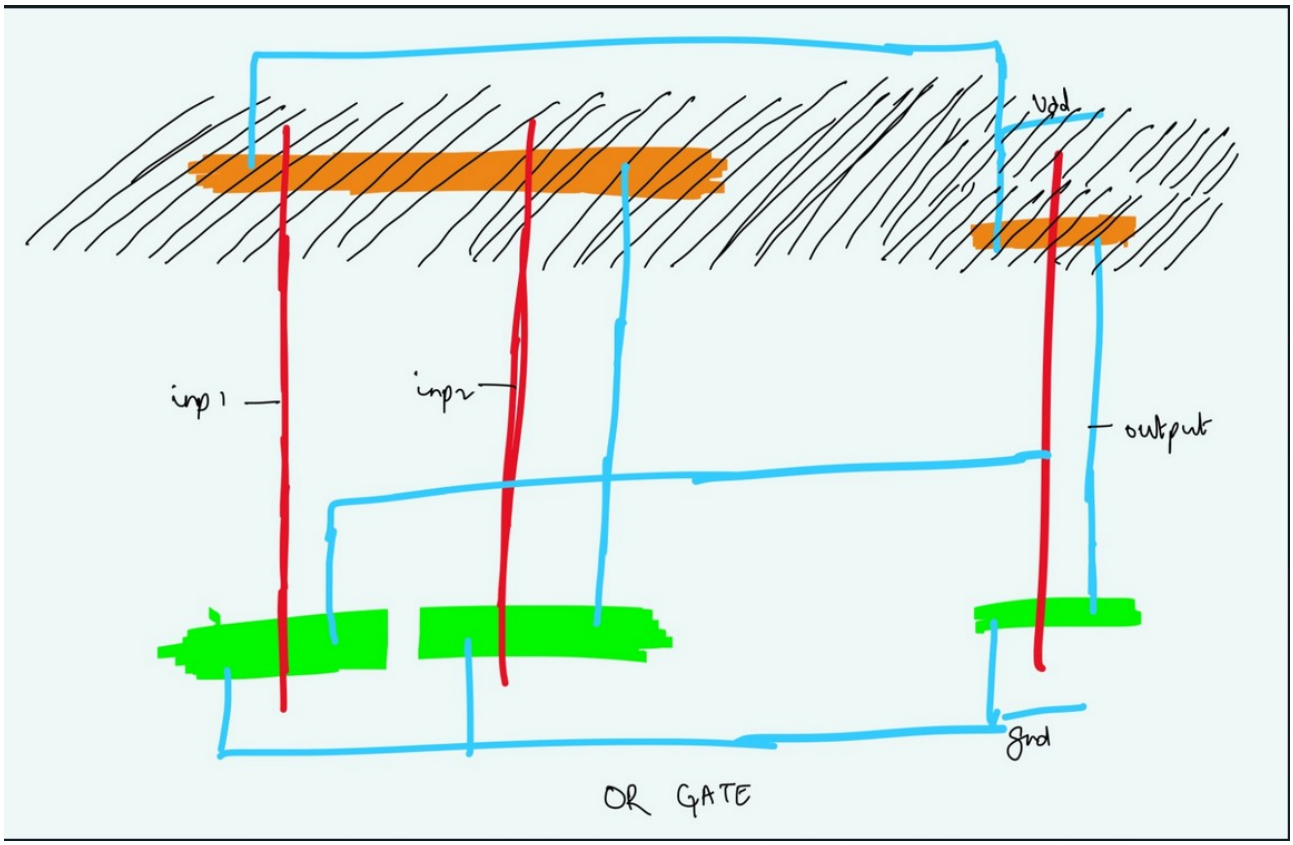
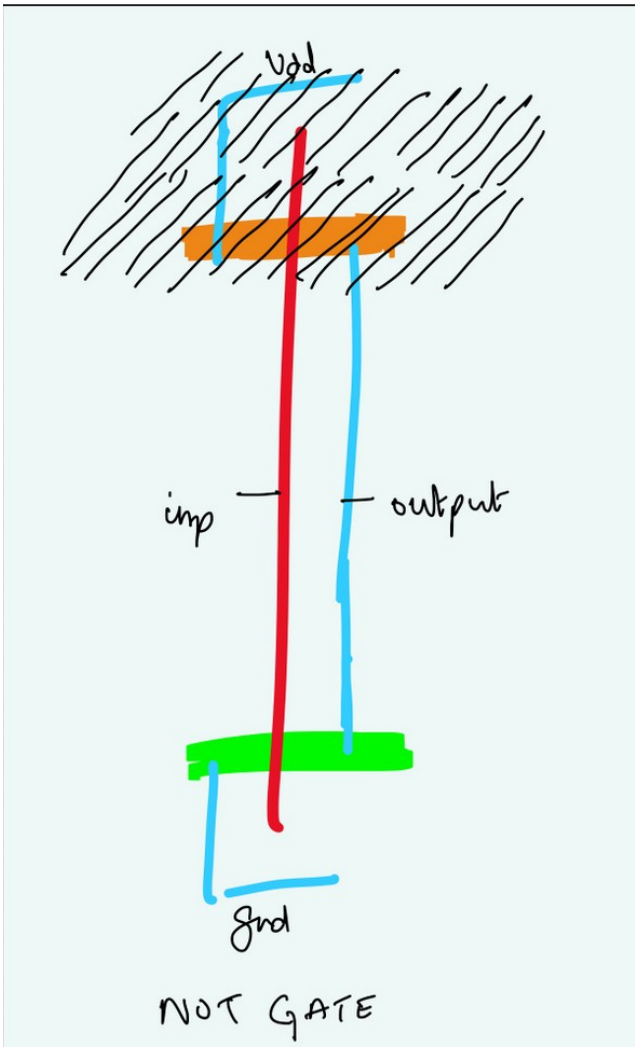
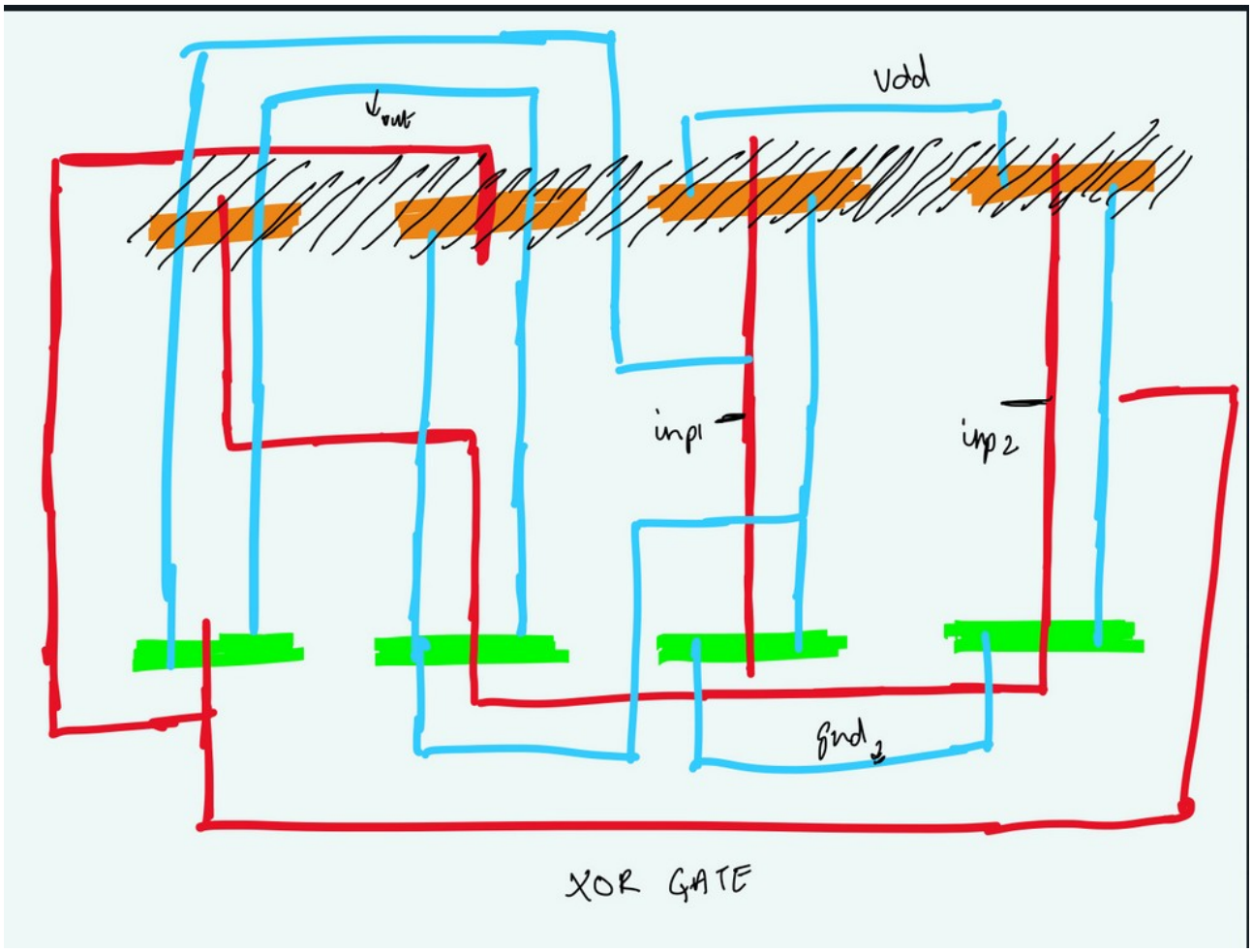
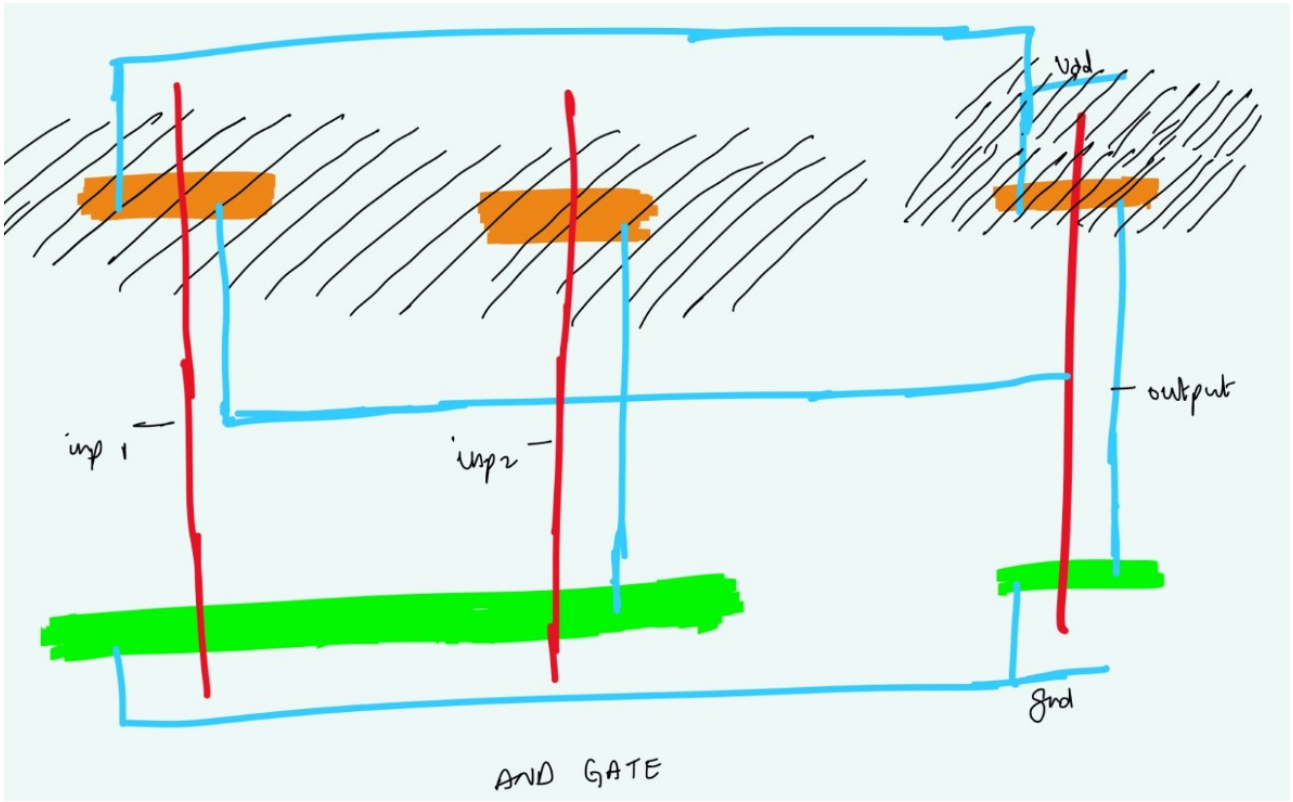
GATES



