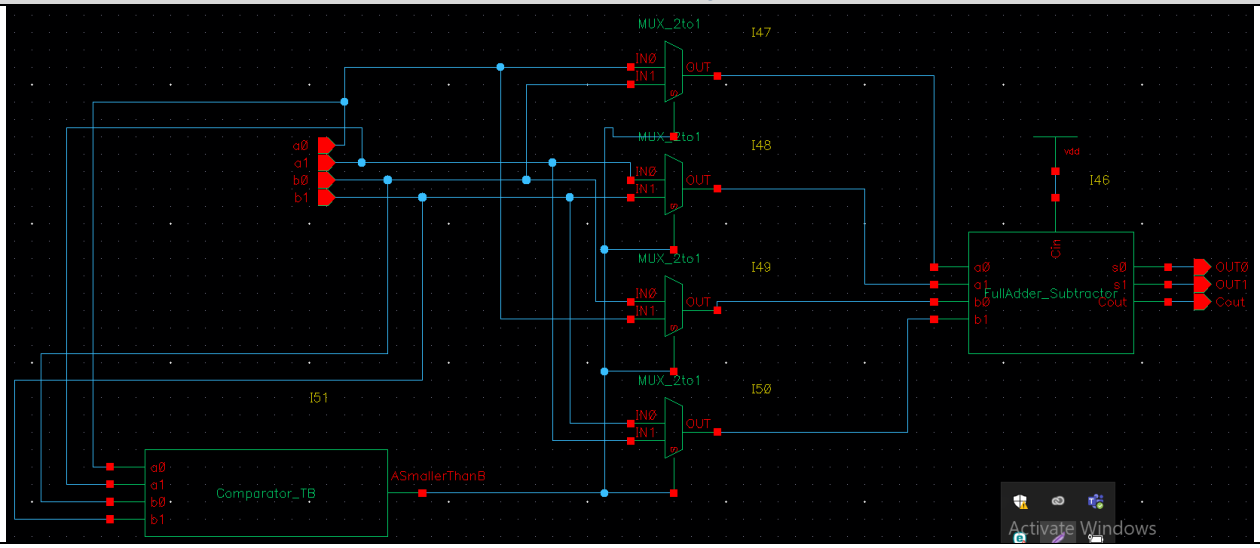
MUX 2:1 Schematic



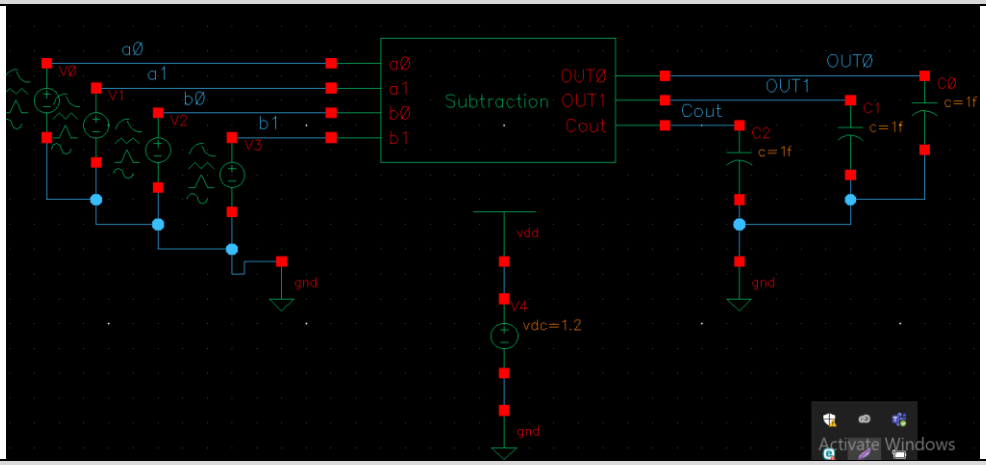
Comparator Schematic (Output = 1 if A<B)



