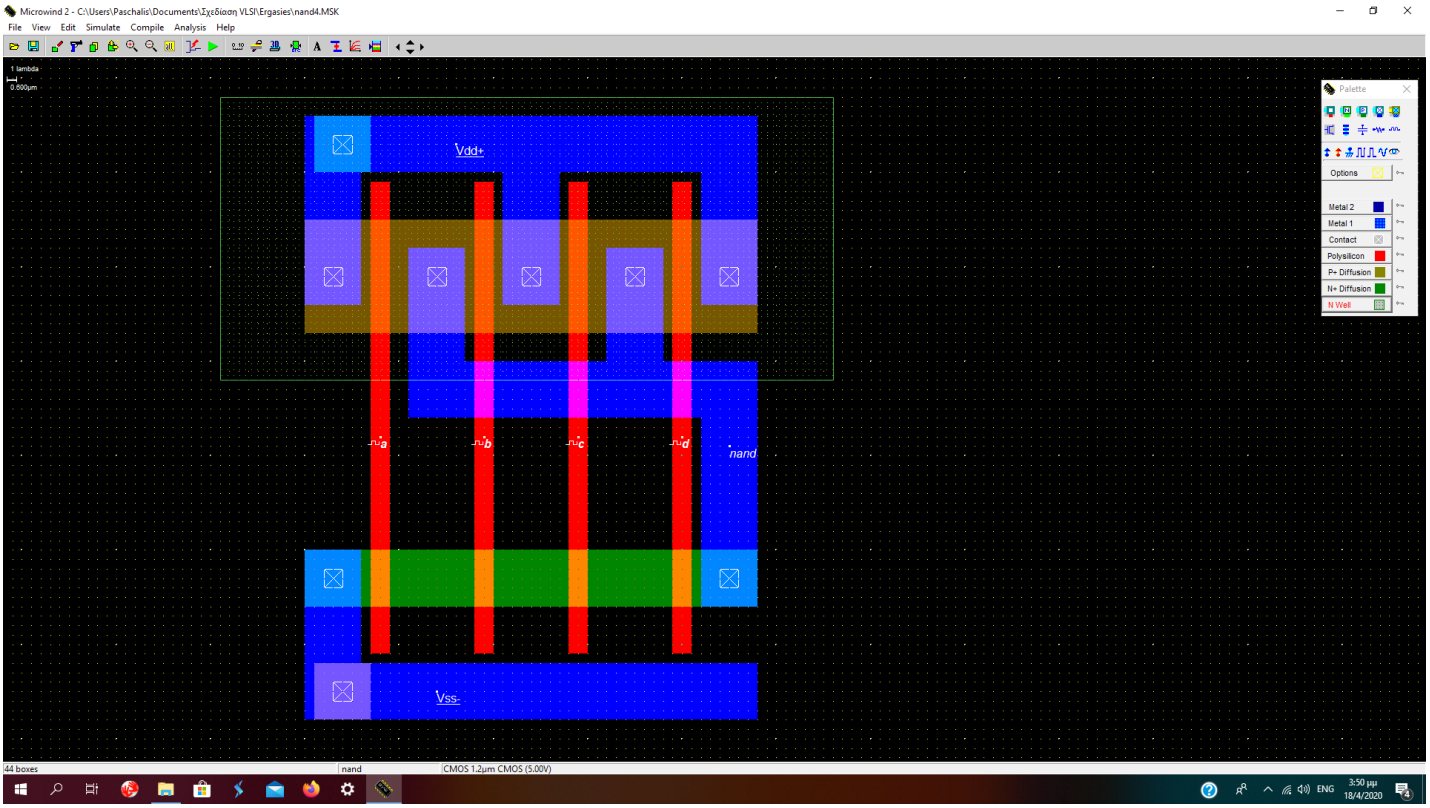
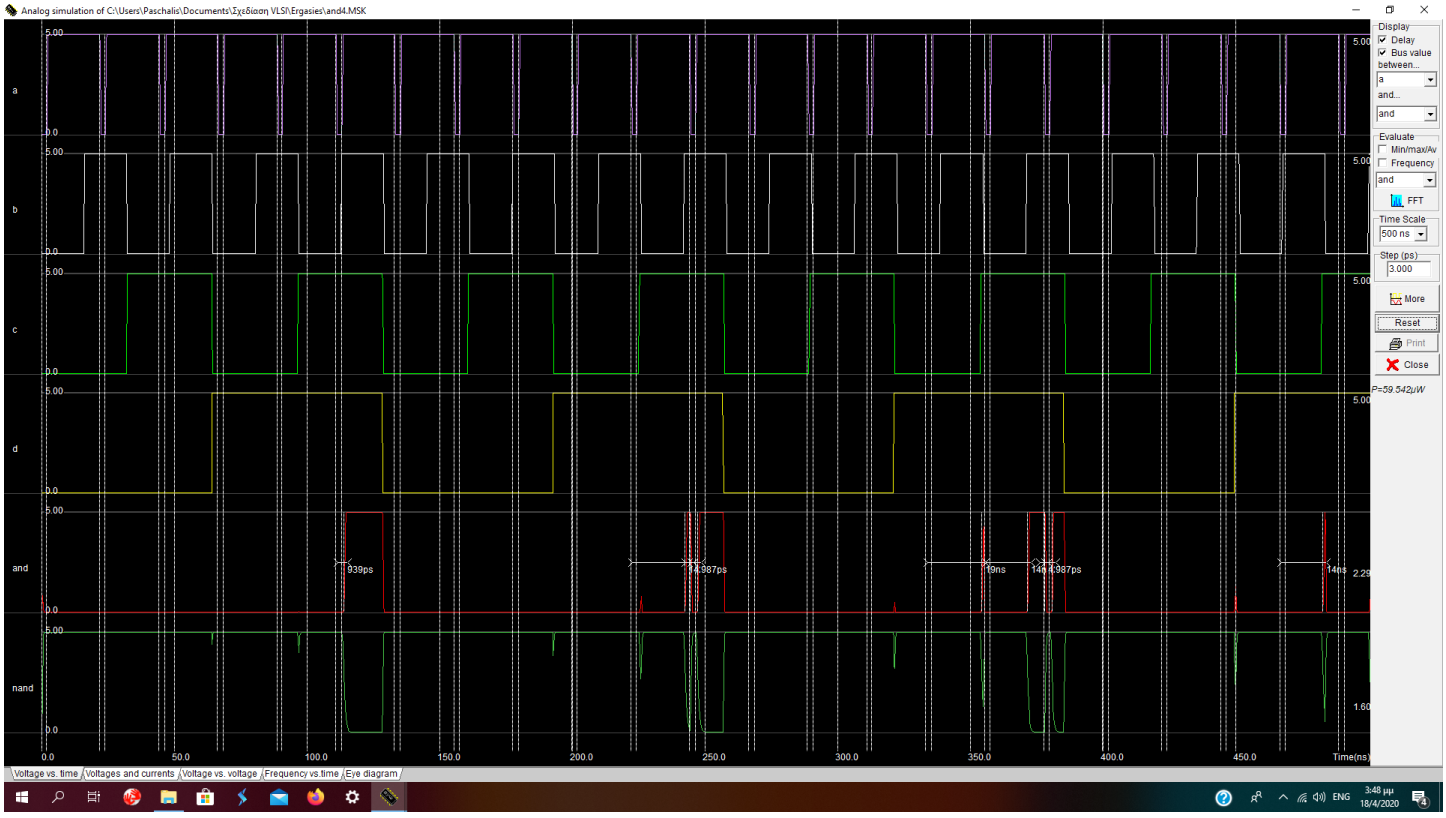