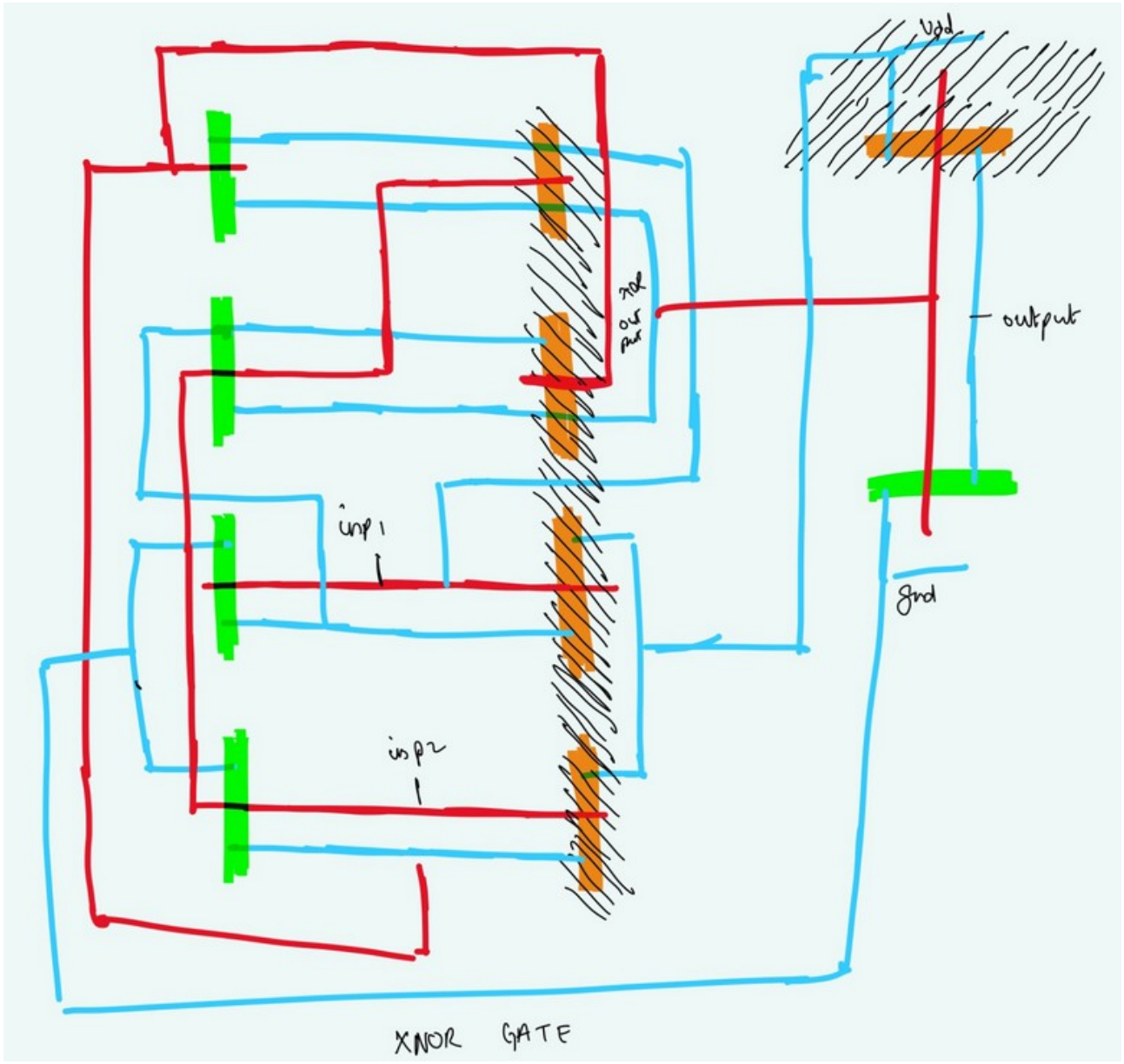




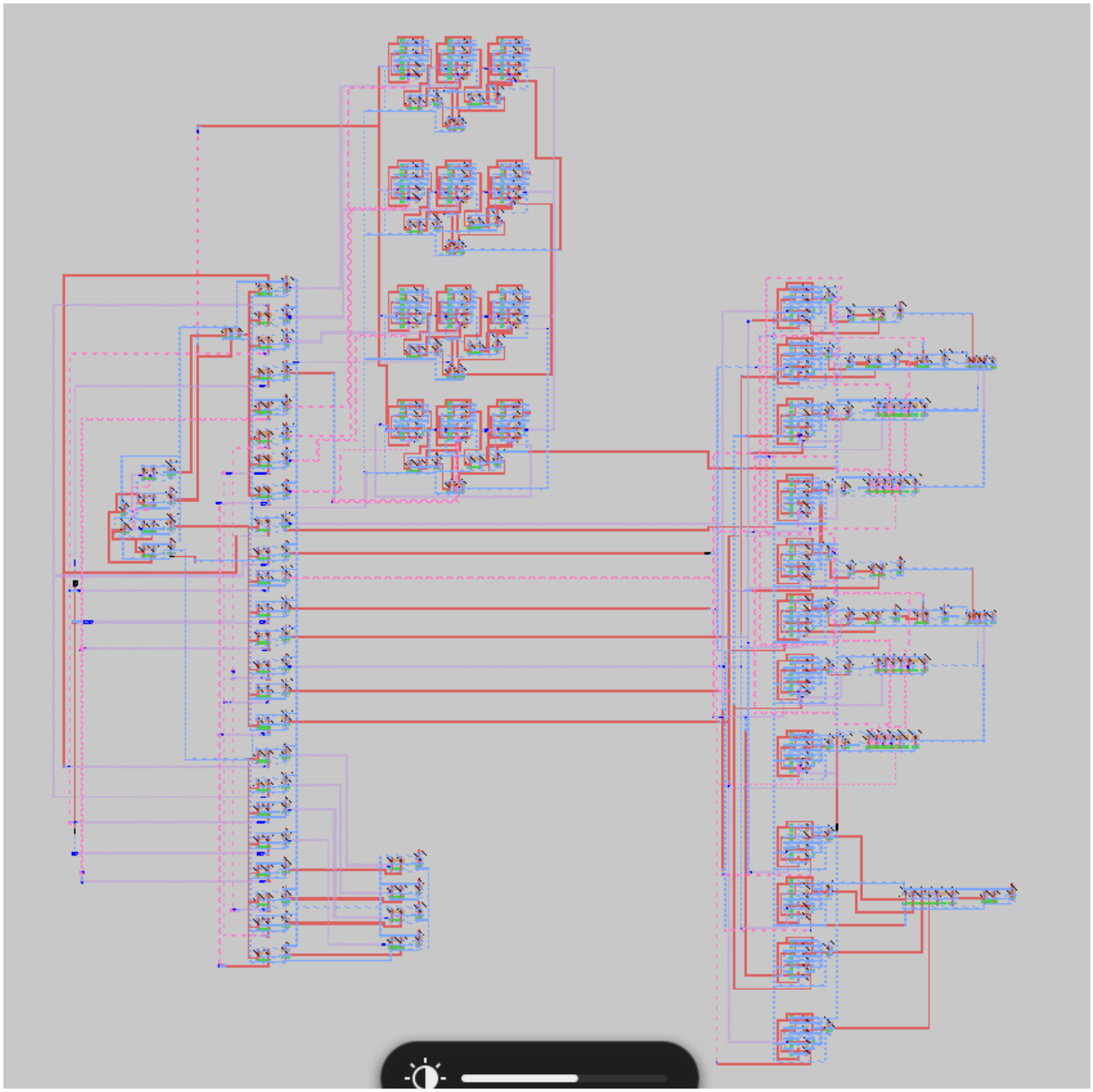
XOR GATE



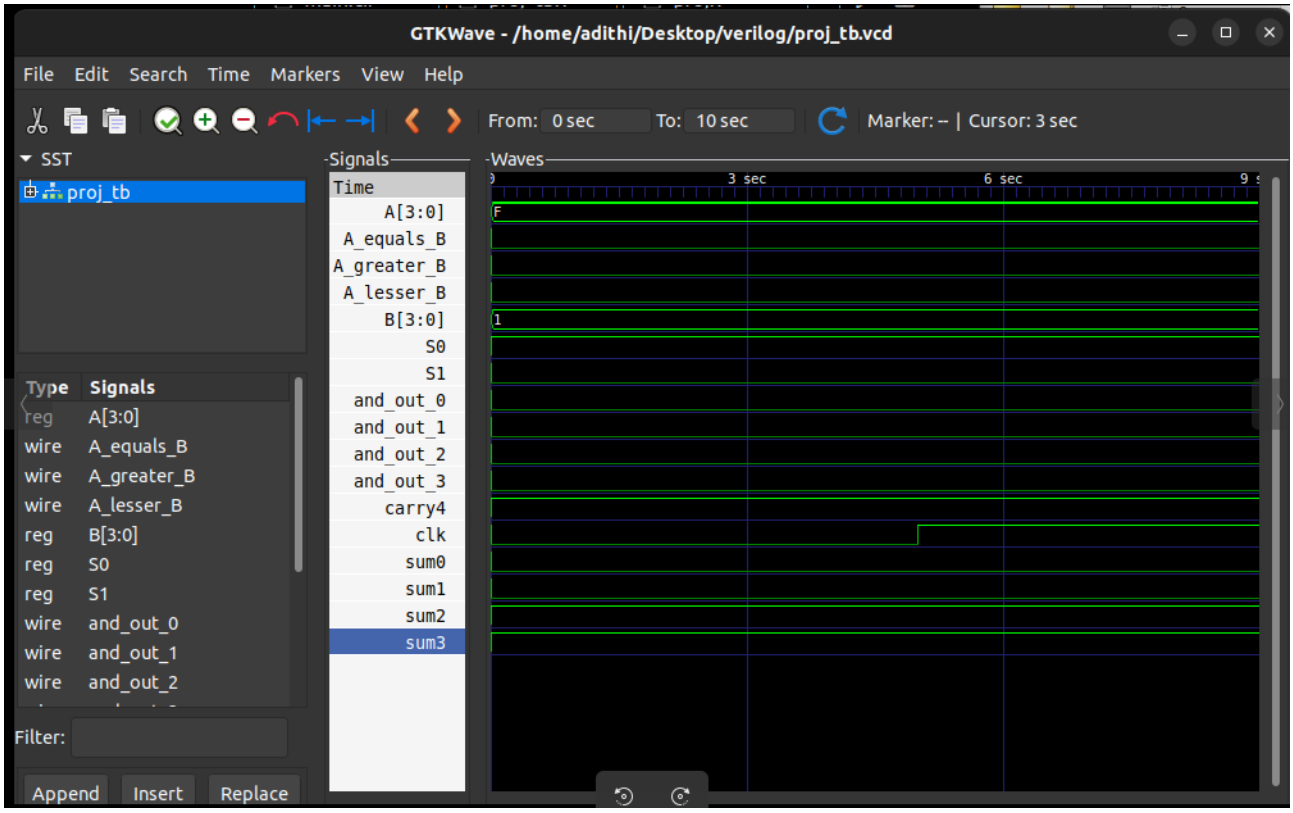
AND GATE


Vdd
output
Gnd
inp1
inp2
XNOR GATE

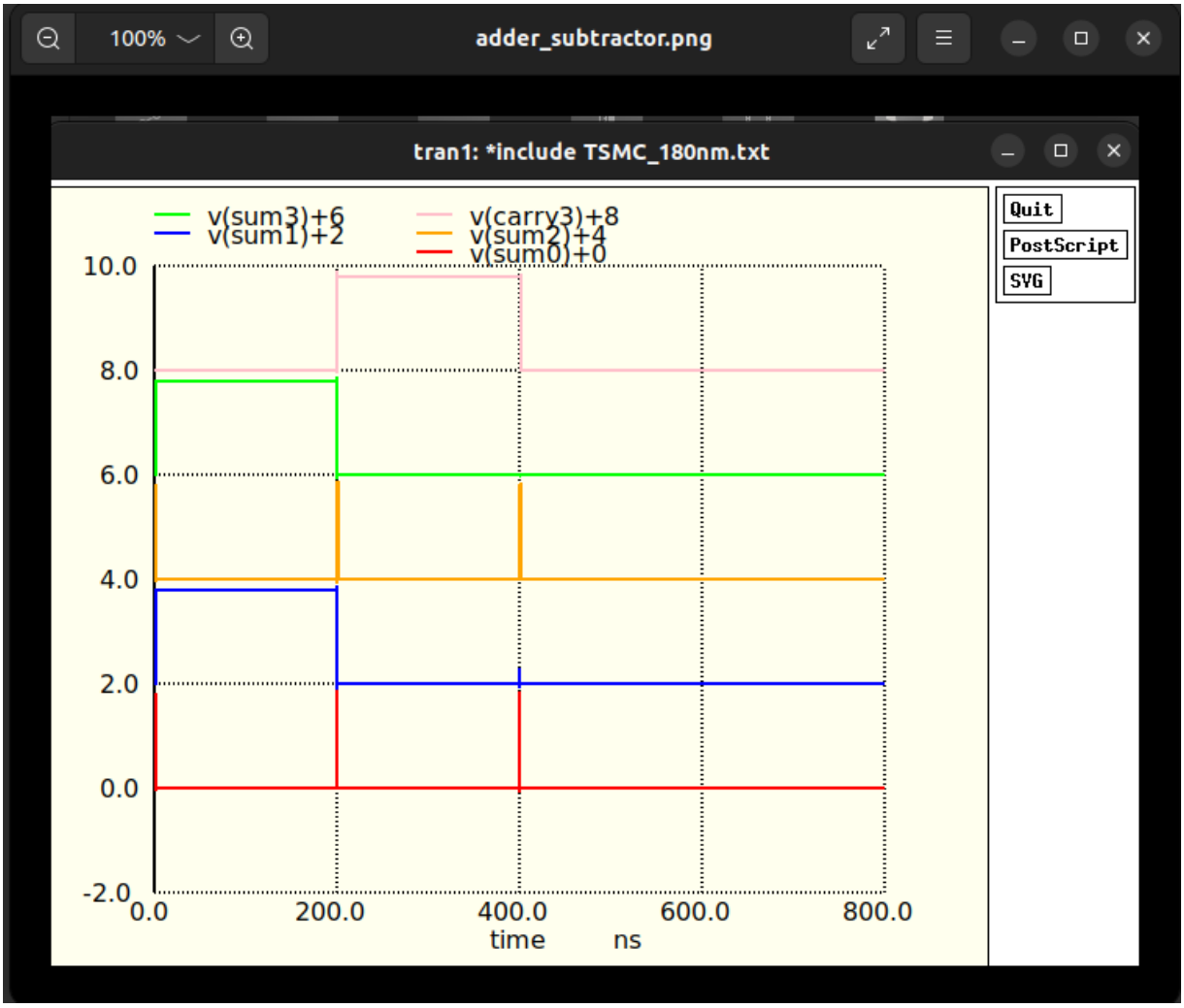
FULL ALU DESIGN

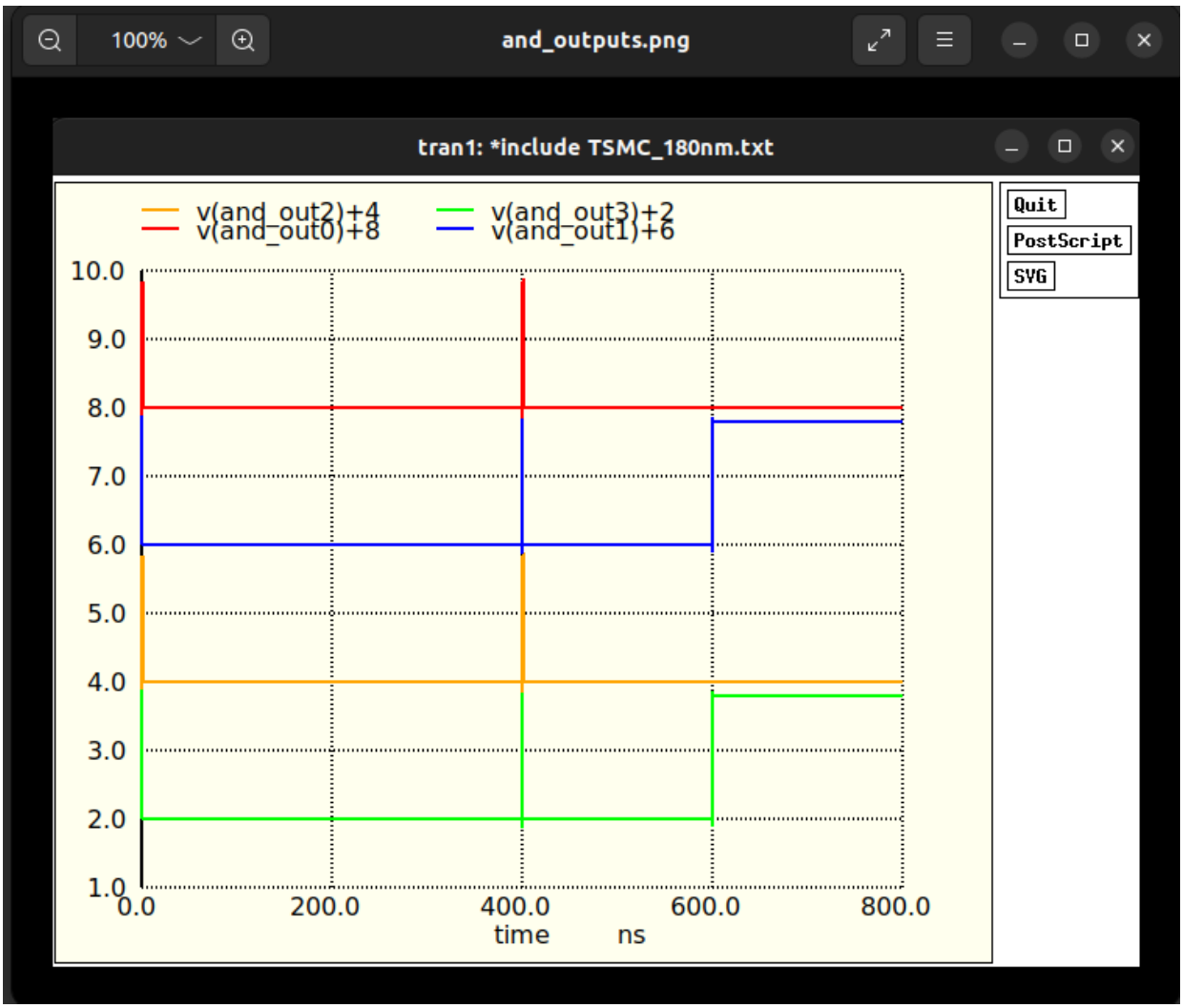