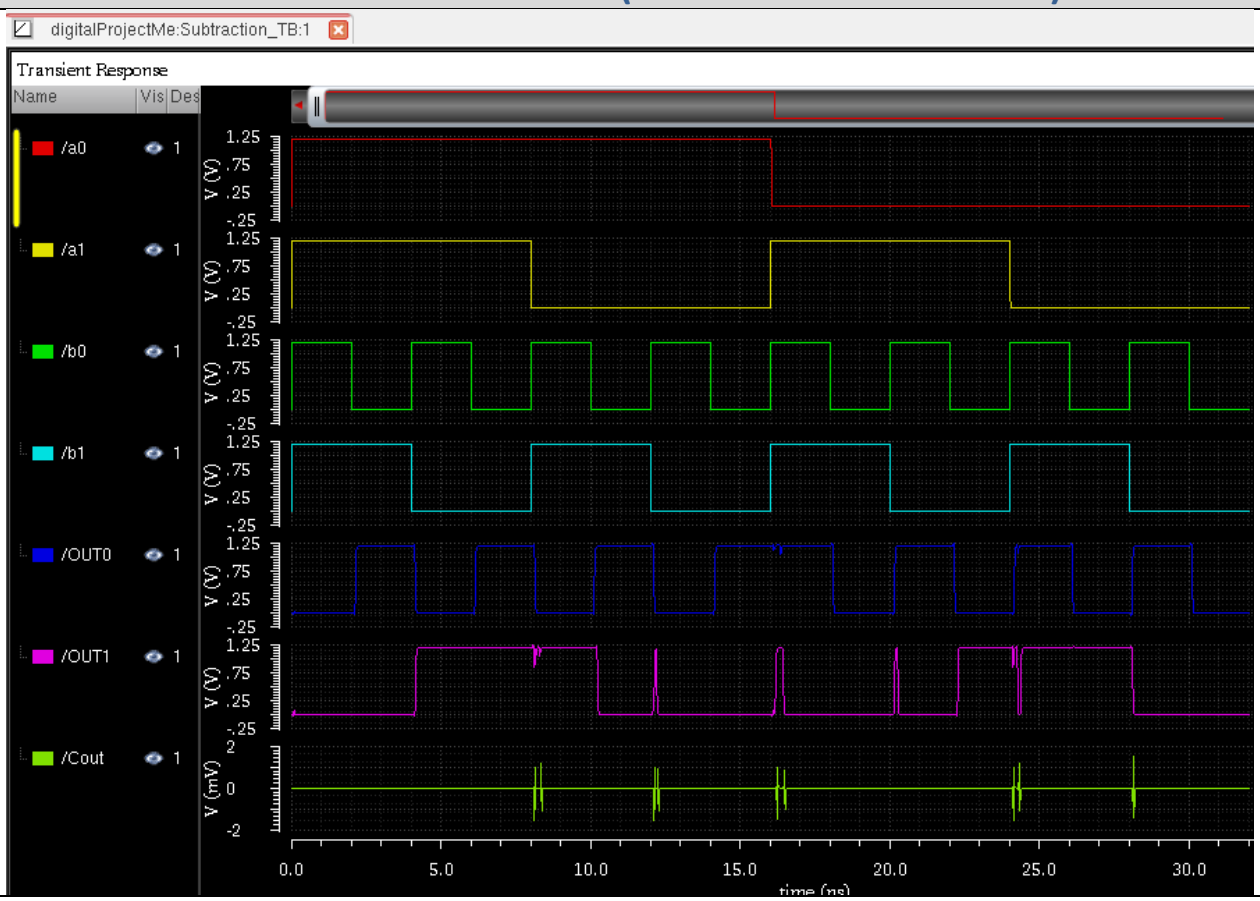
Subtraction Schematic (Comparing which is smaller and then subtracting it from the other)



Subtraction Testbench

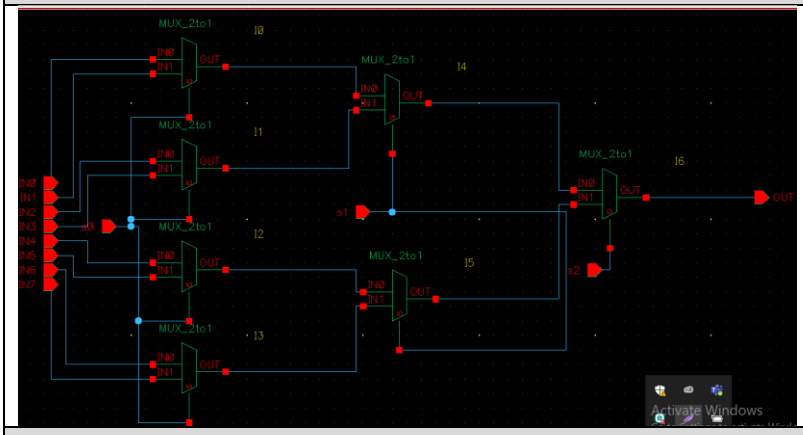


Subtraction waveforms (a-b if a>b and b-a if a<b)