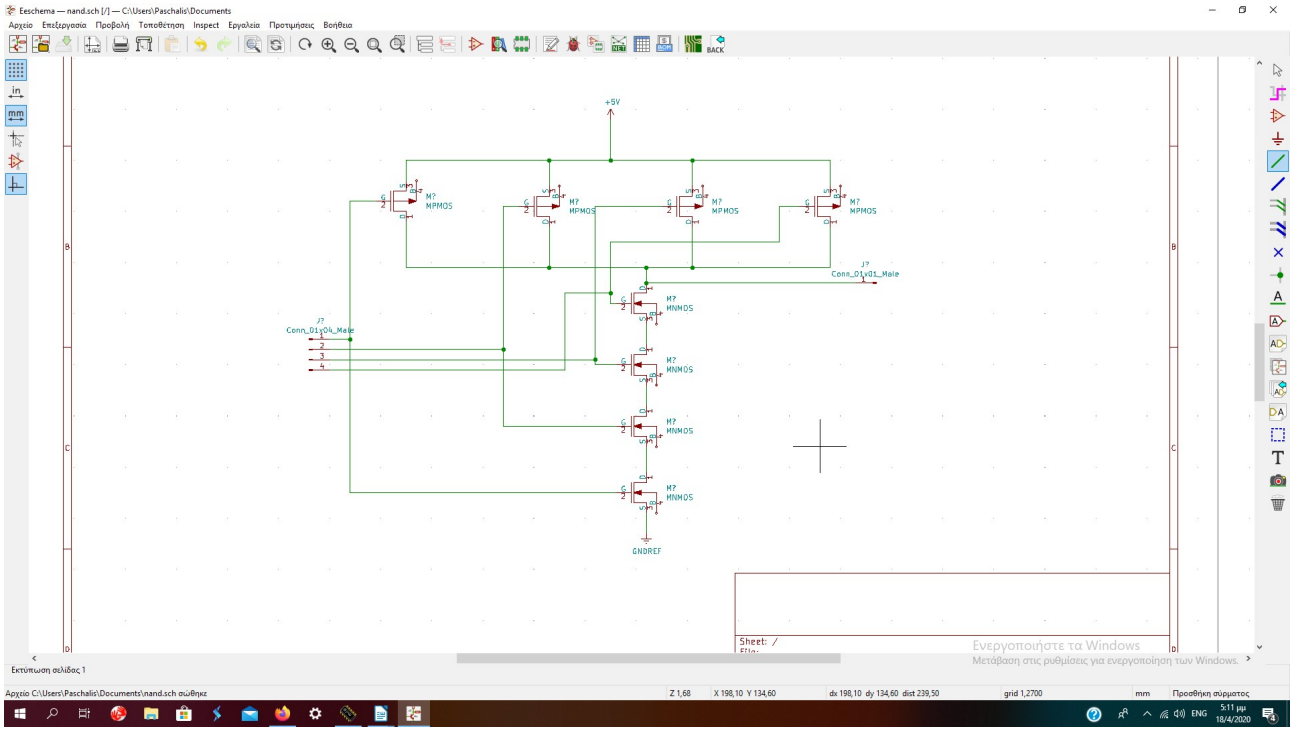
4.1