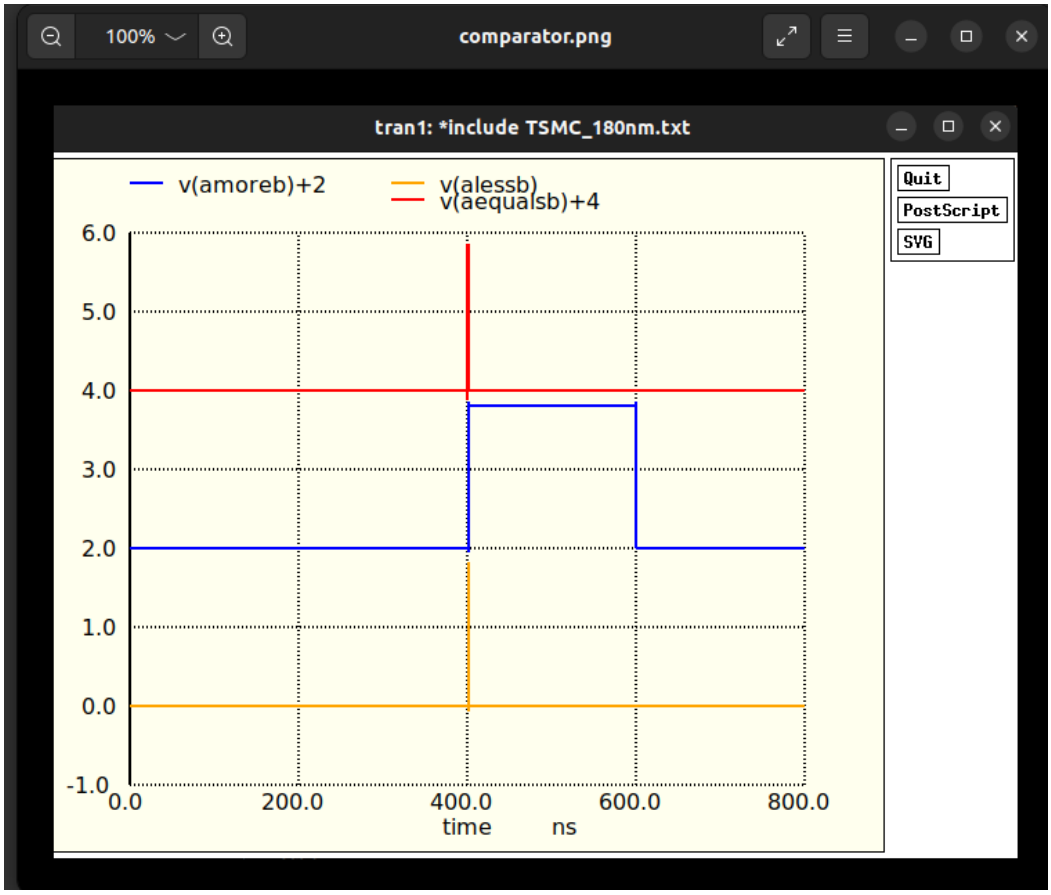
GTK waveplot

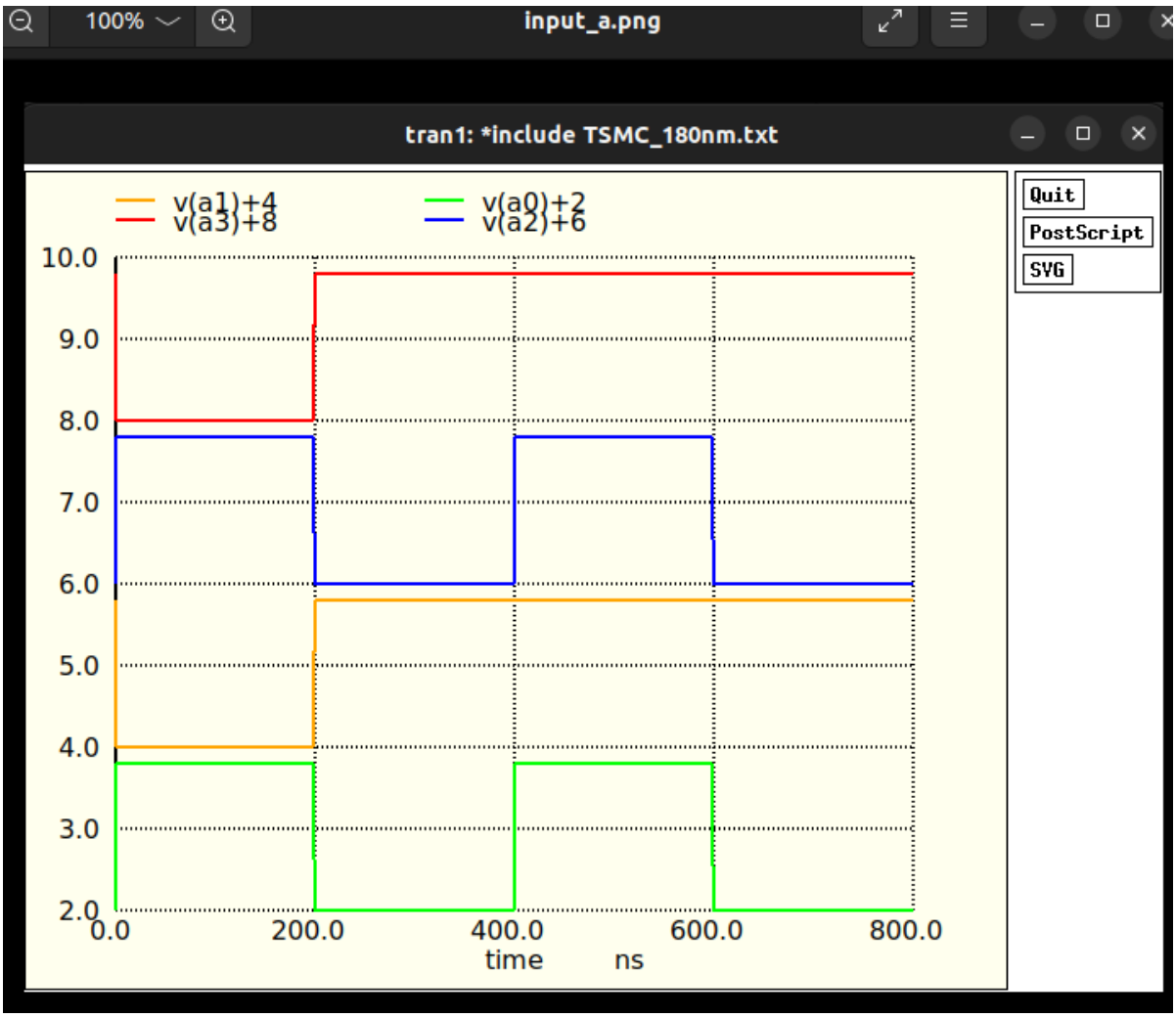


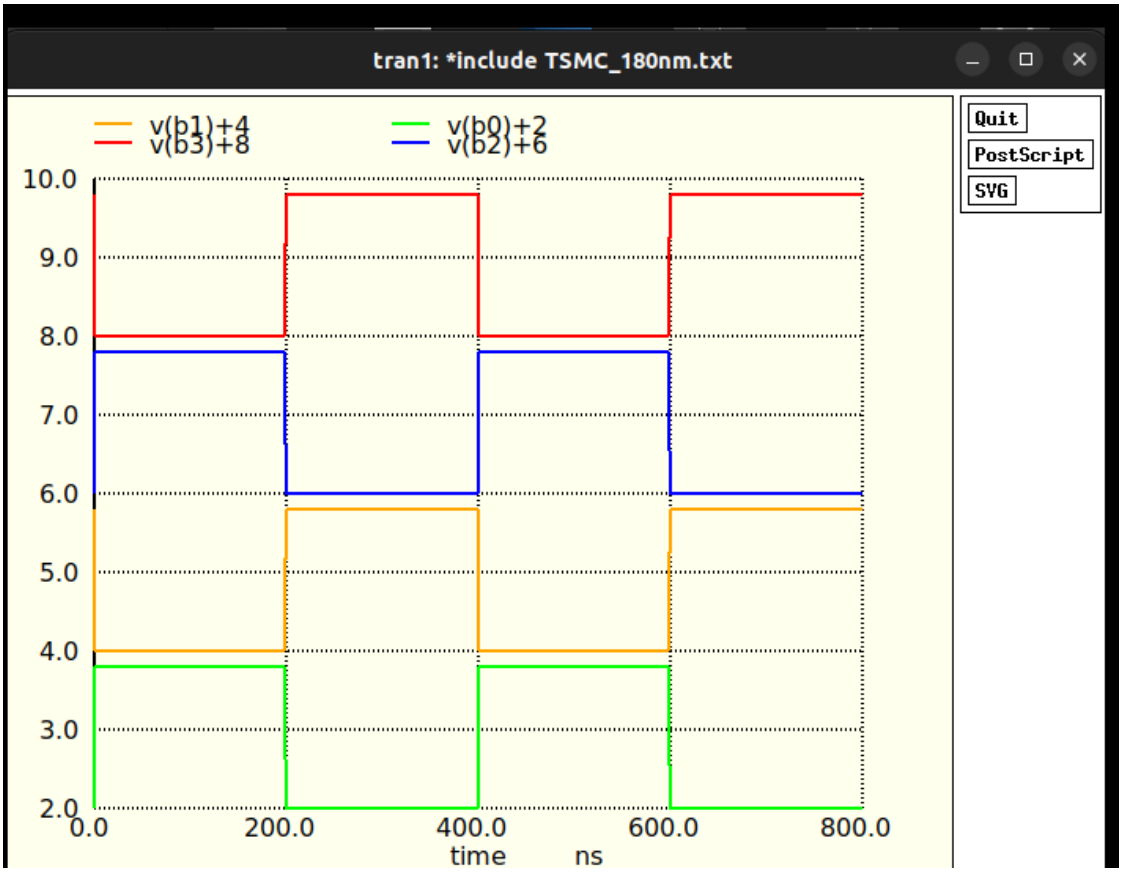
ngspice plots

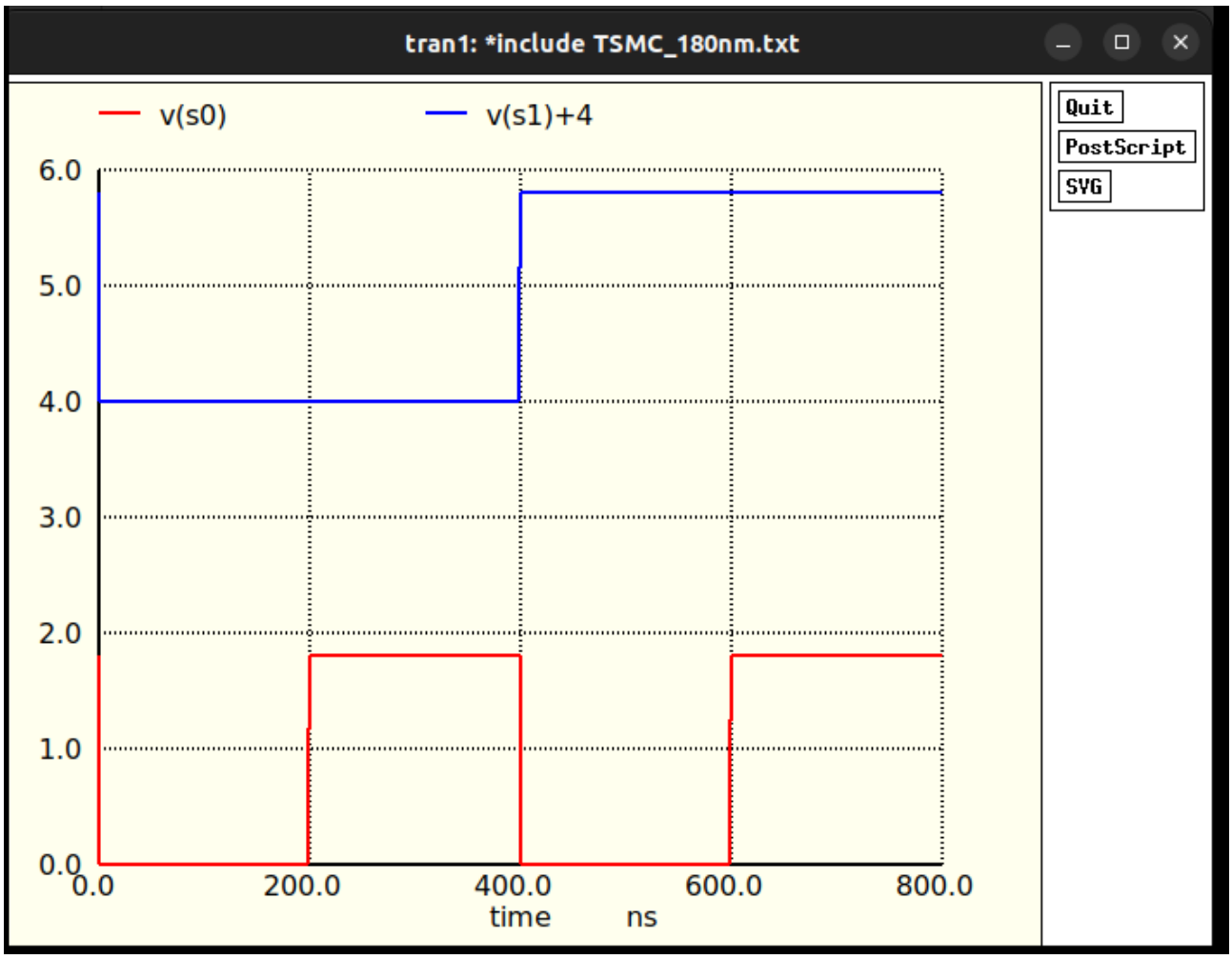



and_outputs.png
100%
tran1: *include TSMC_180nm.txt
v(and_out2)+4
v(and_out0)+8
