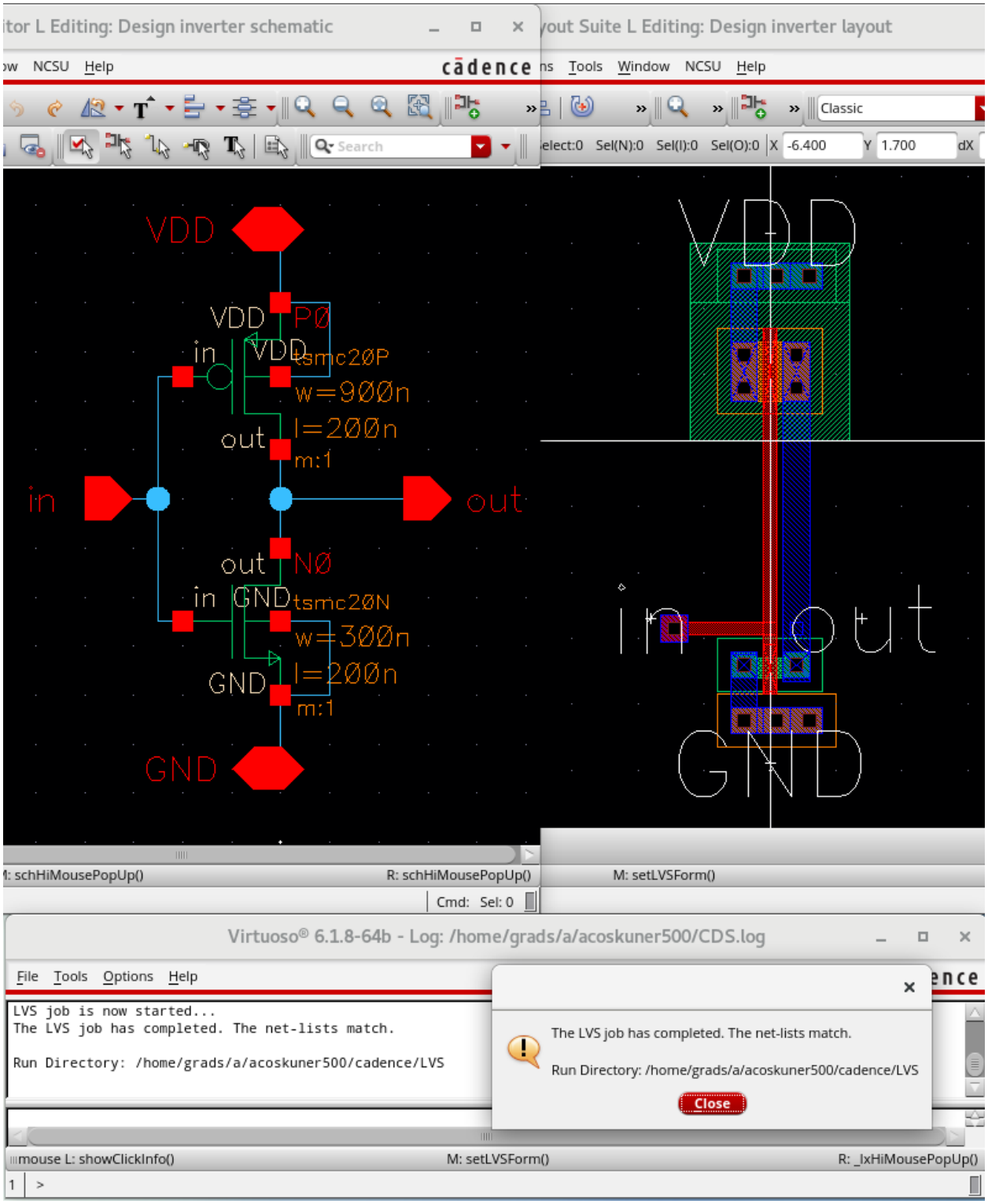
Name: Ahmet Coskuner
TA: Neha Gupta

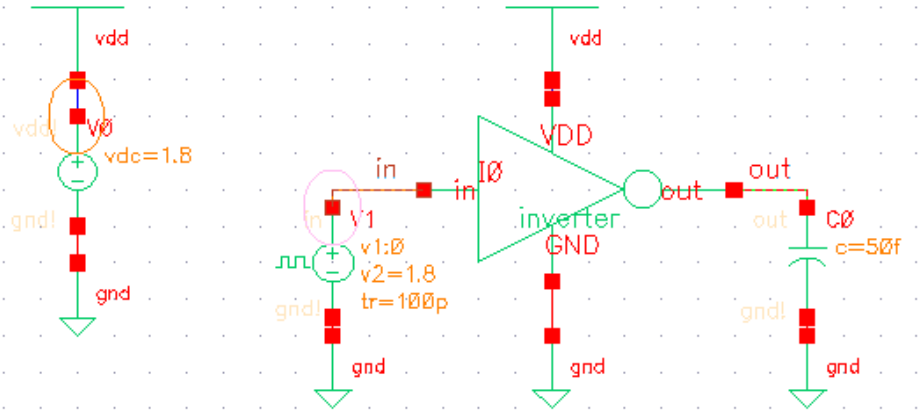