a)

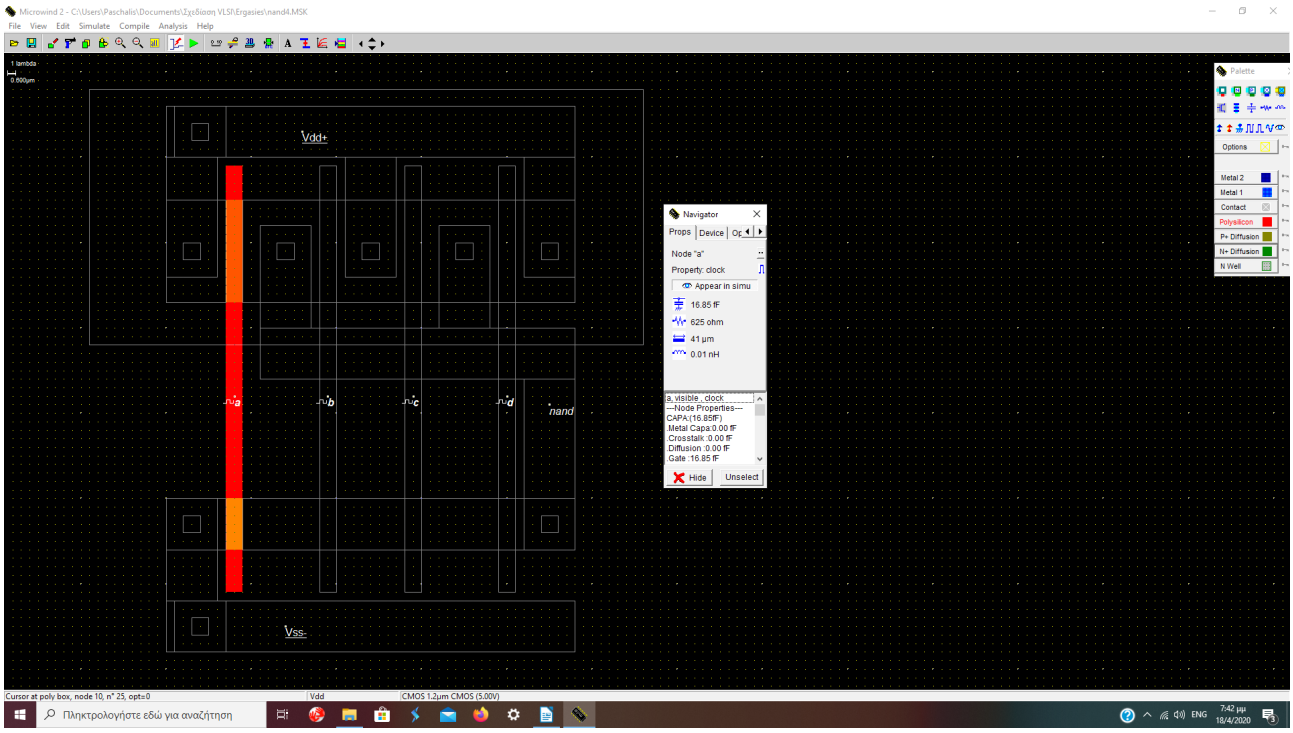

Microwind 2 - C:\Users\Paschalis\Documents\Σχεδίαση VLSI\Ergasies\nand4.MSK
File View Edit Simulate Compile Analysis Help
Vdd
Vss
a
b
c
d
nand
Palette
Options
Metal 2
Metal 1
Contact
Polysilicon
P+ Diffusion
N+ Diffusion
N Well
44 boxes
nand
CMOS 1.2µm CMOS (5.00V)


Analog simulation of C:\Users\Paschalis\Documents\Σχεδίαση VLSI\Ergasies\and4.MSK
a
b
c
d
and
nand
939ps
4.987ps
19ns
14ns 4.987ps
14ns
Display
Delay
Bus value
between...
and...
Evaluate
Min/max/Av
Frequency
FFT
Time Scale
500 ns
Step (ps)
3.000
More
Reset
Print
Close
P=59.542µW
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
Time(ns)
Voltage vs. time
Voltages and currents
Voltage vs. voltage
Frequency vs.time
Eye diagram



Inputs				outputs	
a	b	c	d	nand	and
0	0	0	0	1	0
0	0	0	1	1	0
0	0	1	0	1	0
0	0	1	1	1	0
0	1	0	0	1	0
0	1	0	1	1	0
0	1	1	0	1	0
0	1	1	1	1	0
1	0	0	0	1	0
1	0	0	1	1	0
1	0	1	0	1	0
1	0	1	1	1	0
1	1	0	0	1	0
1	1	1	0	1	0
1	1	1	1	0	1

b)