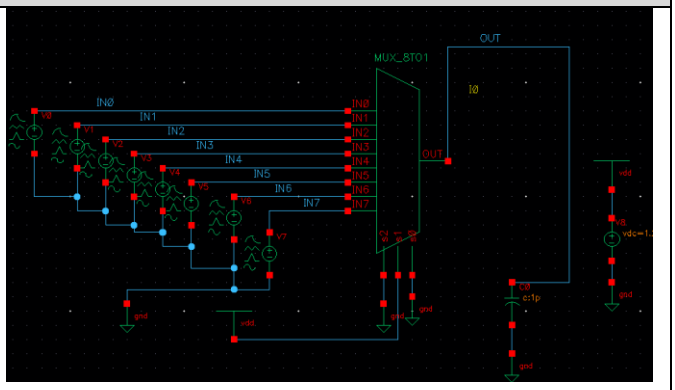


ALU

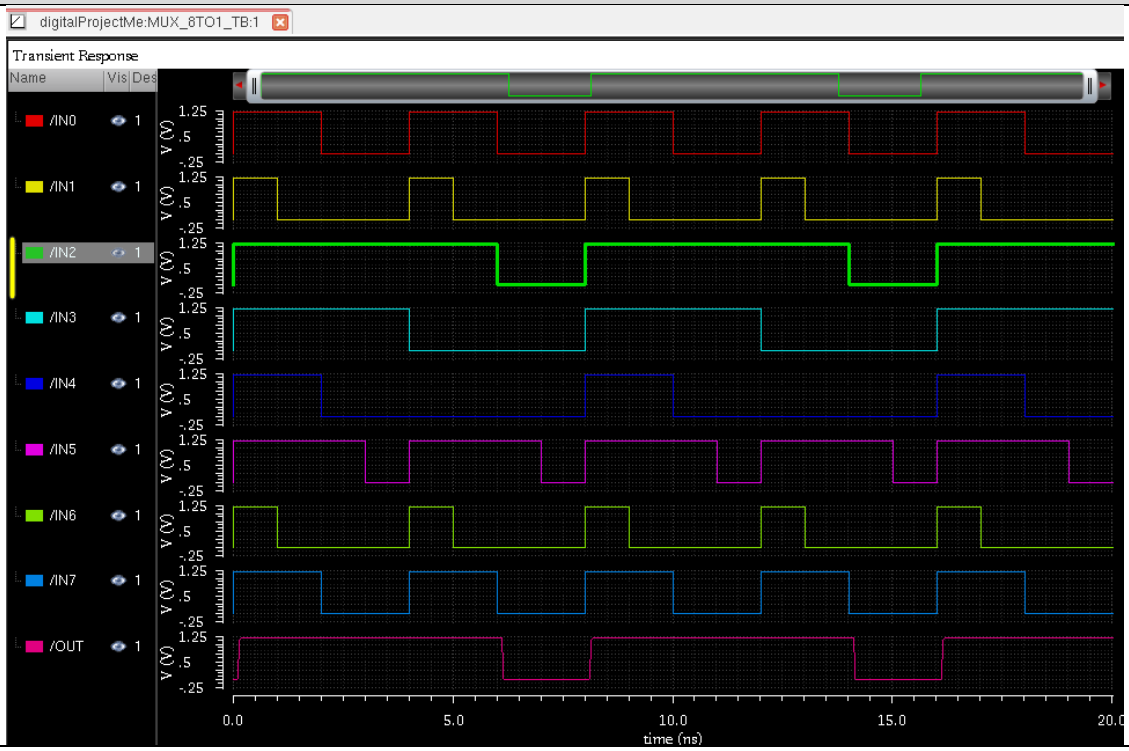
MUX 8:1 Schematic



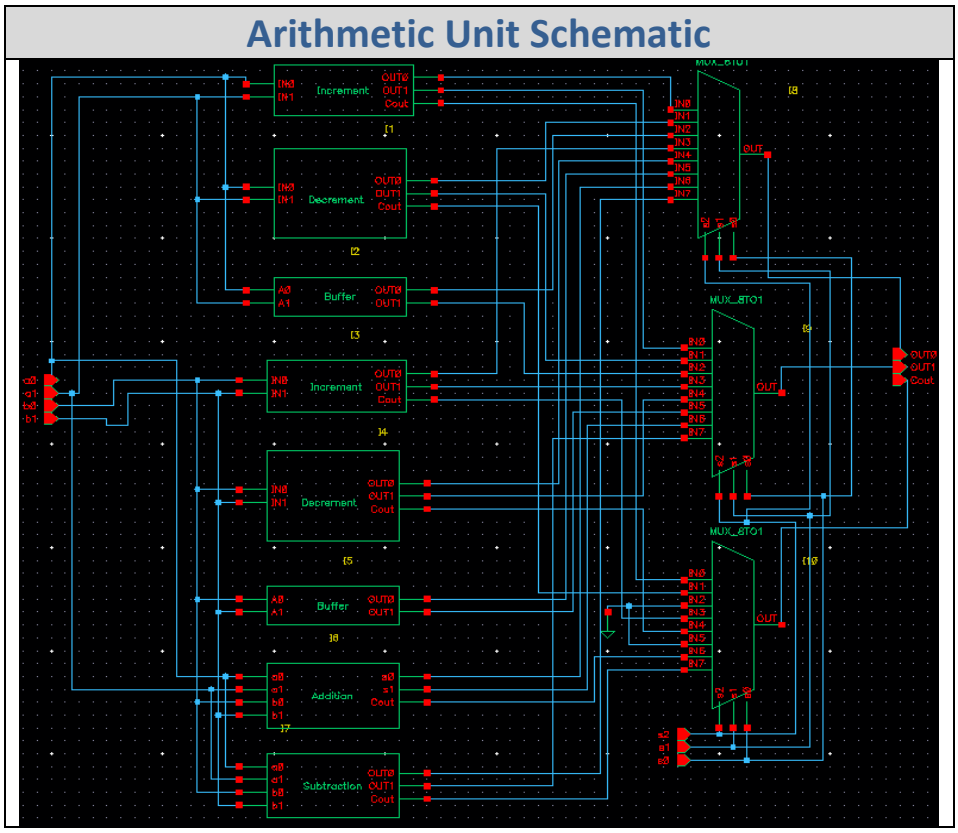