ECEN 714-612 Lab 4

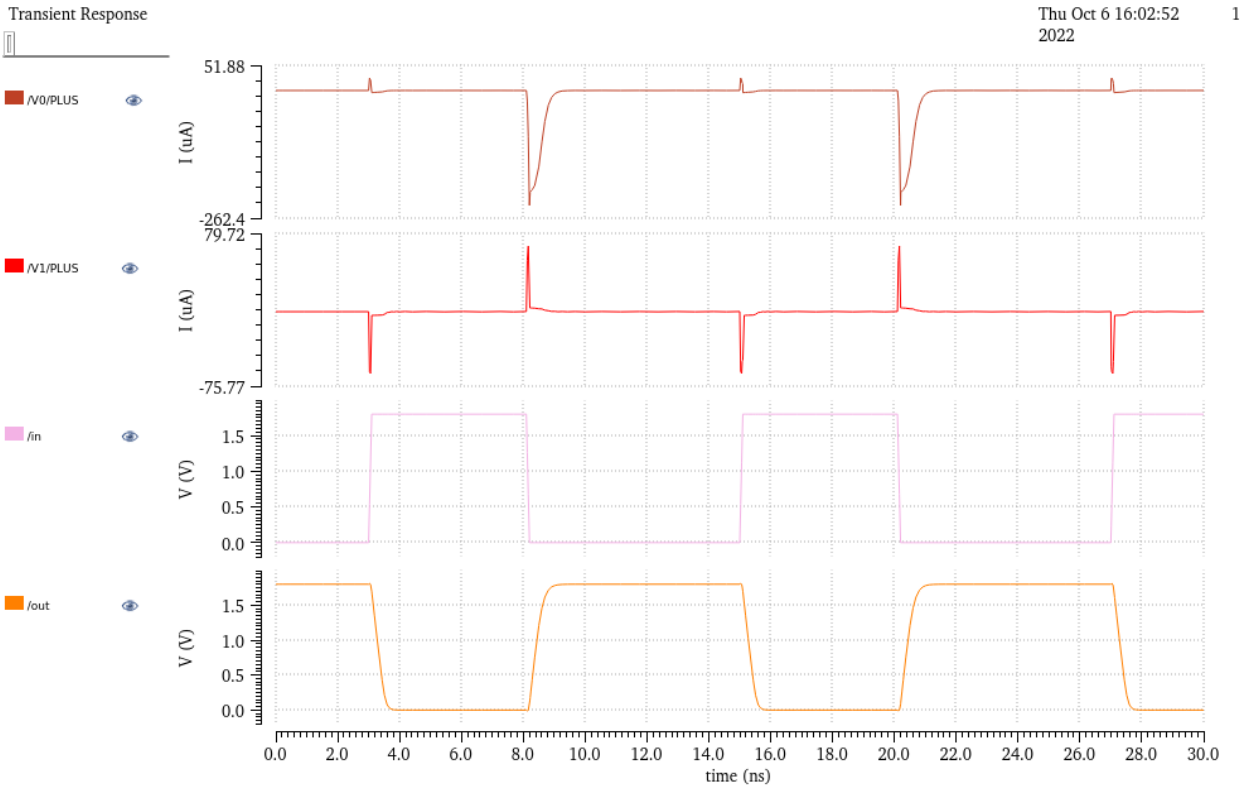
1. Inverter Changes (Schematic, Layout, LVS)