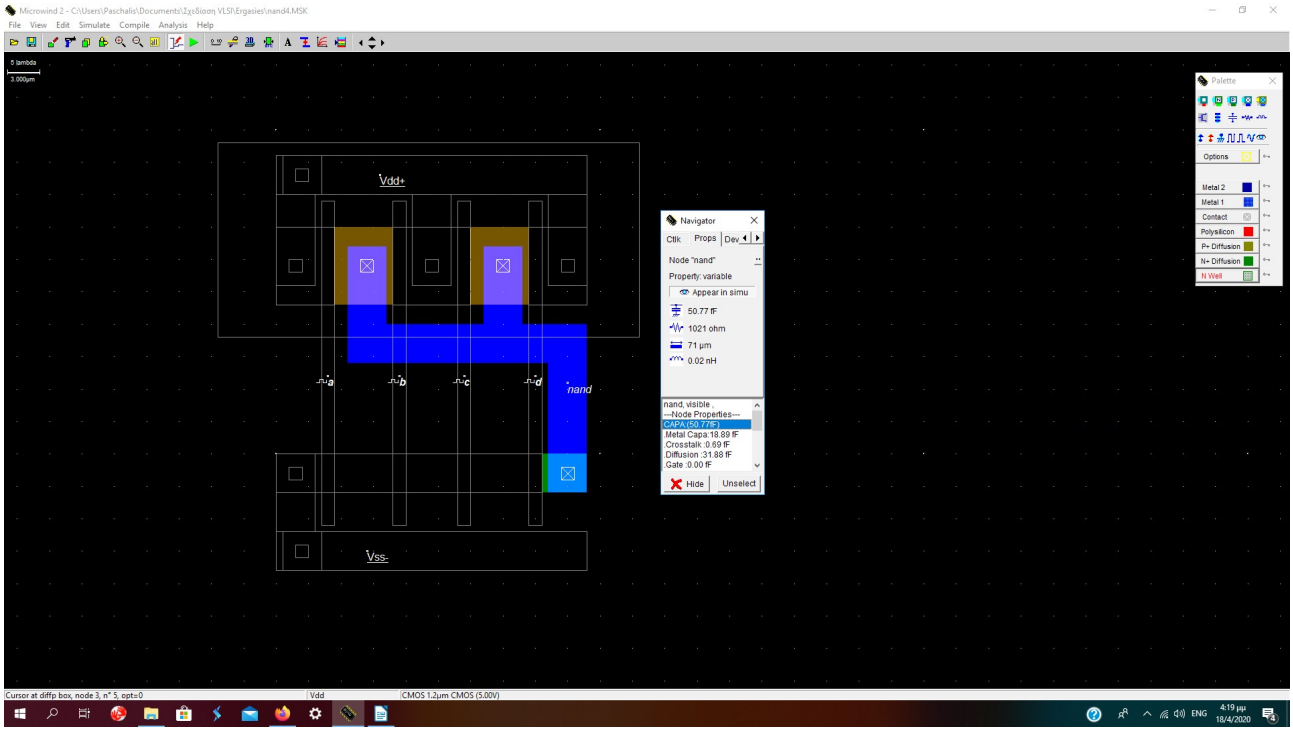


NAND output capatance: 16.85fF

NAND output capatance: 17.08fF

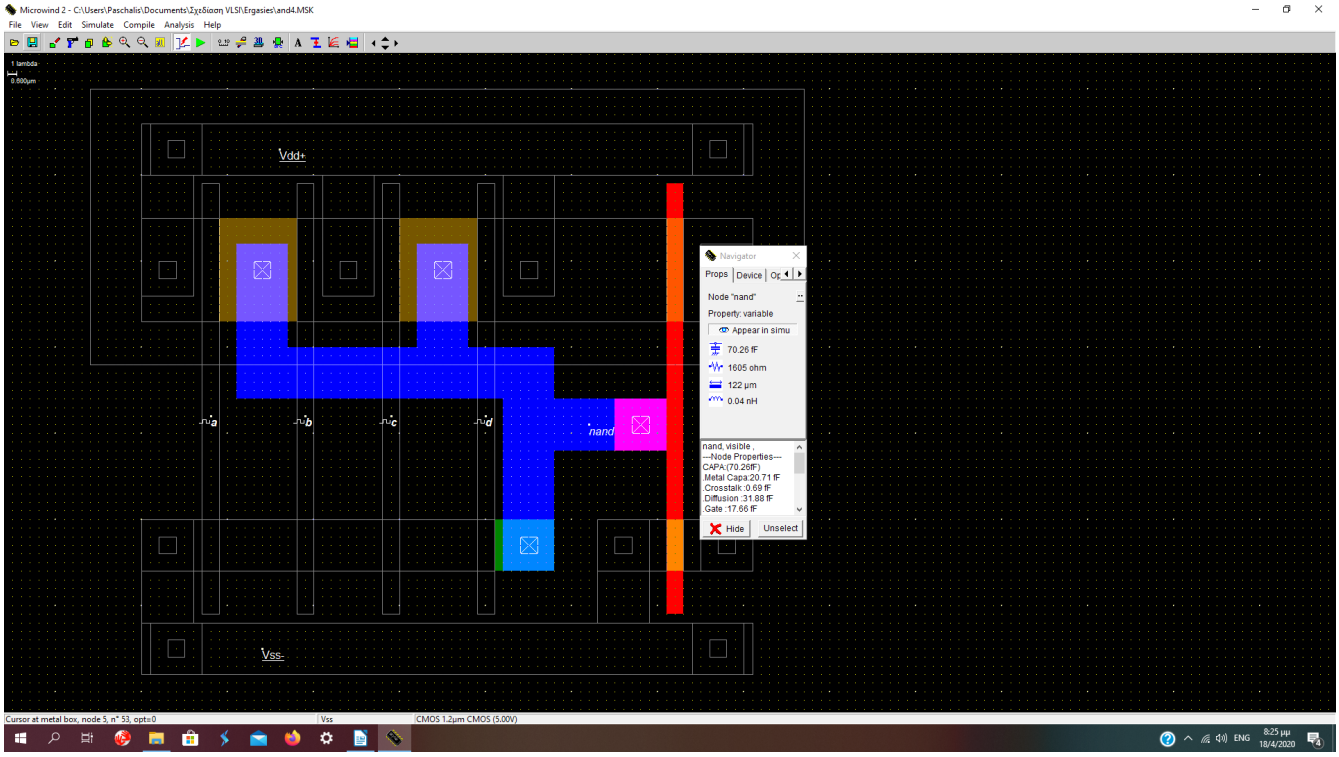
NAND output capatance: 17.08fF