MUX 8:1 Testbench



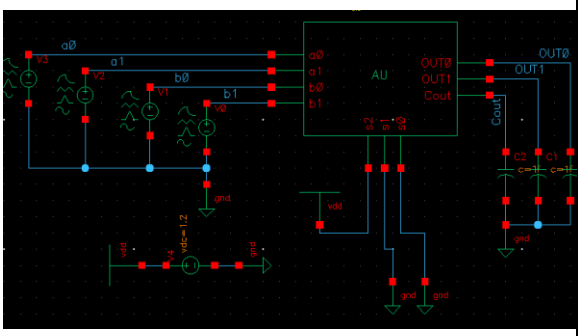
MUX 8:1 Testbench



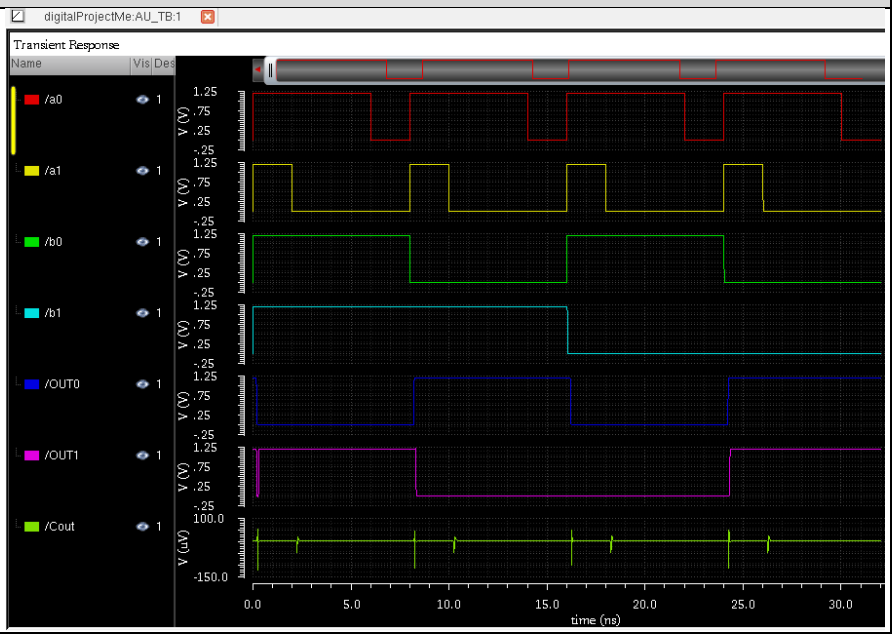