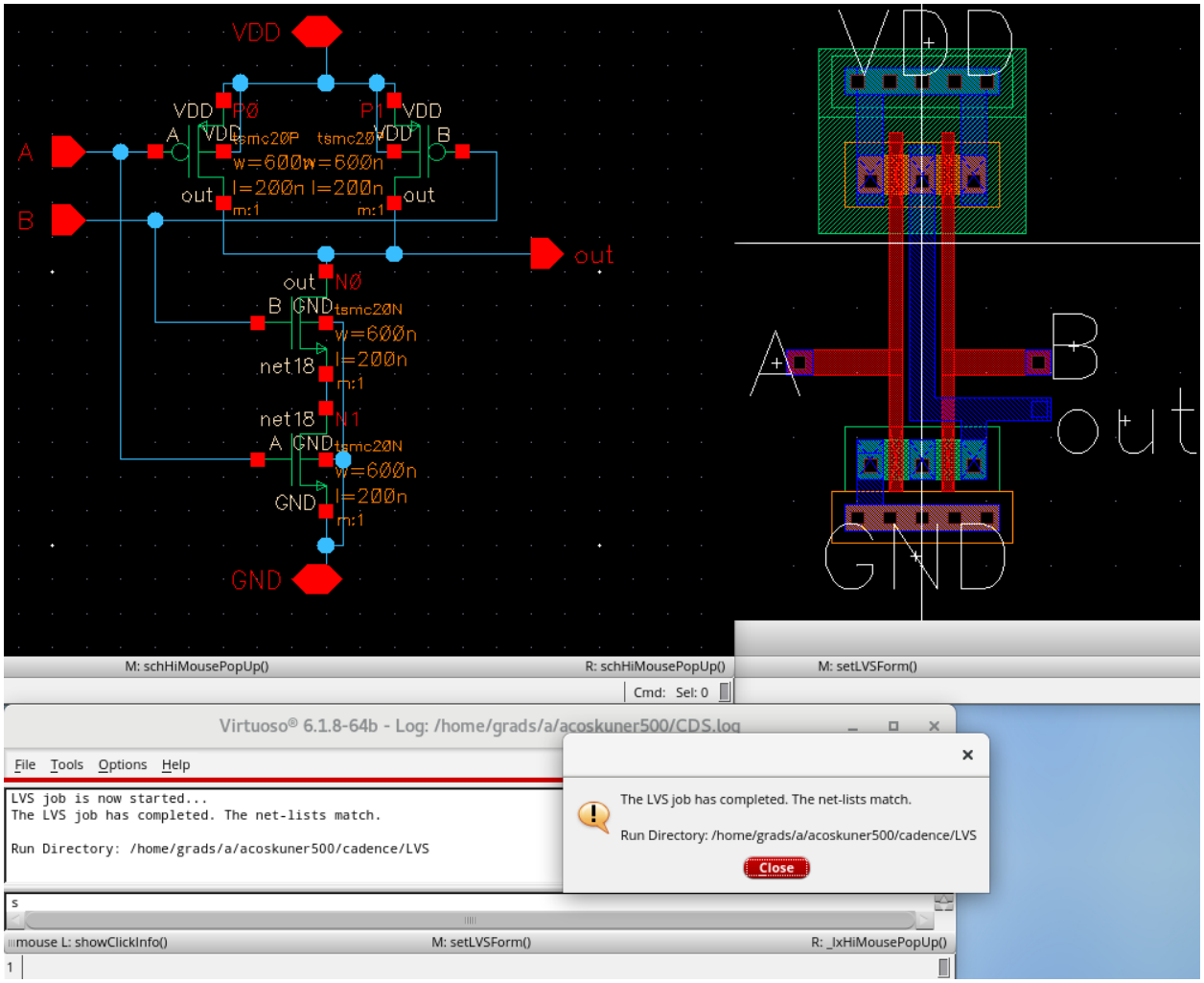
2. Inverter simulation

Inverter power VDD	-11.60E-6
Inverter vpulse average power	-183.2E-9
Inverter rising delay	8.150E-9 264.1E-12 20.15E-9 264.1E-12
Inverter falling delay	3.050E-9 257.1E-12 15.05E-9 257.1E-12 27.05E-9 257.1E-12