NAND output capatance: 17.08fF

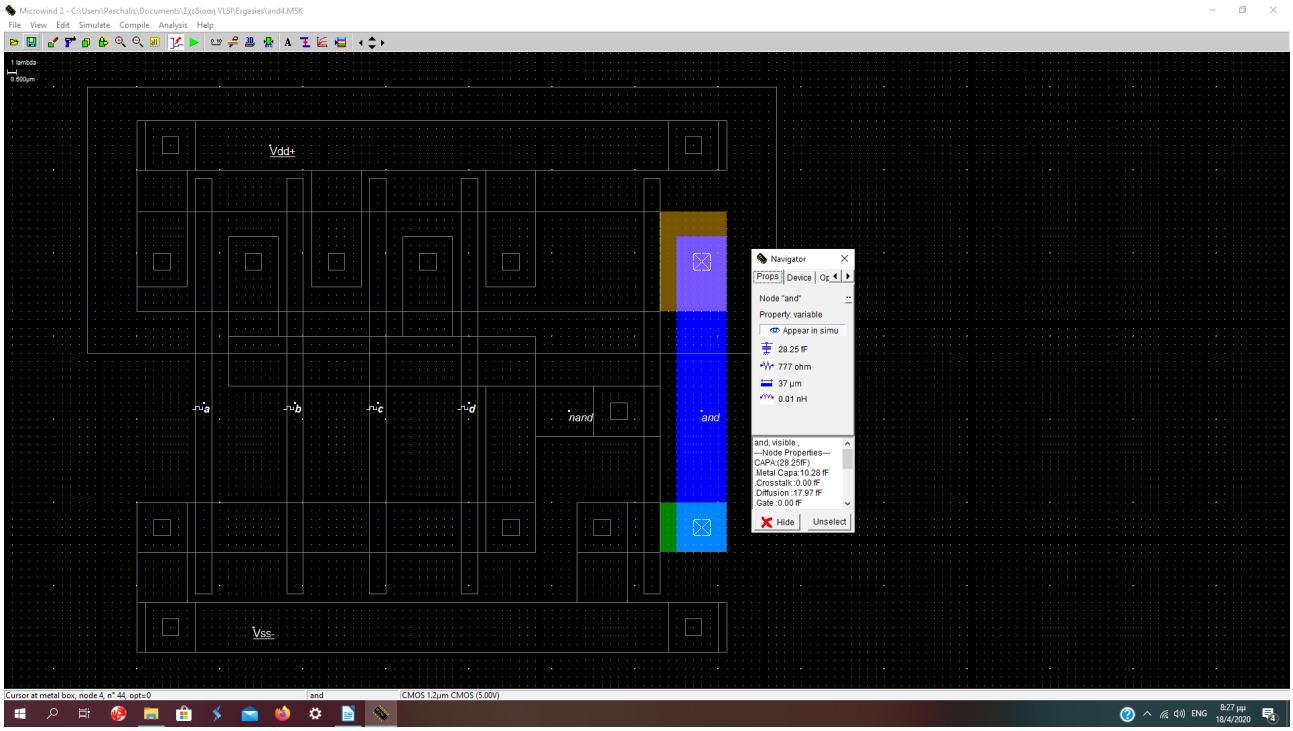


NAND output capatance: 50.77fF

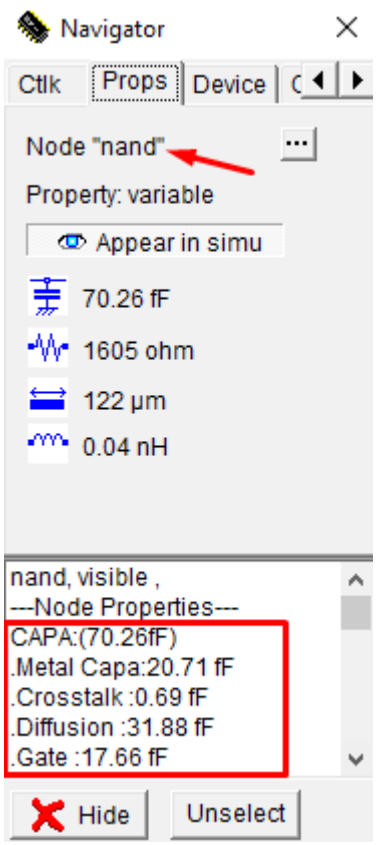
c)

