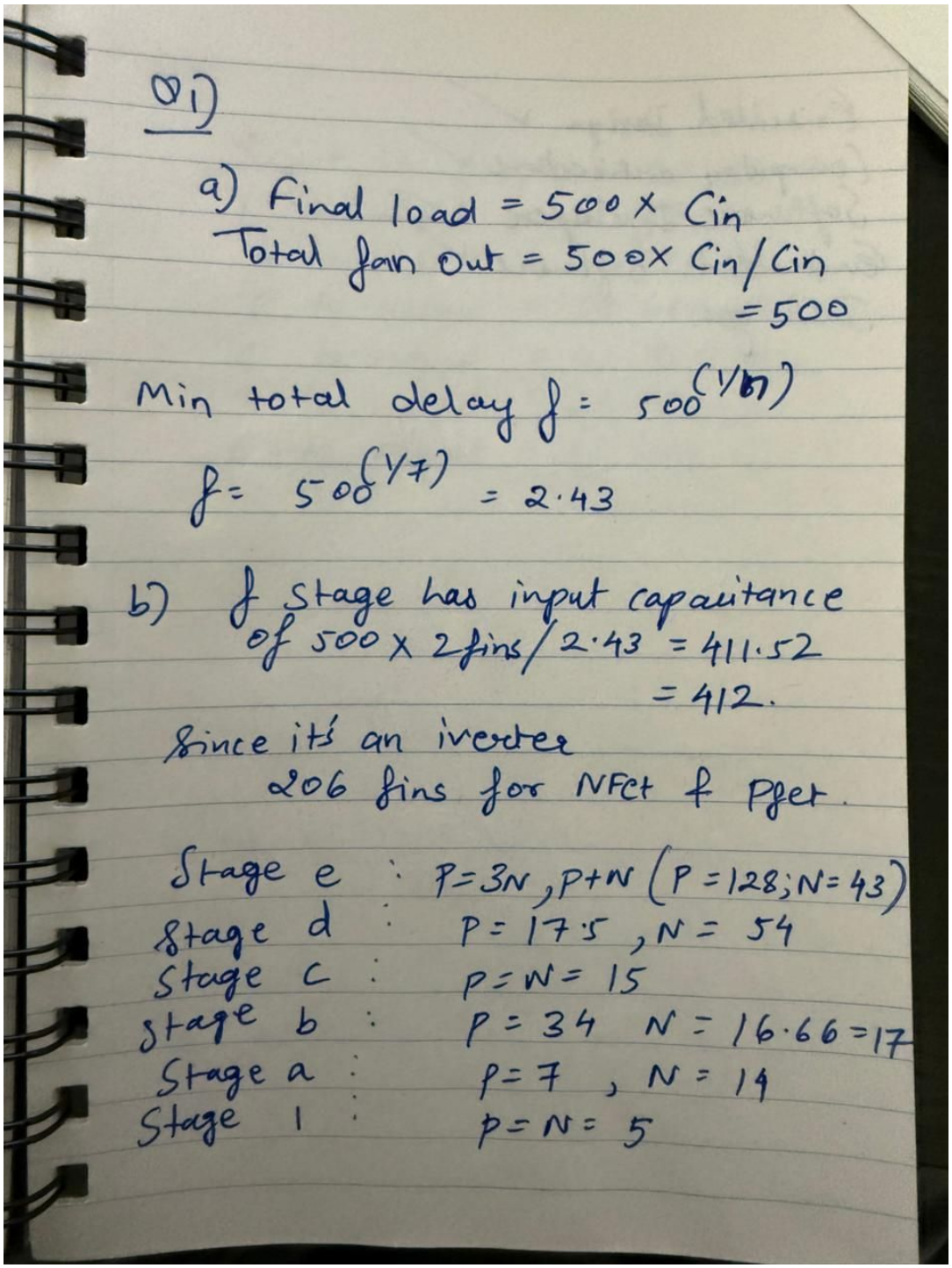
Q.1



Q1)