v(and_out3)+2
v(and_out1)+6
Quit
PostScript
SVG
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
200.0
400.0
600.0
800.0
time
ns

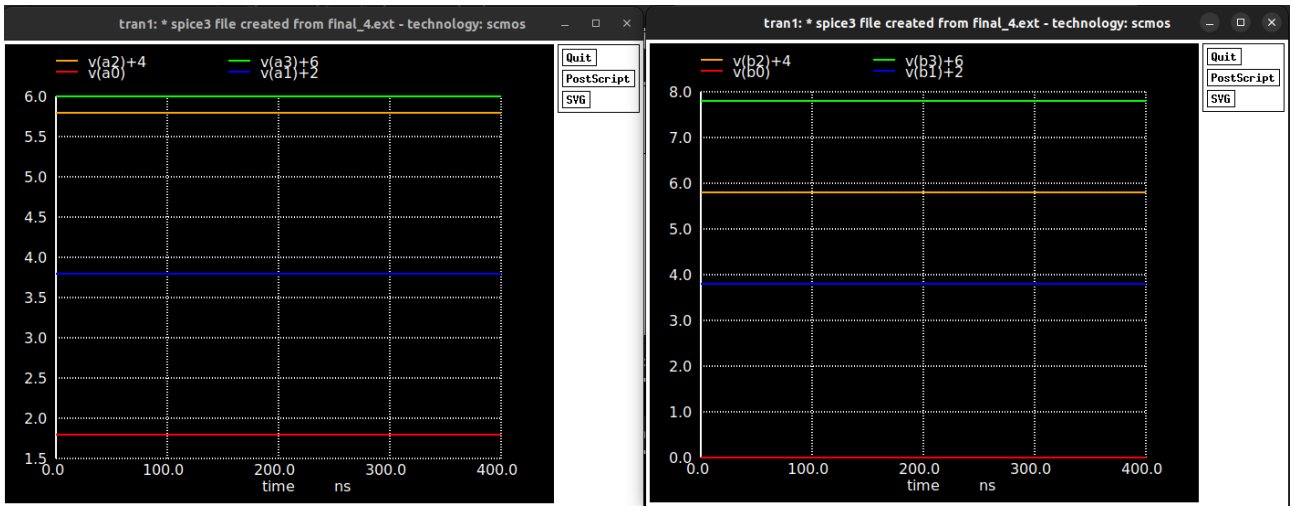

comparator.png
100%
tran1: *include TSMC_180nm.txt
v(amoreb)+2
v(alessb)
v(aequalsb)+4
Quit
PostScript
SVG
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
0.0
200.0
400.0
600.0
800.0
time
ns


100%
input_a.png
tran1: *include TSMC_180nm.txt
v(a1)+4
v(a3)+8
v(a0)+2
v(a2)+6
Quit
PostScript
SVG
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
0.0
200.0
400.0
600.0
800.0
time
ns