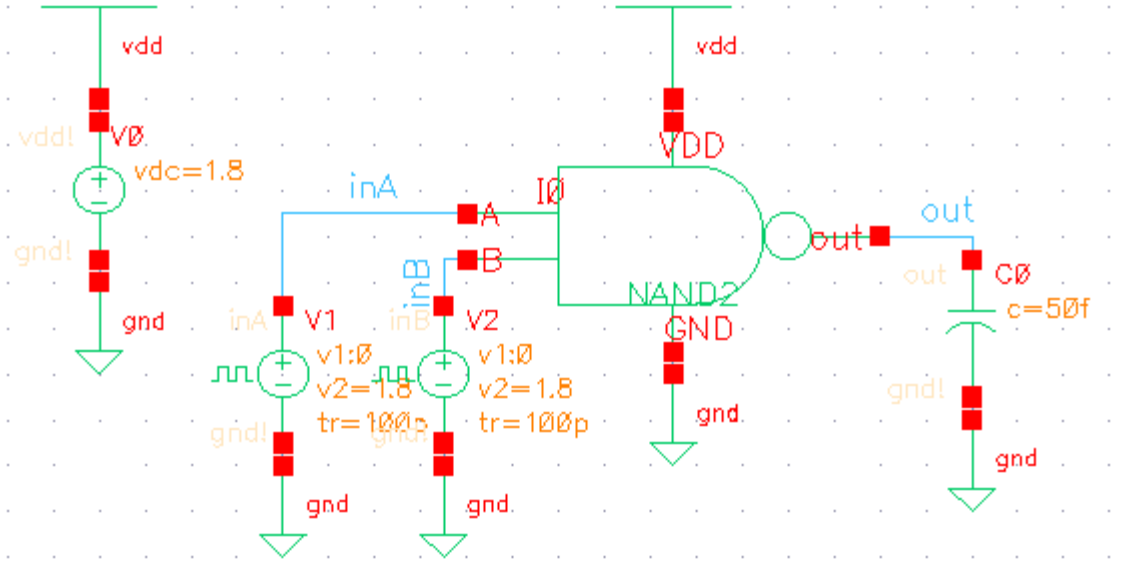


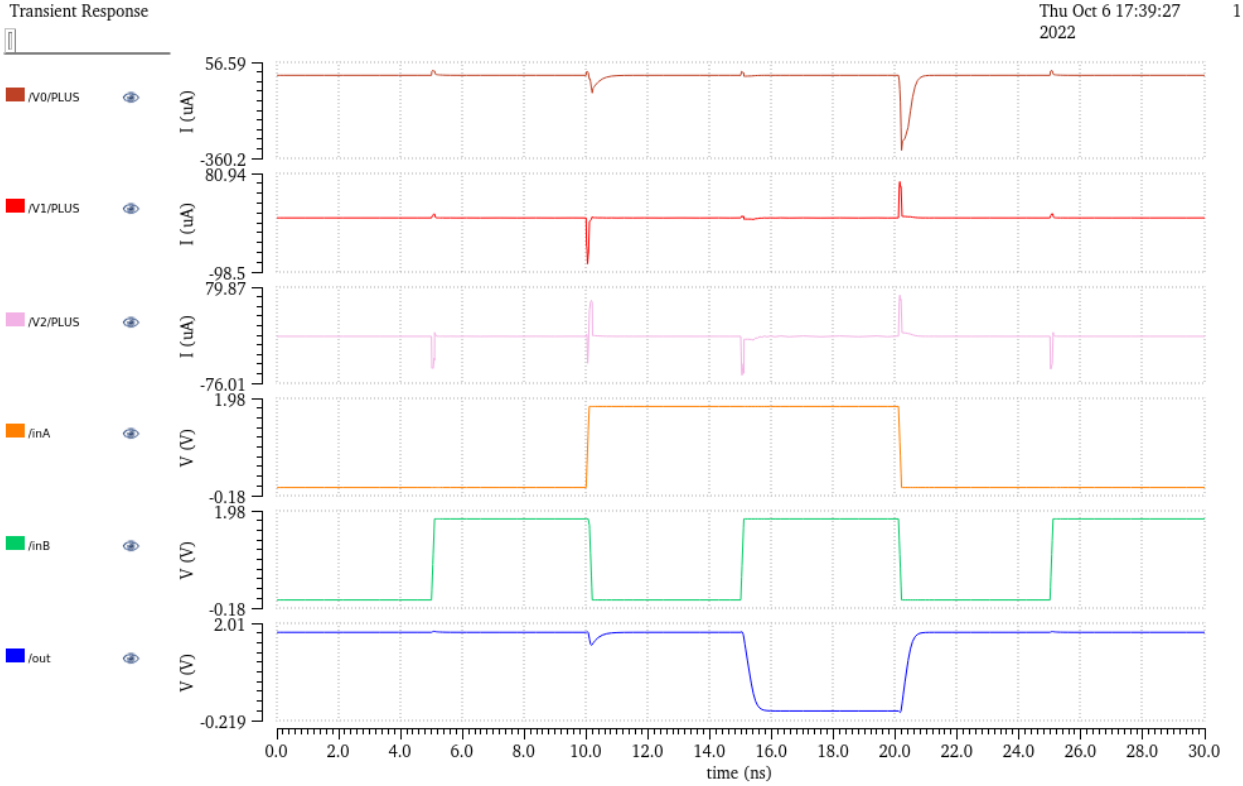
3. NAND2 Changes (Schematic, Layout, LVS)