a) Final load = 500 × Cin
Total fan out = 500× Cin/Cin
= 500

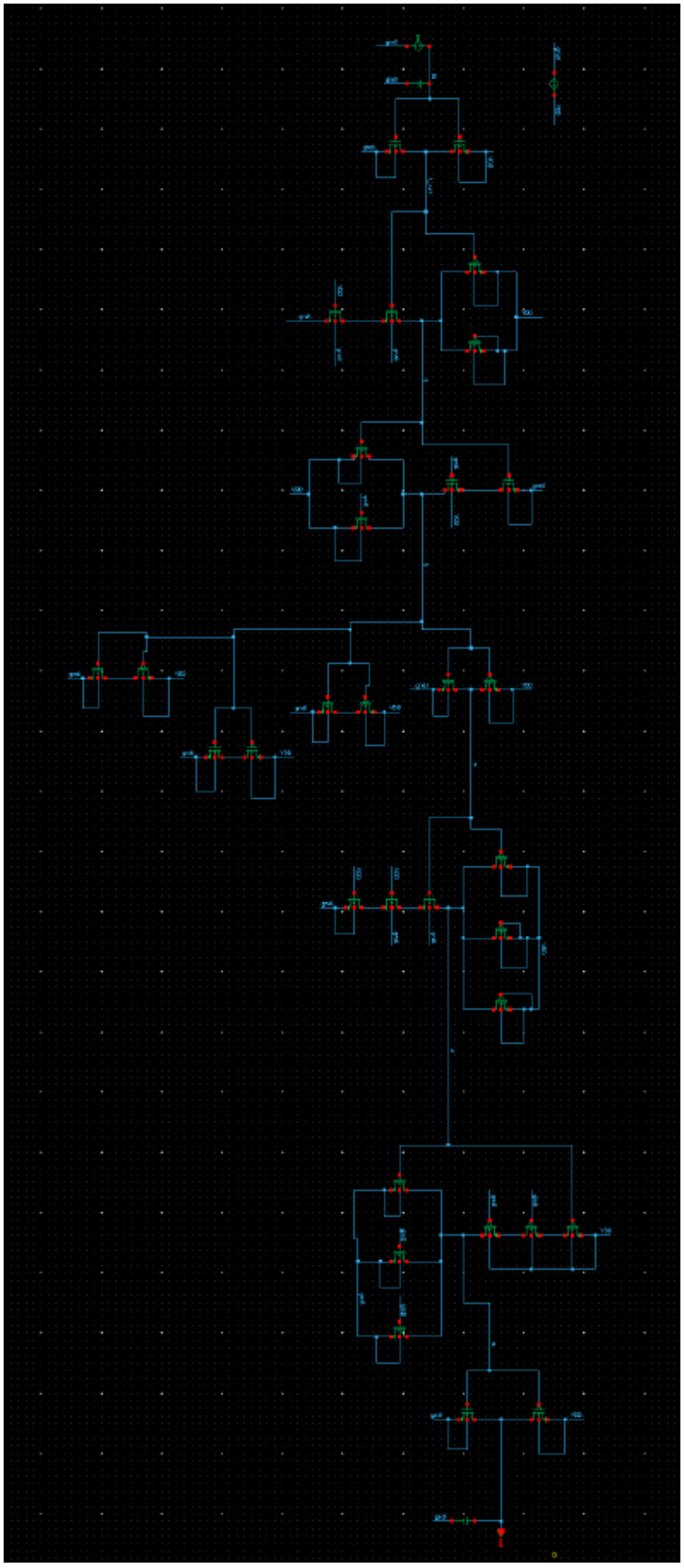
Min total delay f = $500^{(1/7)}$

f = $500^{(1/7)}$ = 2.43

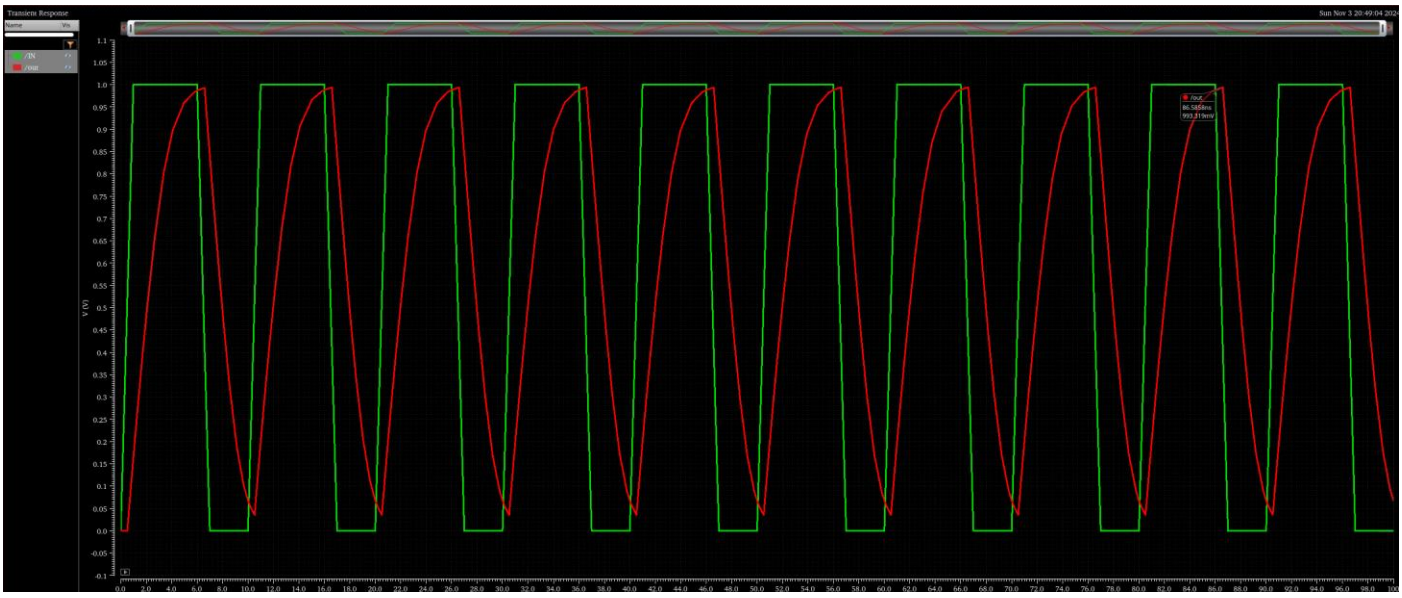
b) f stage has input capacitance of 500 × 2fins/2.43 = 411.52
= 412.