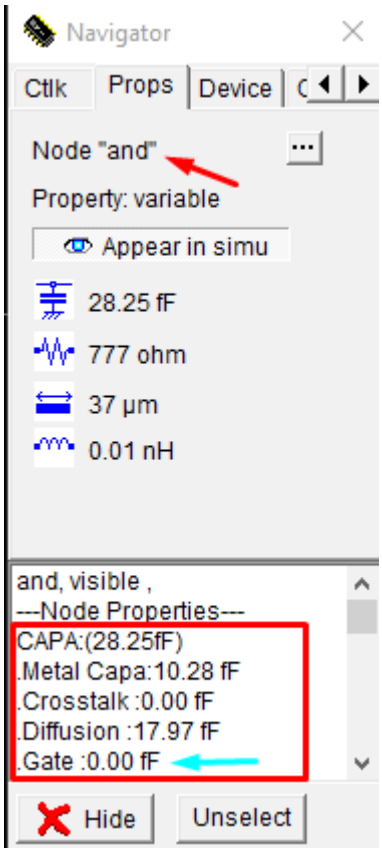


NAND output capatance: 70.26fF



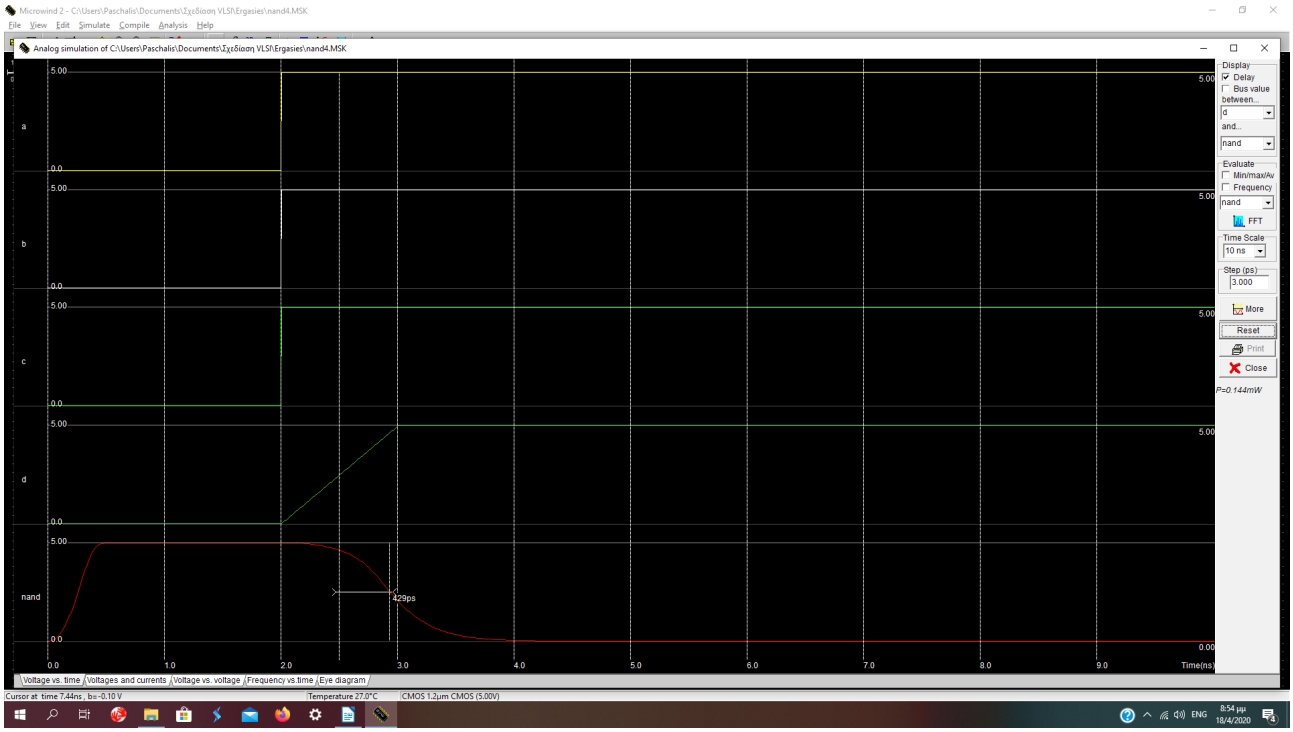
AND output capatance: 26.25fF





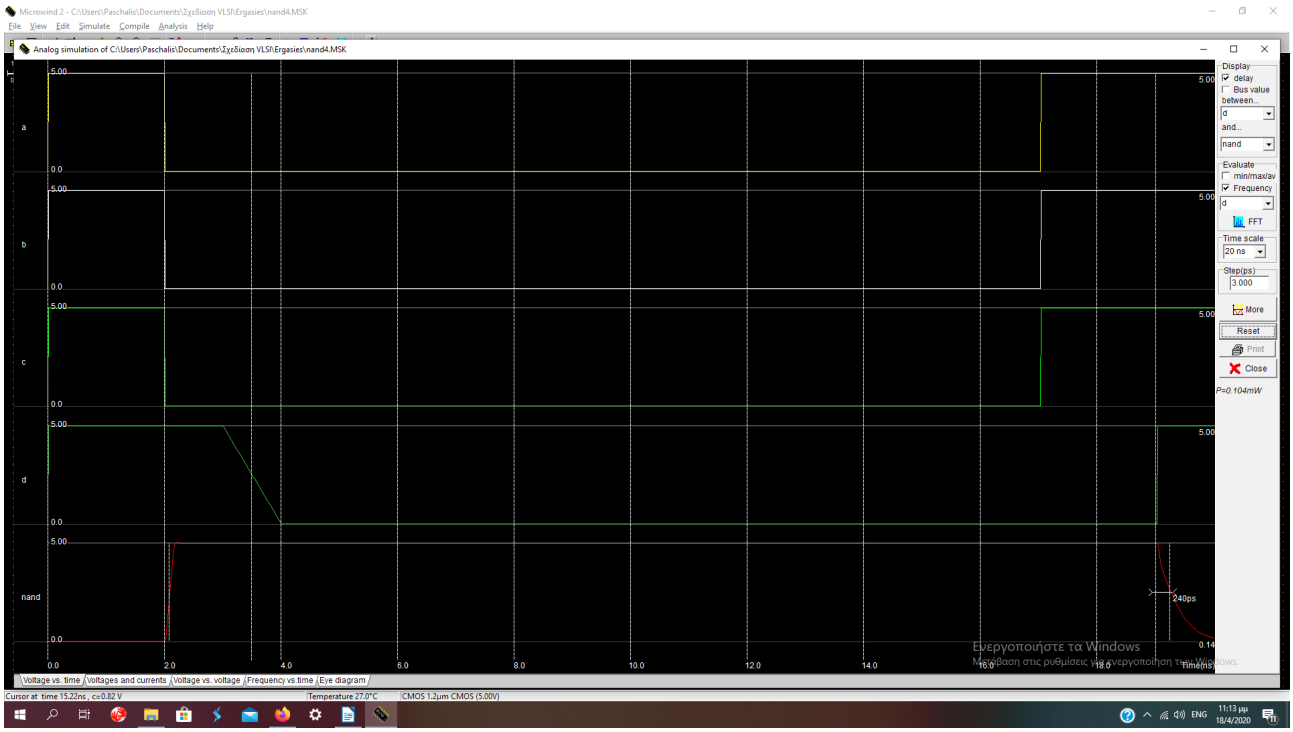
4.2

a)



Delay input d-output nand: 429ps

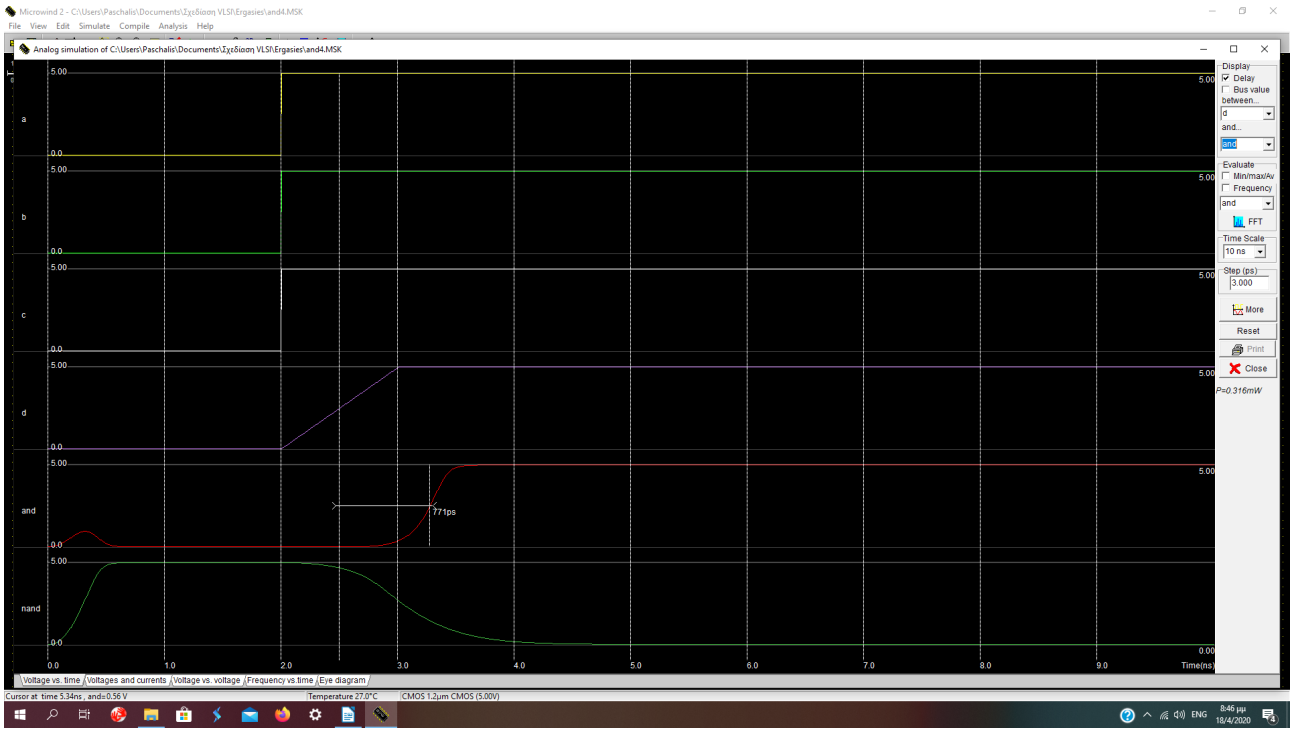
b)