Arithmetic Unit Schematic



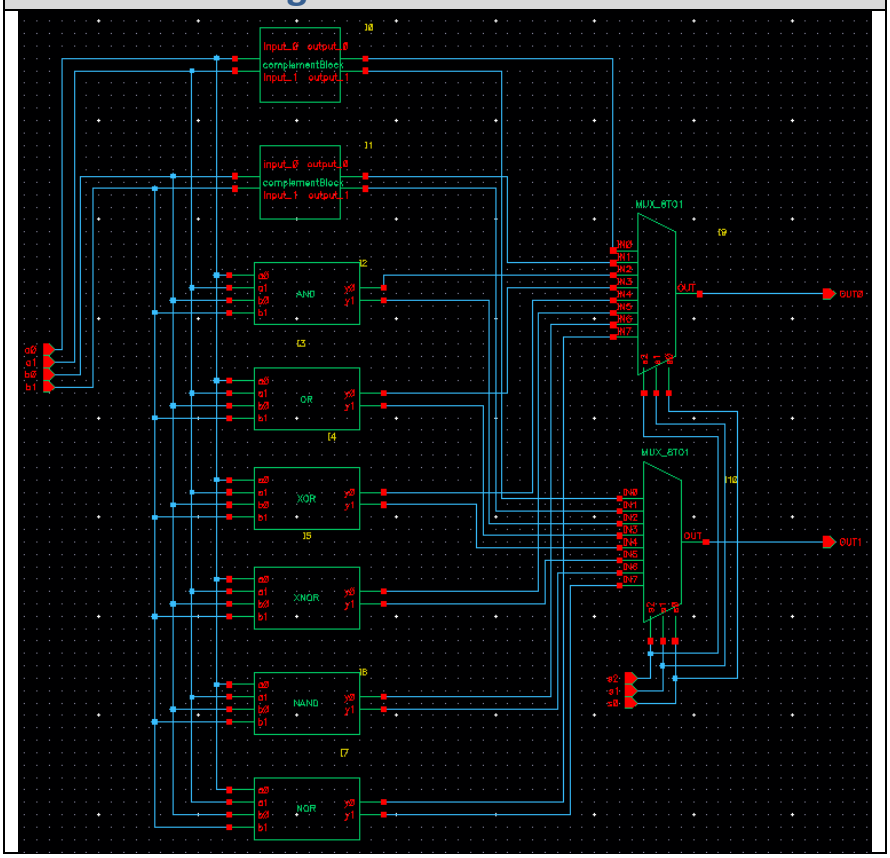
Testbench for Arithmetic Unit
(S2 S1 S0 = 1 0 0) ➔ Decrement b