Since it's an inverter
206 fins for NFet & Pfet.

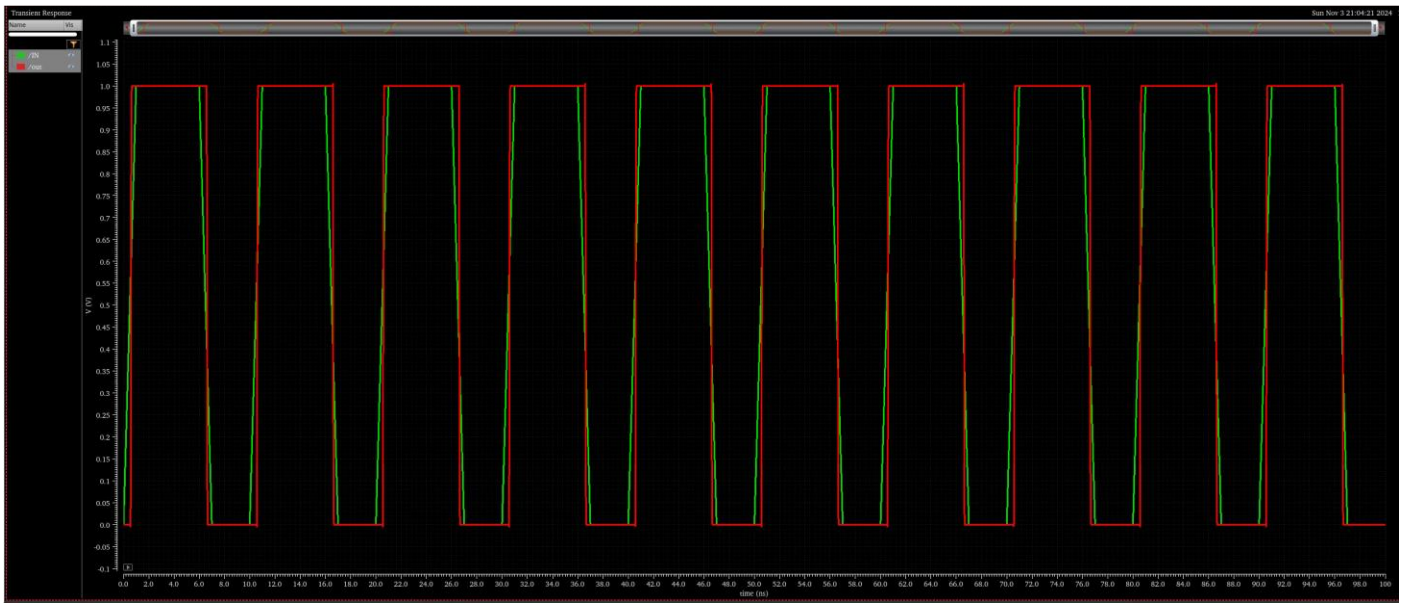
Stage e : P=3N, P+N (P=128; N=43)
Stage d : P = 17.5, N = 54
Stage c : P = N = 15
Stage b : P = 34 N = 16.66 = 17
Stage a : P = 7, N = 14
Stage 1 : P = N = 5



C)