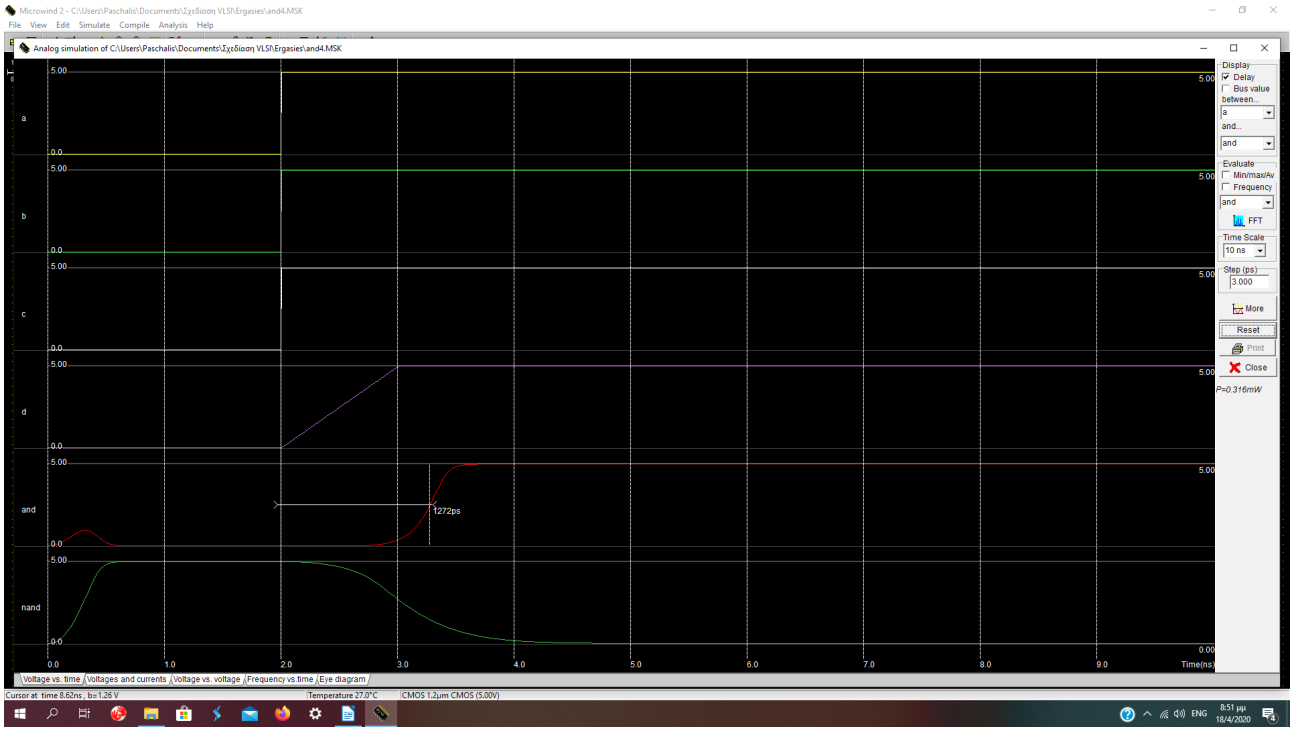
Κατερχόμενες είσοδοι

Delay input a-output nand: 240ps

c)



Delay input d-output and: 771ps



Delay input a-output and: 1272ps

d)

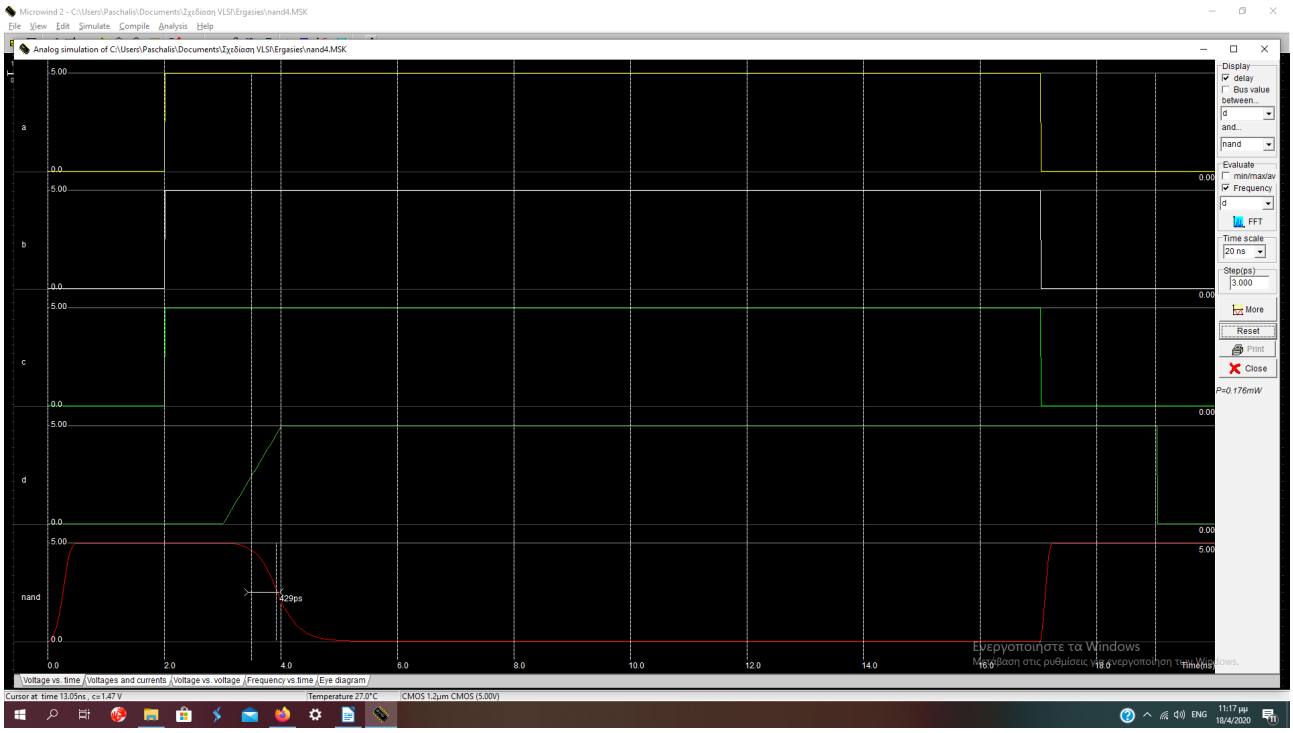
Delay between a input and output NAND and AND.