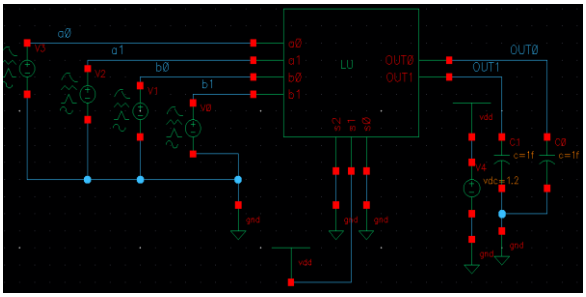
Waveforms of Decrement b Operation



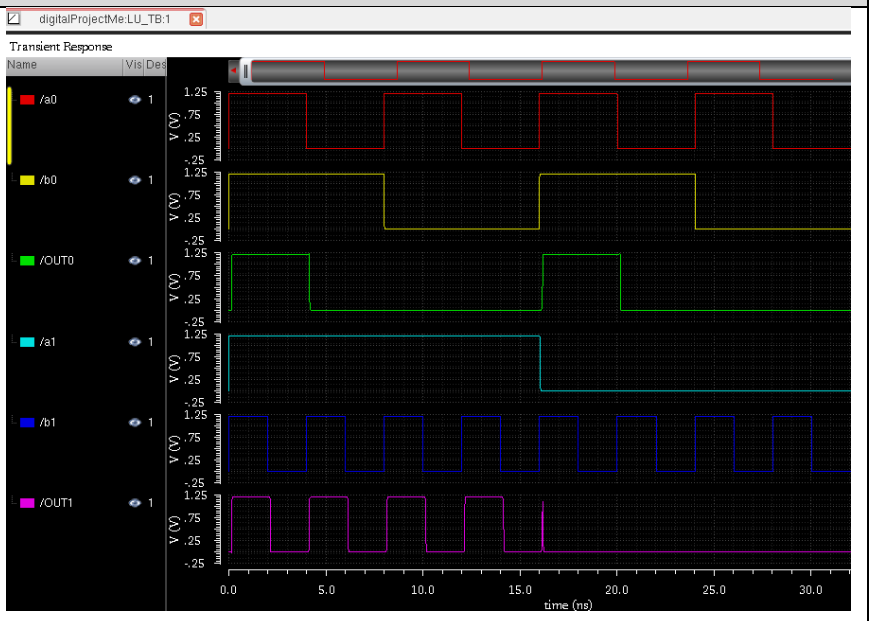
Logical Unit Schematic



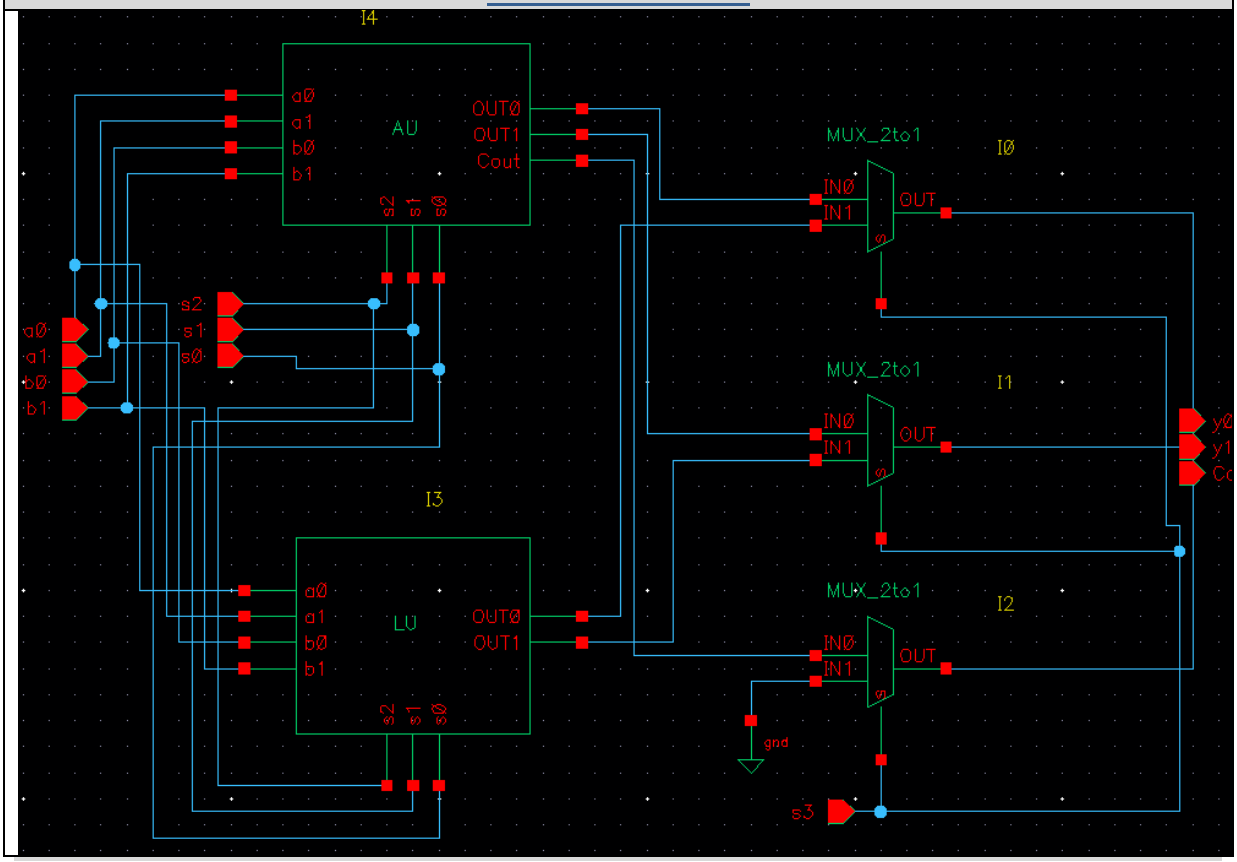
Testbench for Logical Unit (s2 s1 s0 = 0 1 0 ➔ AND)



Waveforms of AND Operation



ALU Schematic



ALU Testbench Schematic
(s3 s2 s1 s0 = 0 1 1 0 ➔ a+b)