Input to output : 1.578E-9

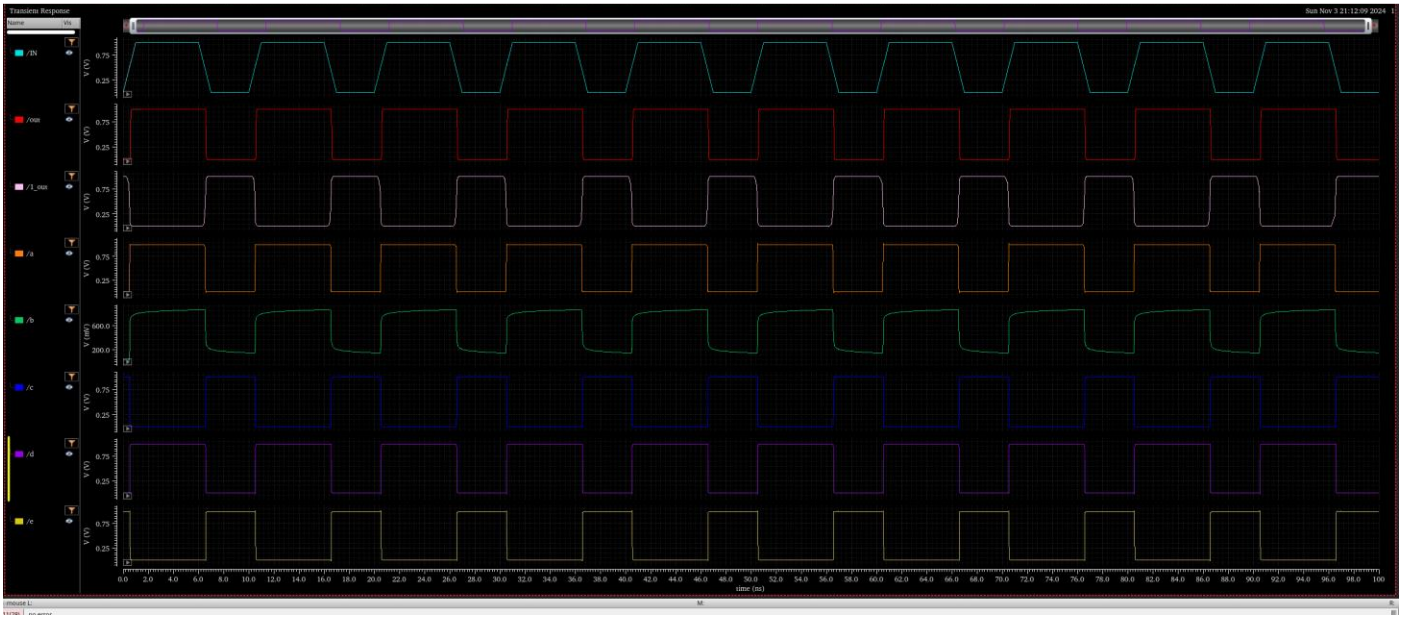


One with sizing: 88.18E-12

So it takes lesser time

d)