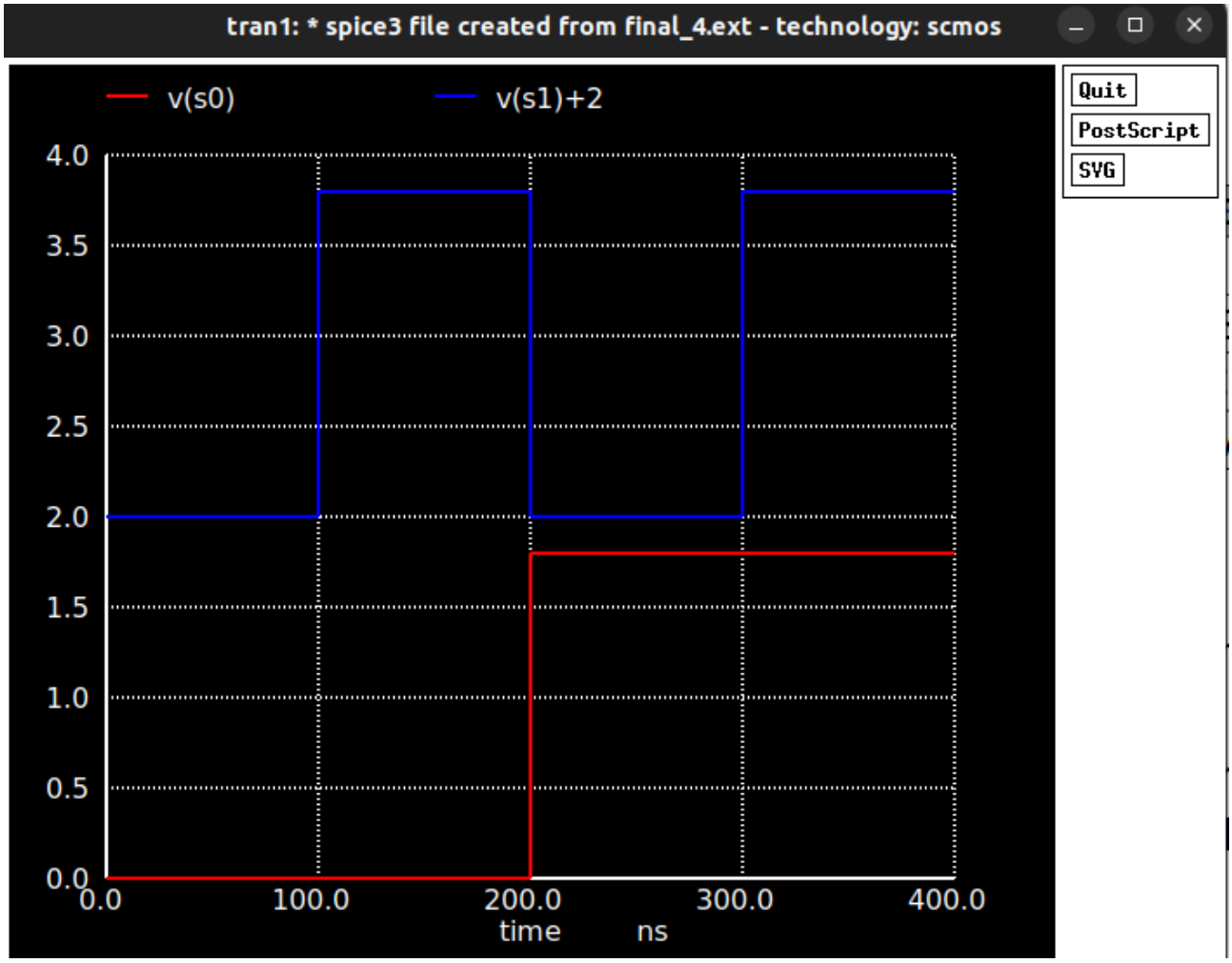

tran1: *include TSMC_180nm.txt
v(b1)+4
v(b3)+8
v(b0)+2
v(b2)+6
Quit
PostScript
SVG
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
0.0
200.0
400.0
600.0
800.0
time
ns