	NAND	AND	NAND inside AND
5 Volt	930 ps	1272 ps	1035 ps
3.5 Volt	1053 ps	1578 ps	1221 ps
2.5 Volt	1290 ps	2157 ps	1569 ps
1.8 Volt	1800 ps	3457 ps	2289 ps
1.2 Volt	3756 ps	9357 ps	4974 ps

5

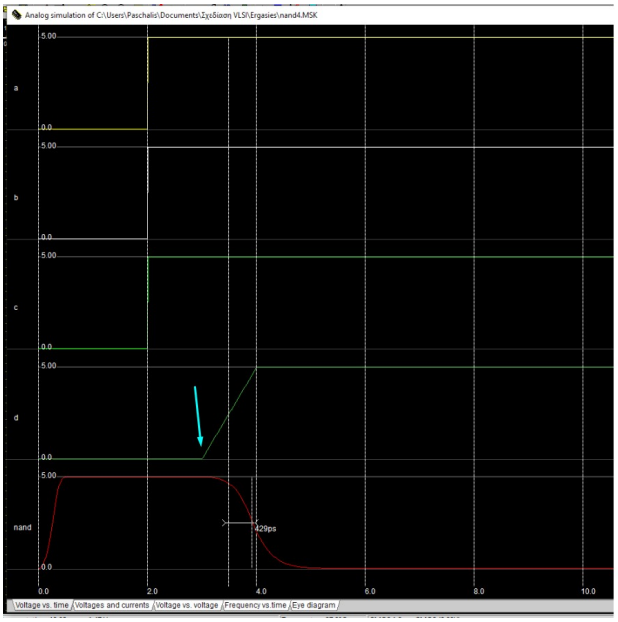
5.2

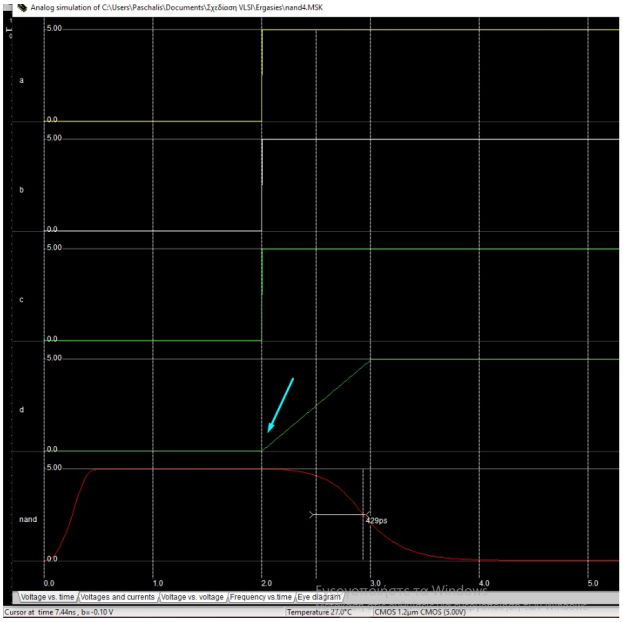
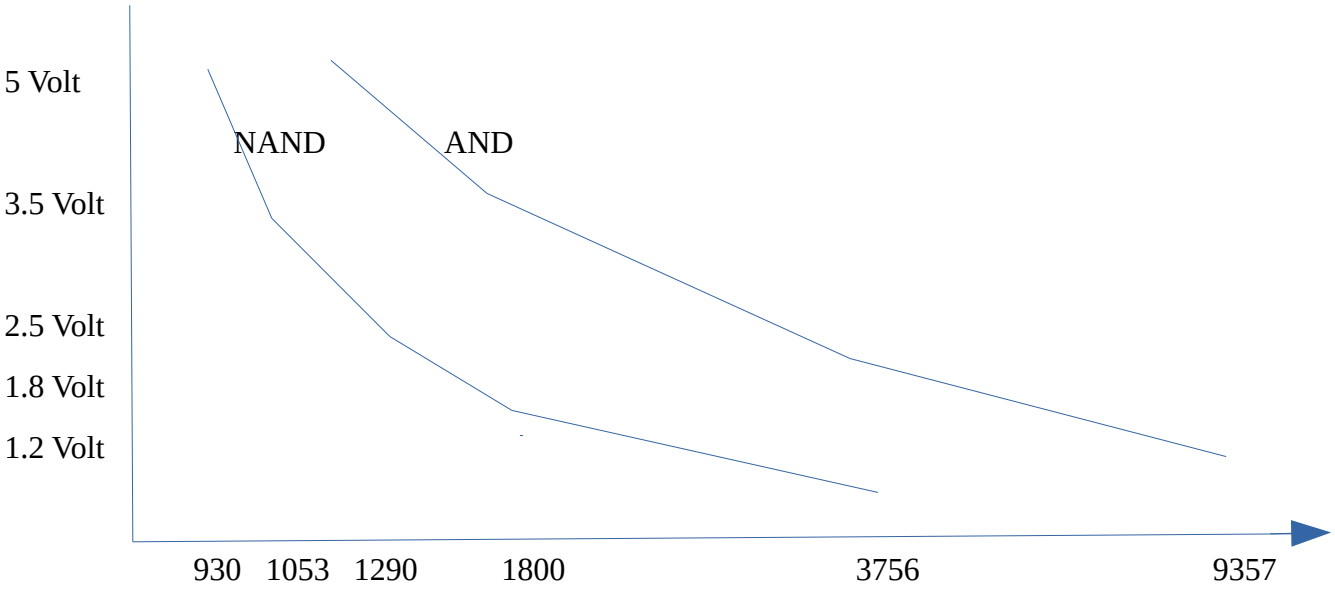
a)



Delay between d and output NAND is 429ps

Time start(ts)=2	Time start(ts)=3
Delay between d and output NAND is 429ps	Delay between d and output NAND is 429ps





b)