every stage



Input to output = 88.18E-12

1 to output = 80.75E-12

A to output = 68.33E-12

B to output = 54.68E-12

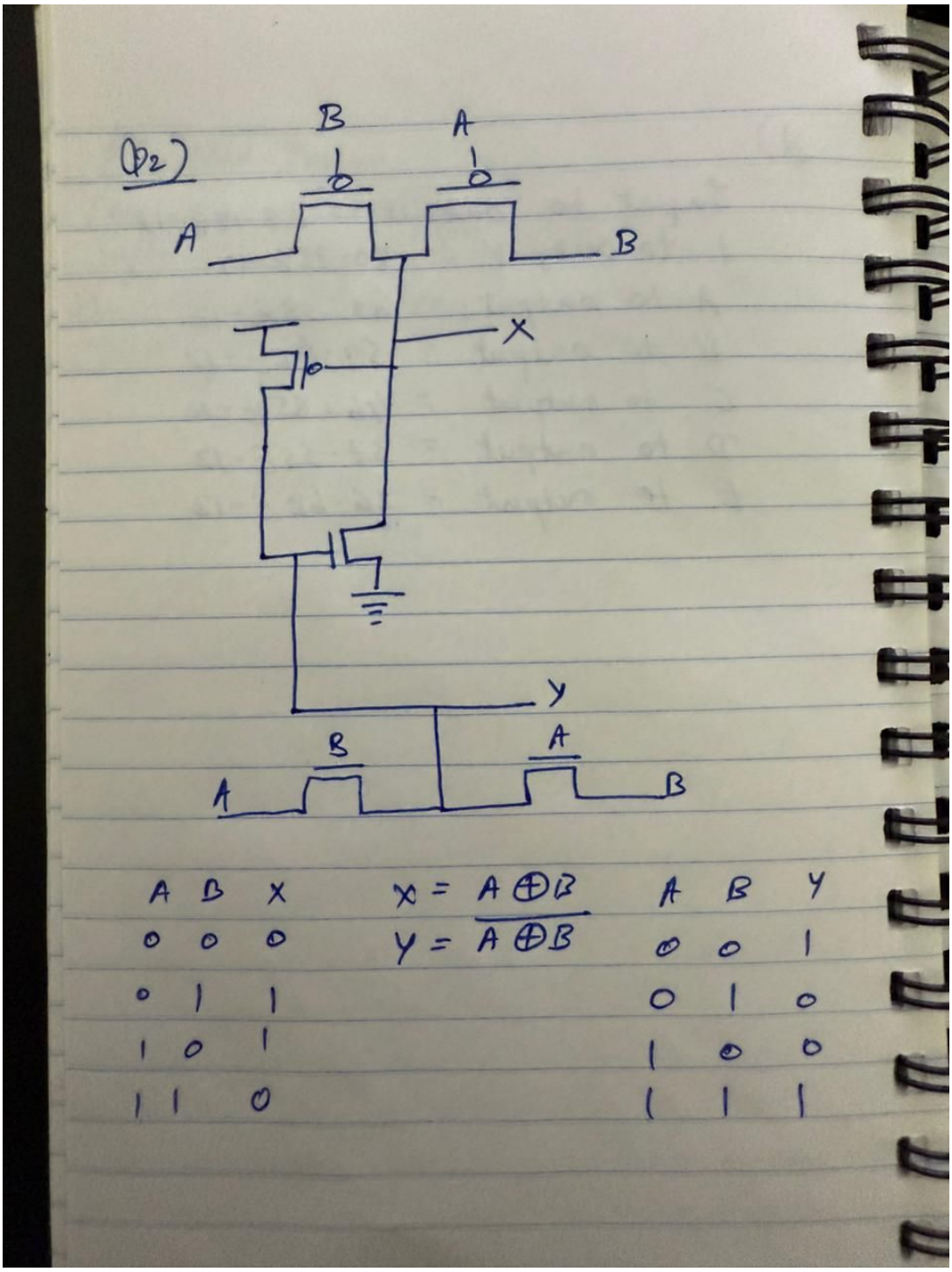
C to output = 46.85E-12

D to output = 37.35E-12

E to output = 26.62E-12

Q2

A)



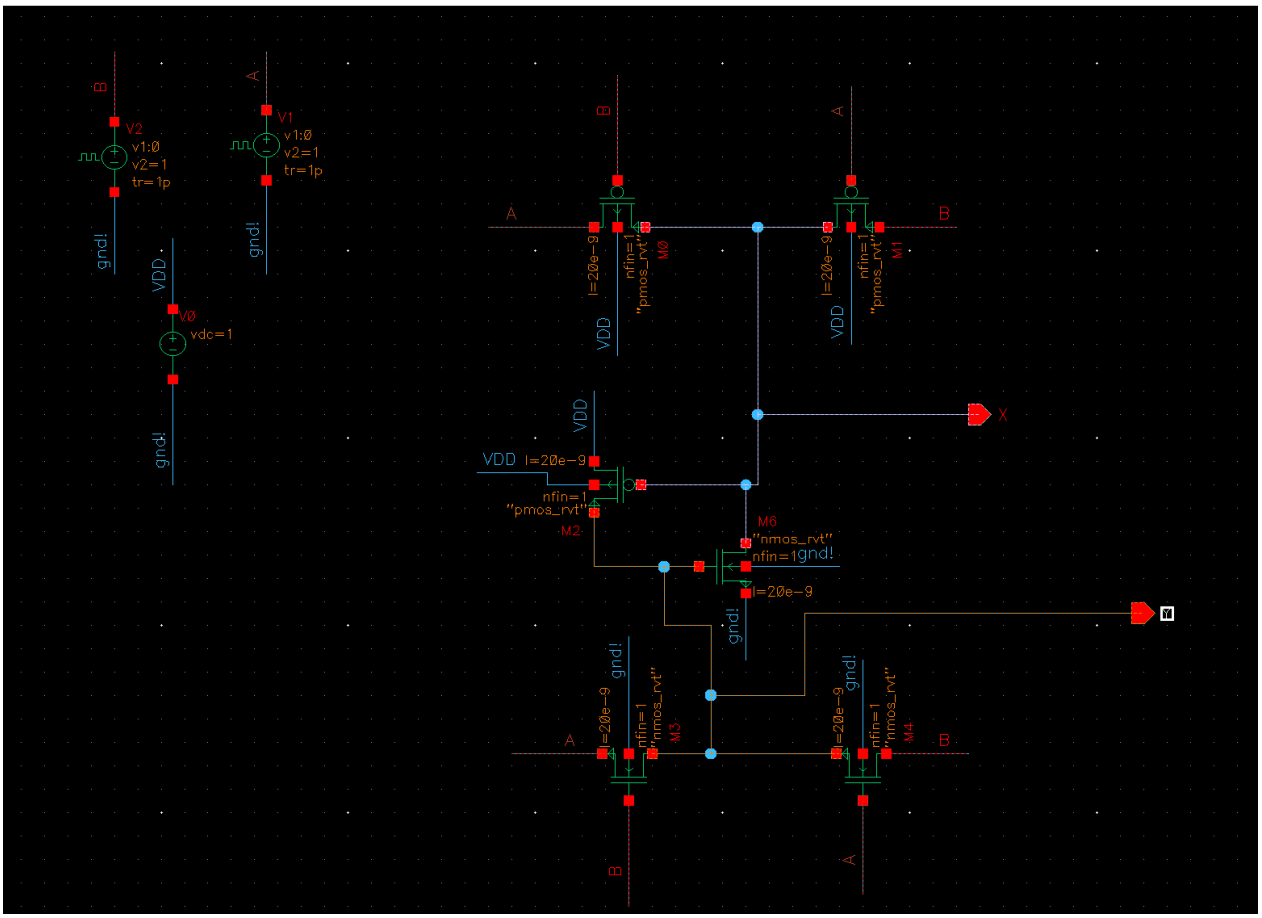
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