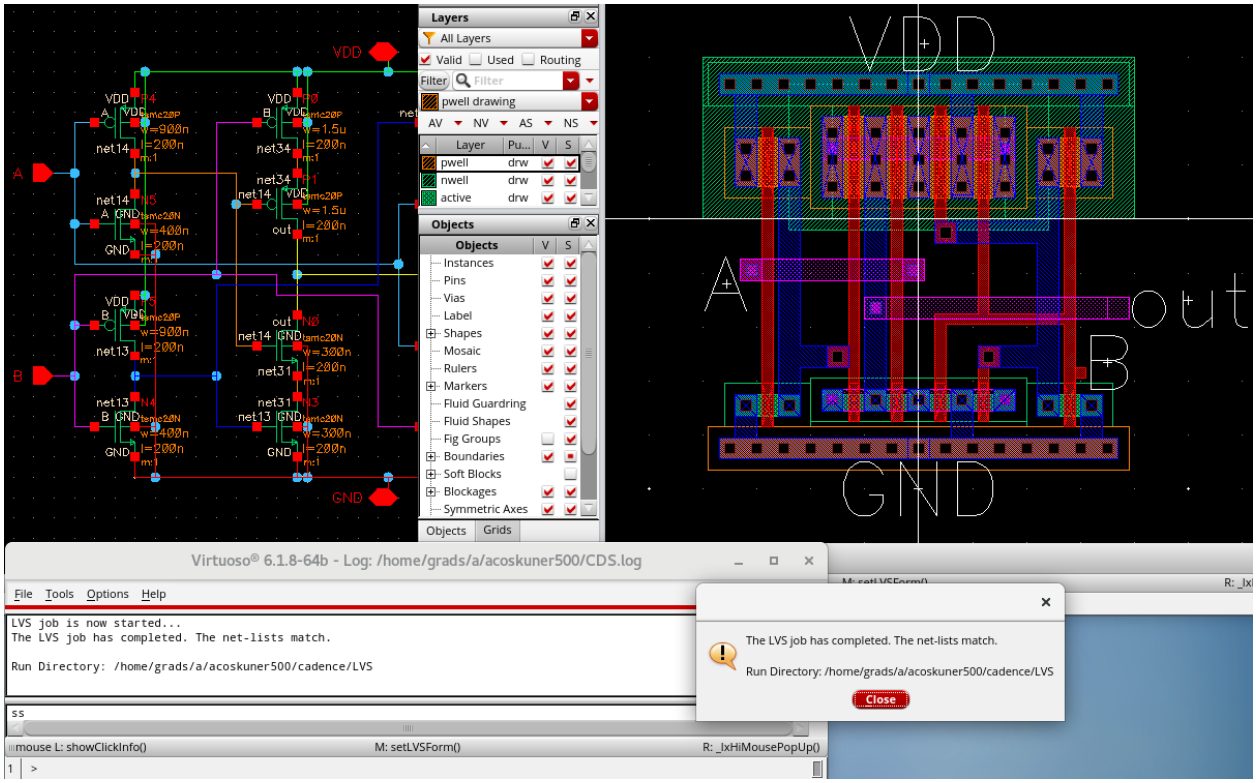
4. NAND2 Simulation

NAND2 power VDD	-6.865E-6
NAND2 inA vpulse average power	11.46E-9
NAND2 inB vpulse average power	-125.5E-9
NAND2 rising delay	2.09E-10
NAND2 falling delay	2.27E-10


vdd
V0
vdc=1.8
vdd!
gnd!
gnd
inA
A
I0
B
inB
VDD
NAND2
GND
out
V1
v1:0
v2=1.8
tr=100p
V2
C0
c=50f

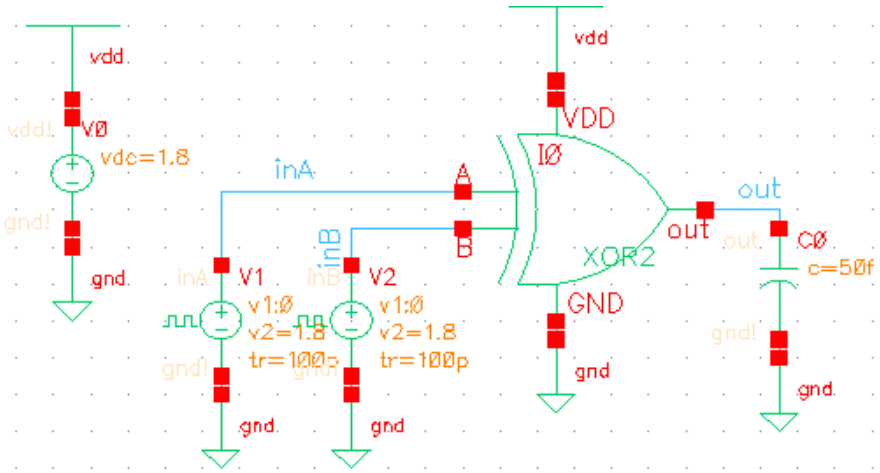

Transient Response
Thu Oct 6 17:39:27 2022
1
/V0/PLUS
/V1/PLUS
/V2/PLUS
/inA
/inB
/out
I (uA)
V (V)
56.59
-360.2
80.94
-98.5
79.87
-76.01
1.98
-0.18
2.01
-0.219
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
time (ns)