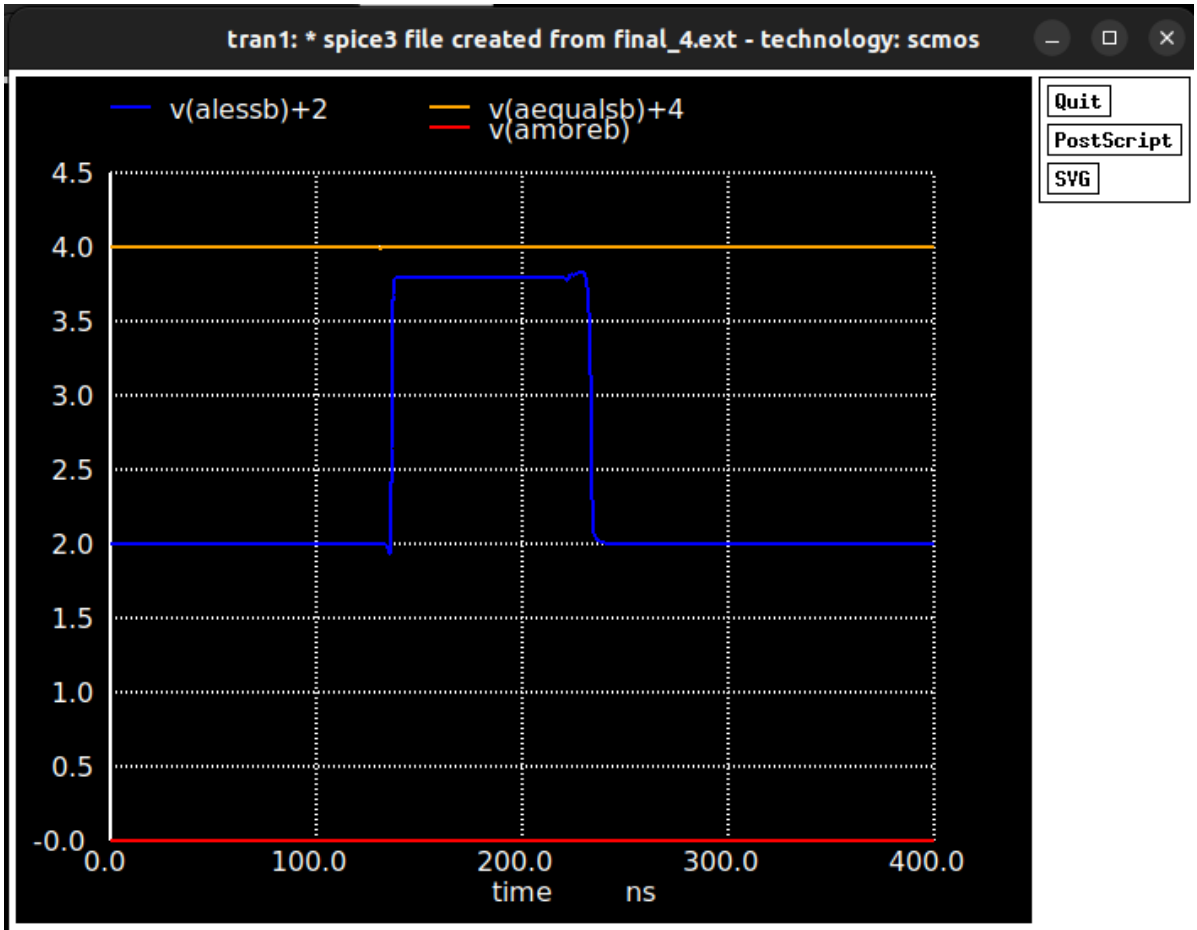


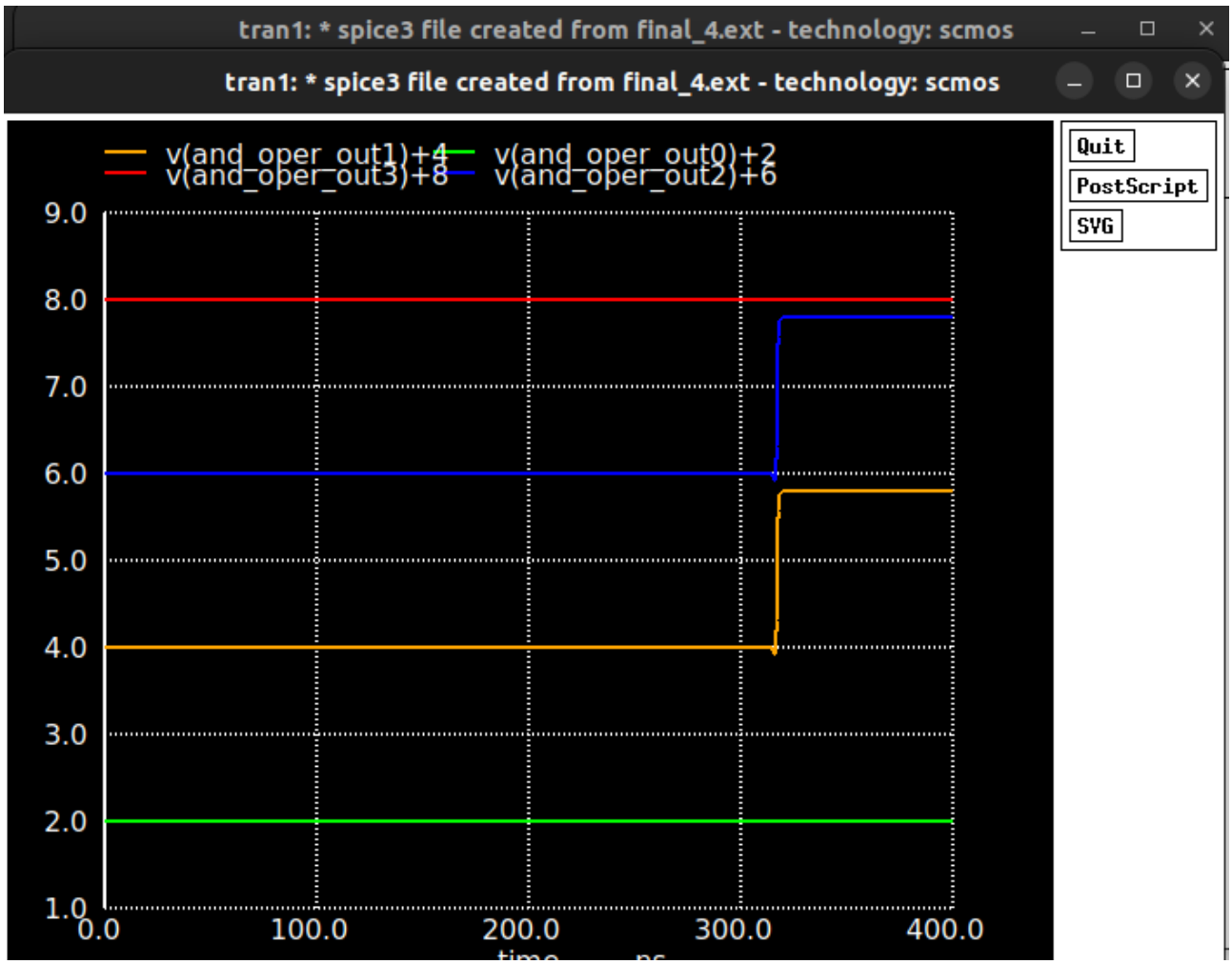
PLOTS FROM MAGIC

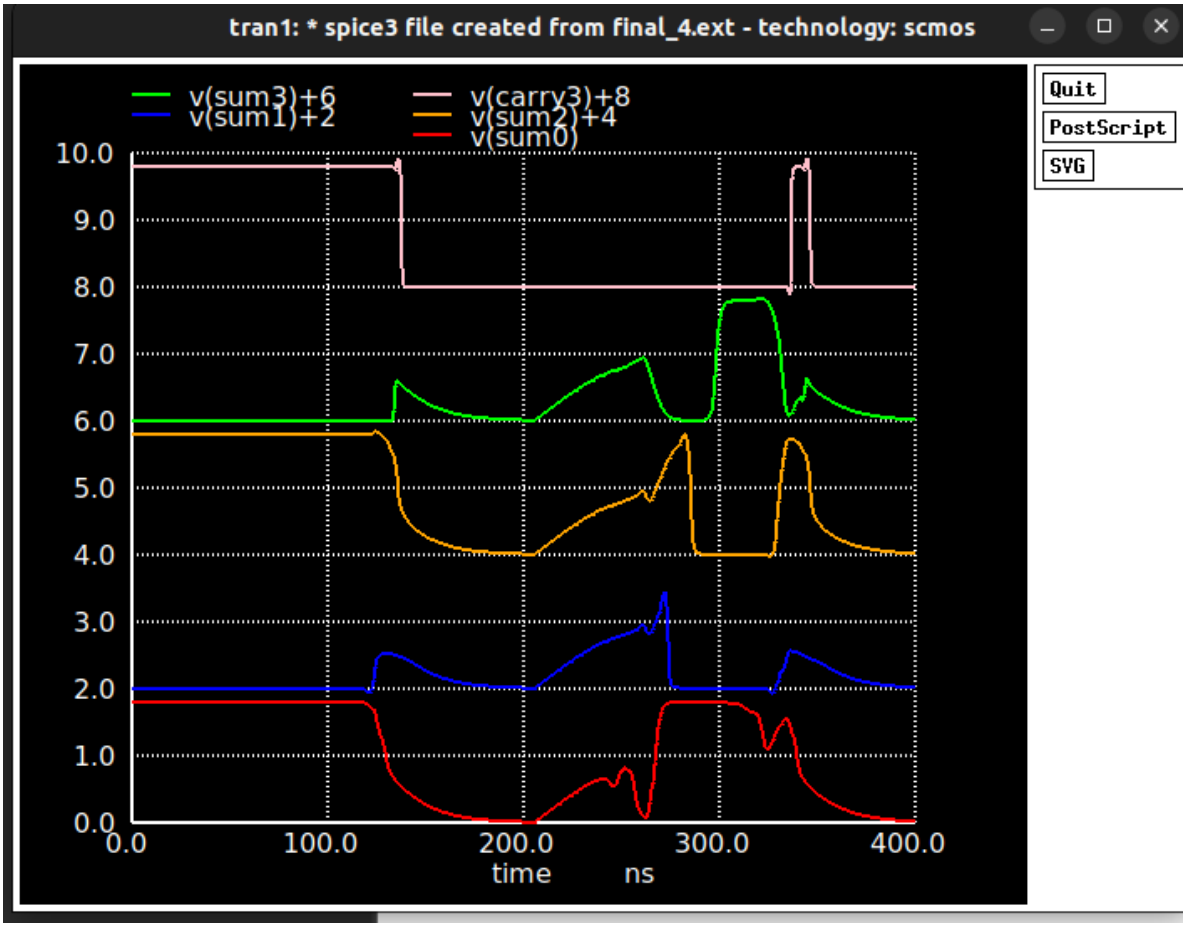


a – 0111
b - 1110


tran1: * spice3 file created from final_4.ext - technology: scmos
v(s0)
v(s1)+2
Quit
PostScript
SVG
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
100.0
200.0
300.0
400.0
time
ns


tran1: * spice3 file created from final_4.ext - technology: scmos
v(alessb)+2
v(aequalsb)+4
v(amoreb)
Quit
PostScript
SVG
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-0.0
0.0
100.0
200.0
300.0
400.0
time
ns


tran1: * spice3 file created from final_4.ext - technology: scmos
tran1: * spice3 file created from final_4.ext - technology: scmos
v(and_oper_out1)+4
v(and_oper_out0)+2
v(and_oper_out3)+8
v(and_oper_out2)+6
Quit
PostScript
SVG
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
100.0
200.0
300.0
400.0


tran1: * spice3 file created from final_4.ext - technology: scmos
v(sum3)+6
v(sum1)+2
v(carry3)+8
v(sum2)+4
v(sum0)
Quit
PostScript
SVG
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
100.0
200.0
300.0
400.0
time
ns

DELAYS

adder delays

Delay Analysis > adder_delay.txt

```
1   tpd                =  1.28164e-08 input = A0 output = sum0
2   tpd                =  1.23021e-08 input = A0 output = sum1
3   tpd                =  1.29370e-08 input = A0 output = sum2
4   tpd                =  1.31226e-08 input = A0 output = sum3
5   tpd                =  1.28164e-08 input = A1 output = sum0
6   tpd                =  1.23021e-08 input = A1 output = sum1
7   tpd                =  1.29370e-08 input = A1 output = sum2
8   tpd                =  1.31226e-08 input = A1 output = sum3
9   tpd                =  1.28164e-08 input = A2 output = sum0
10  tpd                =  1.23021e-08 input = A2 output = sum1
11  tpd                =  1.29370e-08 input = A2 output = sum2
12  tpd                =  1.31226e-08 input = A2 output = sum3
13  tpd                =  1.28164e-08 input = A3 output = sum0
14  tpd                =  1.23021e-08 input = A3 output = sum1
15  tpd                =  1.29370e-08 input = A3 output = sum2