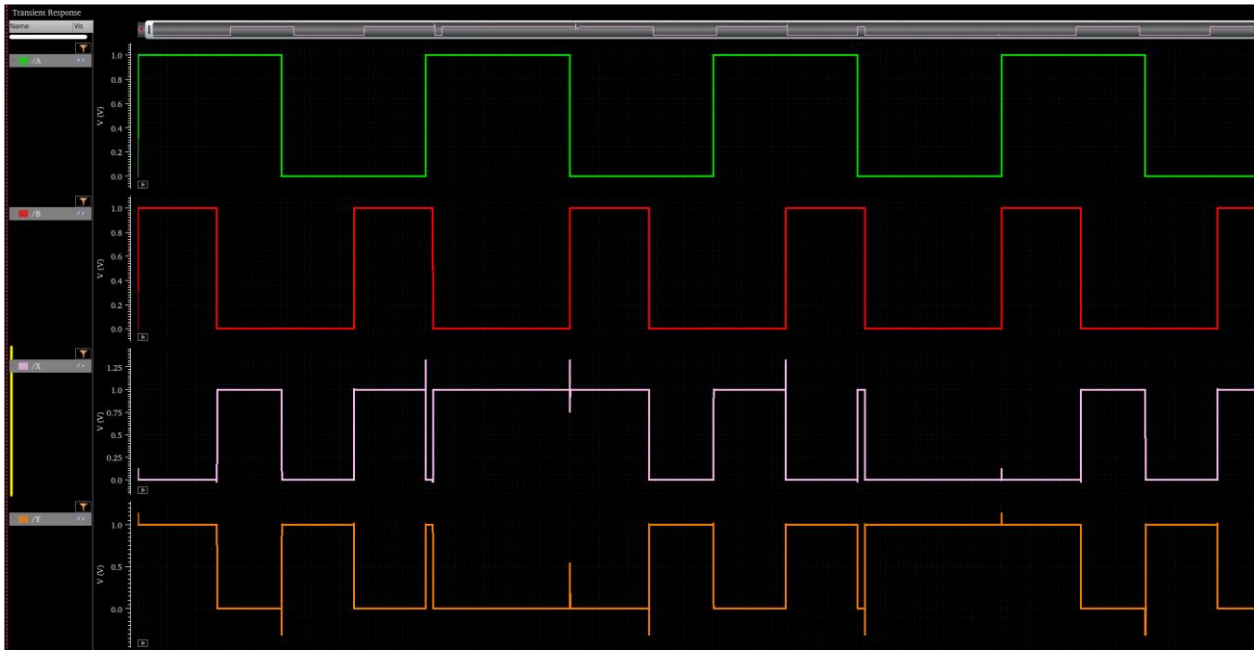
$X = A \oplus B$

$Y = \overline{A \oplus B}$

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

B)





Delay:

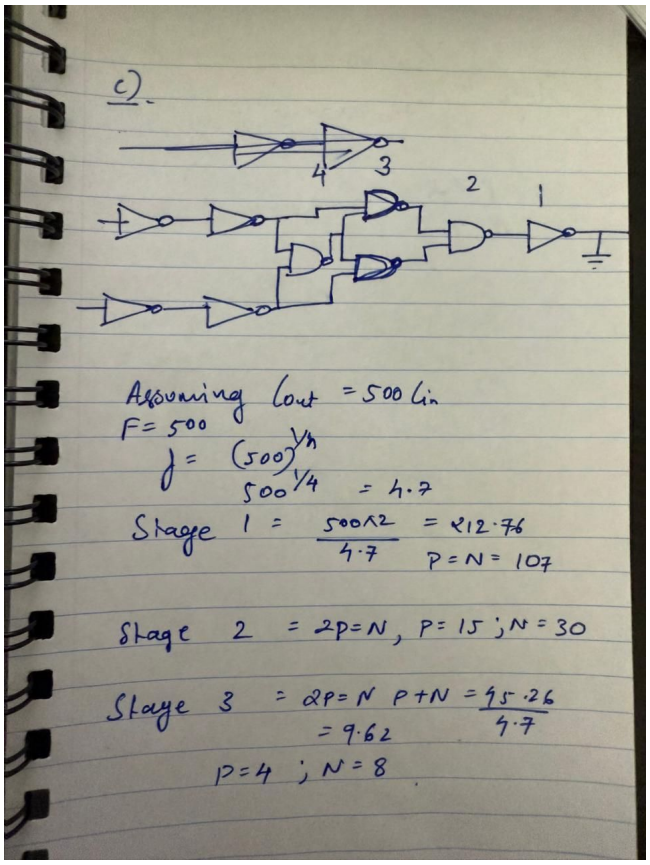
A to X: 12.5E-9

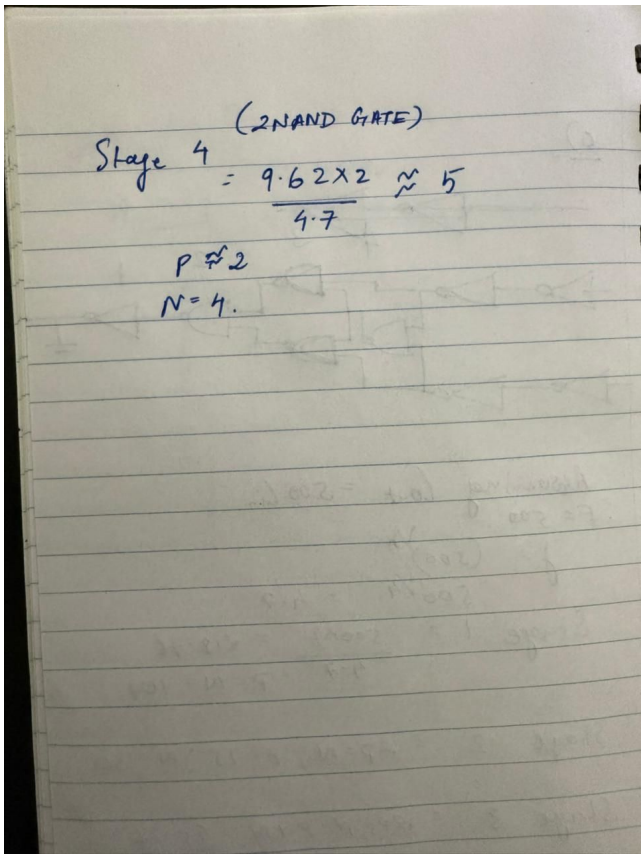
B to X: 2.533E-12

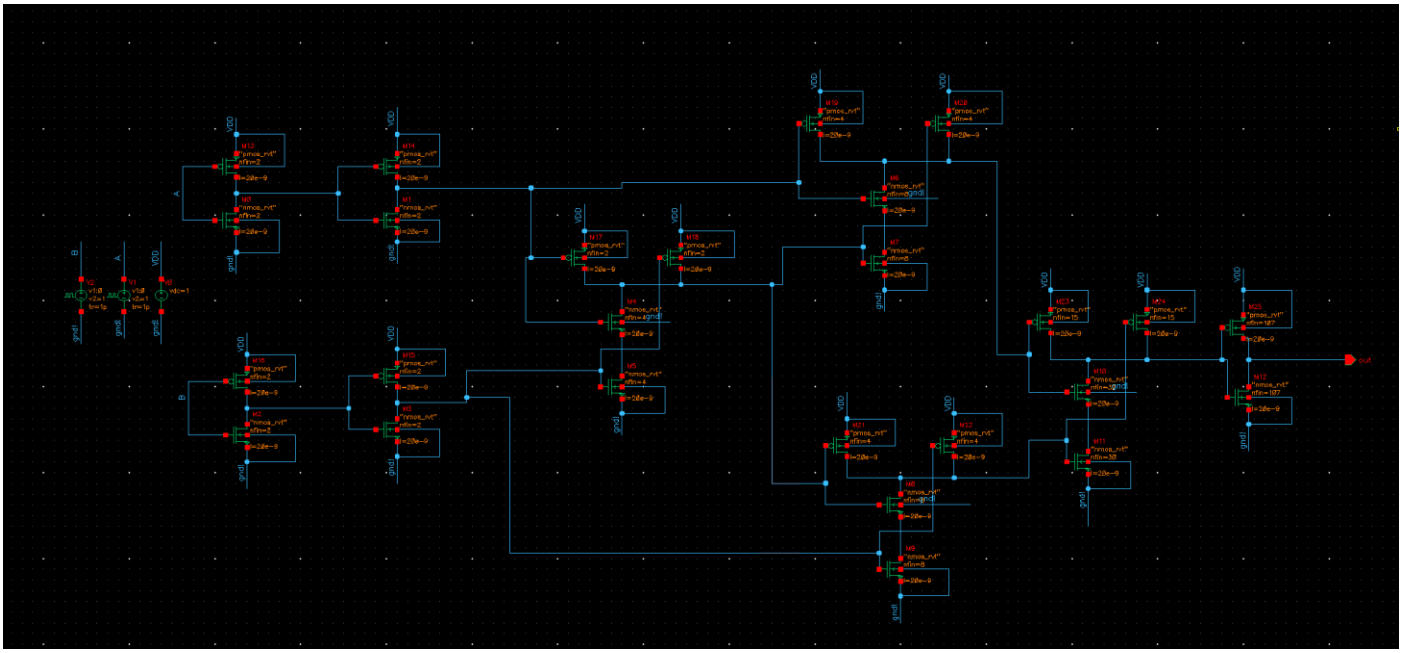
A to Y: 5.0E-9

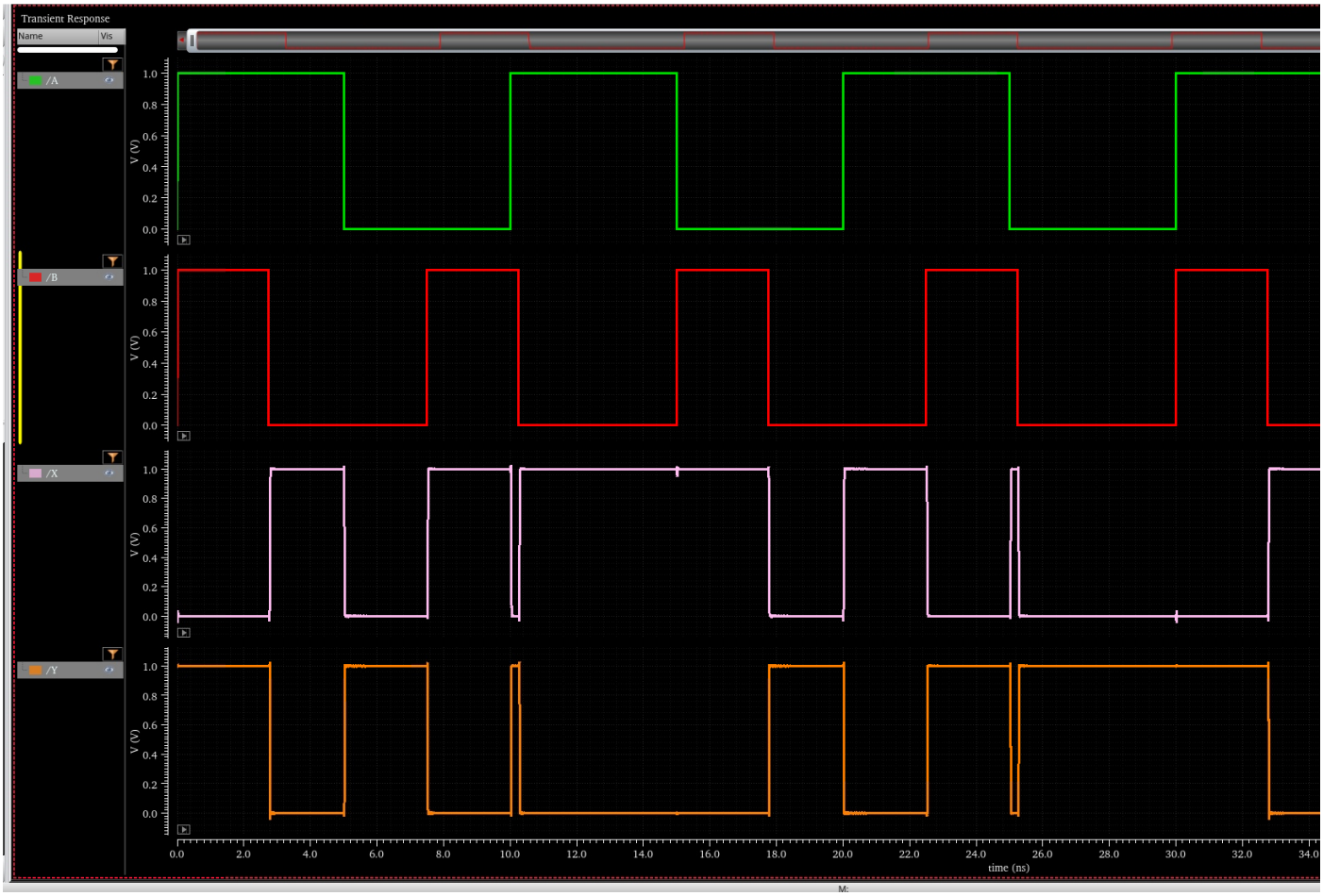
B to Y: 2.503E-9

C)


c).
4
3
2
1
Assuming Cout = 500 Cin
F = 500
f = (500)^1/n
500^1/4 = 4.7
Stage 1 = 500/4.7 = 212.76
P = N = 107
Stage 2 = 2P = N, P = 15 ; N = 30
Stage 3 = 2P = N P+N = 95.26/4.7
= 9.62
P = 4 ; N = 8


(2NAND GATE)
Stage 4 = 9.62X2/4.7 ≈ 5
P = 2
N = 4.





A to X: 22.28E-12

B to X: 34.67E-12

A to Y: 24.24E-12

B to Y: 35.52E-12