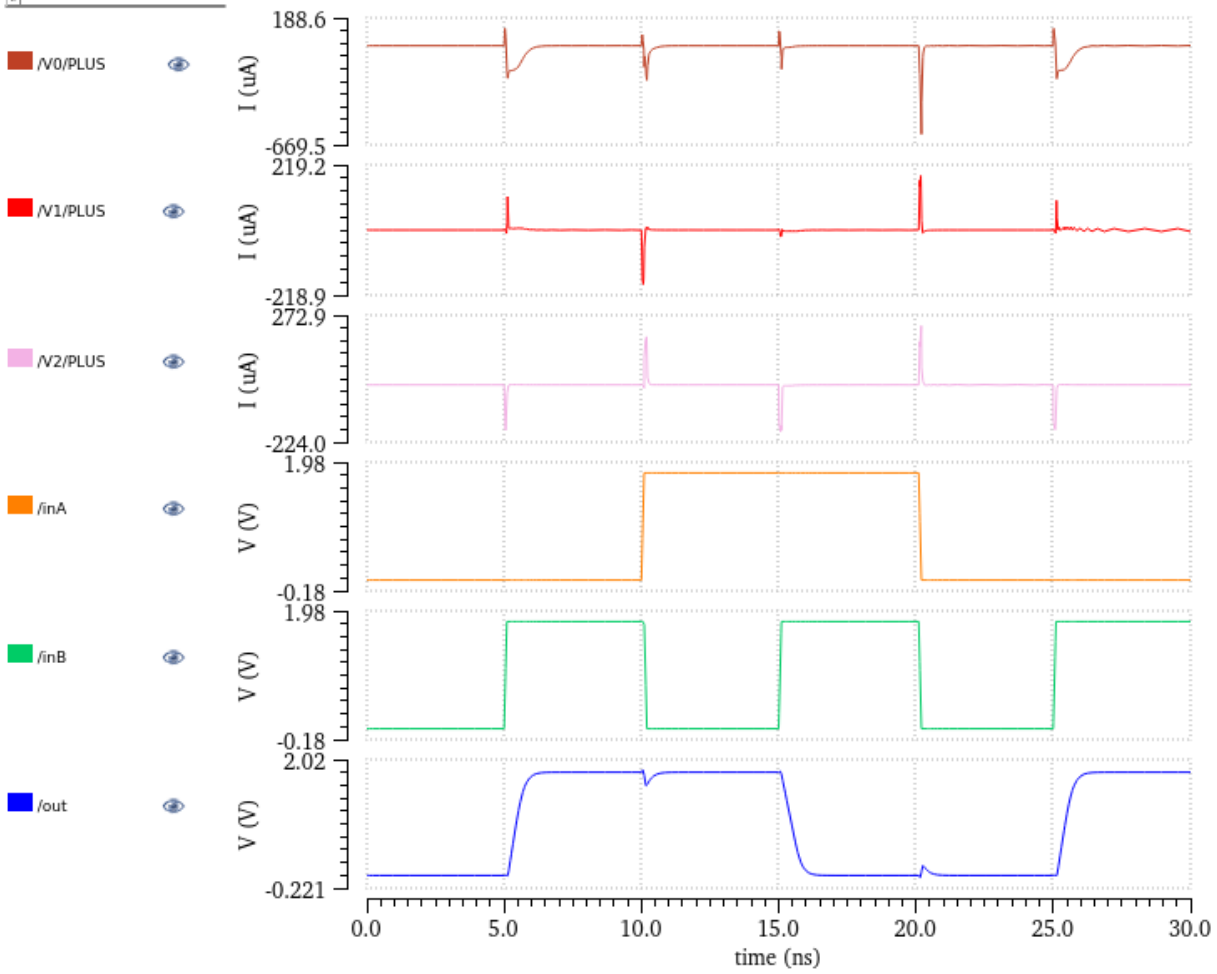
5. XOR2 Changes (Layout, LVS; no change to schematic)



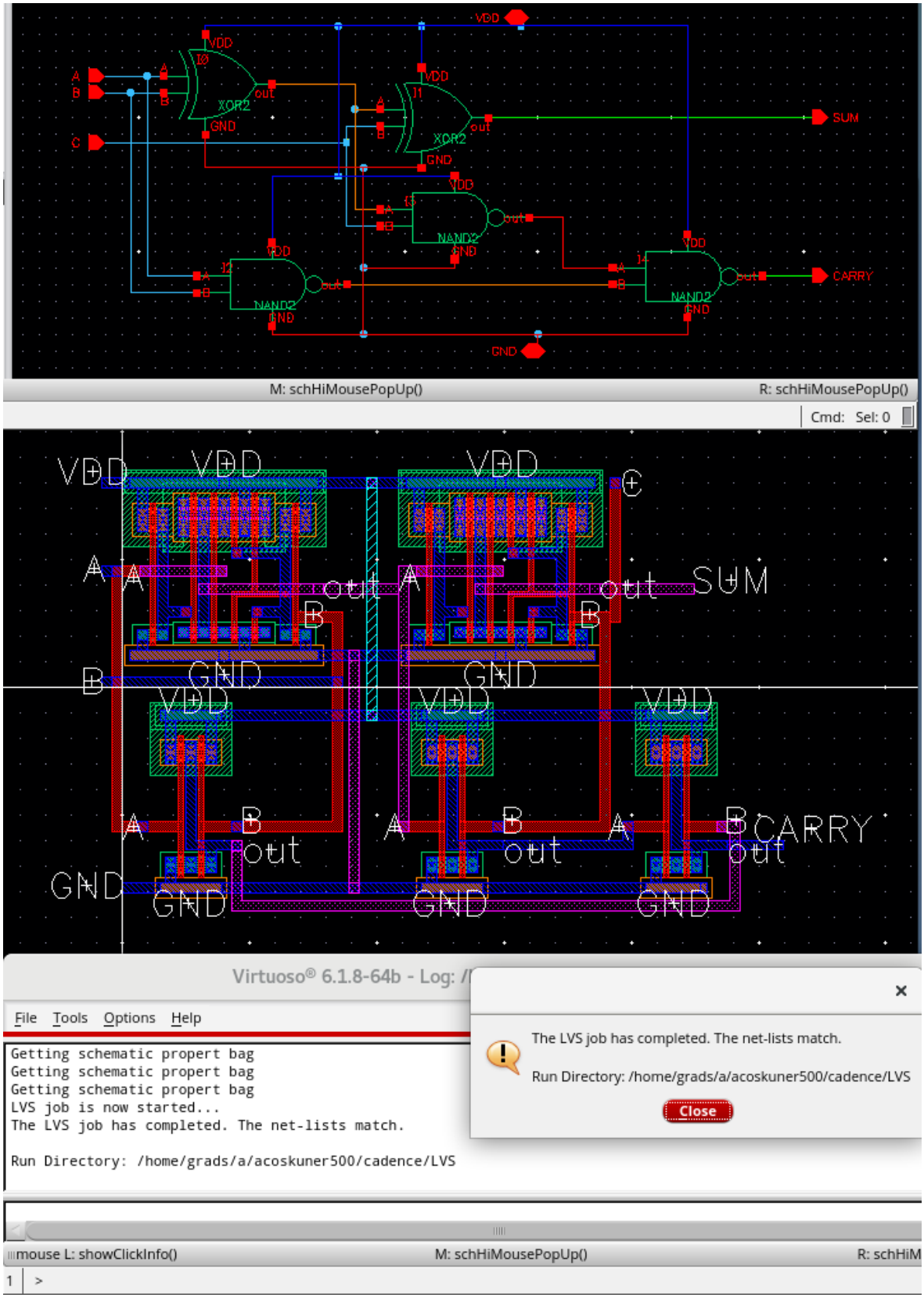
6. XOR2 Simulation

XOR2 power VDD	-17.05E-6
XOR2 inA vpulse average power	128.4E-9
XOR2 inB vpulse average power	-472.8E-9
XOR2 rising delay	3.85E-10
XOR2 falling delay	4.19E-10


vdd
V0
vdc=1.8
gnd
inA
inB
V1
V2
v1:0
v2=1.8
tr=100p
VDD
GND
XOR2
I0
A
B
out
C0
c=50f

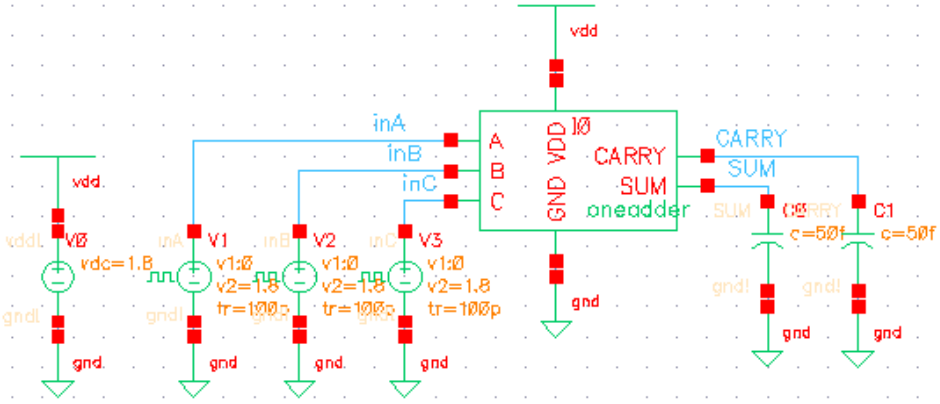

/V0/PLUS
/V1/PLUS
/V2/PLUS
/inA
/inB
/out
188.6
-669.5
219.2
-218.9
272.9
-224.0
1.98
-0.18
1.98
-0.18
2.02
-0.221
I (uA)
V (V)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
time (ns)

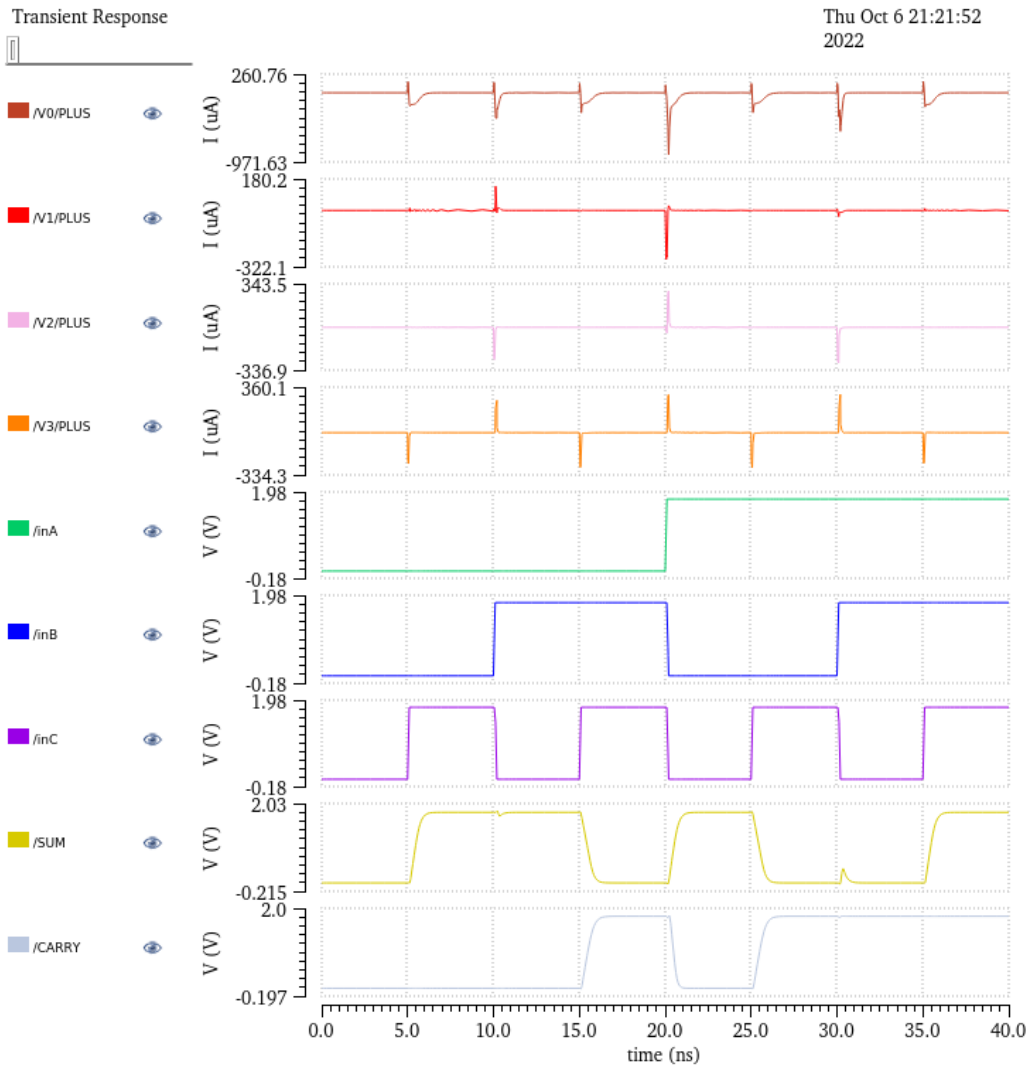
7. 1-bit adder (schematic, layout, DRC, LVS)



8. 1-bit adder Simulation

Full Adder VDD Average power	-33.89E-6
Full Adder inA vpulse average power	-461.7E-9
Full Adder inB vpulse average power	-596.4E-9
Full Adder inC vpulse average power	-419.2E-9
Full Adder SUM rising delay	4.00E-10
Full Adder SUM falling delay	4.28E-10
Full Adder CARRY rising delay	4.37E-10
Full Adder CARRY falling delay	3.37E-10





9. 1-bit Adder Max Frequency: 1/3ns = 333MHz