16  tpd                =  1.31226e-08 input = A3 output = sum3
17  tpd                =  1.47743e-08 input = B0 output = sum0
18  tpd                =  1.91460e-08 input = B0 output = sum1
19  tpd                =  1.96785e-08 input = B0 output = sum2
20  tpd                =  1.96914e-08 input = B0 output = sum3
21  tpd                =  1.47743e-08 input = B1 output = sum0
22  tpd                =  1.91460e-08 input = B1 output = sum1
23  tpd                =  1.96785e-08 input = B1 output = sum2
24  tpd                =  1.96914e-08 input = B1 output = sum3
25  tpd                =  1.47743e-08 input = B2 output = sum0
26  tpd                =  1.91460e-08 input = B2 output = sum1
27  tpd                =  1.96785e-08 input = B2 output = sum2
28  tpd                =  1.96914e-08 input = B2 output = sum3
29  tpd                =  1.47743e-08 input = B3 output = sum0
30  tpd                =  1.91460e-08 input = B3 output = sum1
31  tpd                =  1.96785e-08 input = B3 output = sum2
32  tpd                =  1.96914e-08 input = B3 output = sum3
33
```

subtractor delays

Delay Analysis > subtractor.txt

```
tpd                    =  5.71699e-09 input = A0 output = sum0
tpd                    =  5.71699e-09 input = A0 output = sum1
tpd                    =  5.71699e-09 input = A0 output = sum2
tpd                    =  5.71699e-09 input = A0 output = sum3
tpd                    =  5.71699e-09 input = A1 output = sum0
tpd                    =  5.71699e-09 input = A1 output = sum1
tpd                    =  5.71699e-09 input = A1 output = sum2
tpd                    =  5.71699e-09 input = A1 output = sum3
tpd                    =  5.71699e-09 input = A2 output = sum0
tpd                    =  5.71699e-09 input = A2 output = sum1
tpd                    =  5.71699e-09 input = A2 output = sum2
tpd                    =  5.71699e-09 input = A2 output = sum3
tpd                    =  5.71699e-09 input = A3 output = sum0
tpd                    =  5.71699e-09 input = A3 output = sum1
tpd                    =  5.71699e-09 input = A3 output = sum2
tpd                    =  5.71699e-09 input = A3 output = sum3
tpd                    =  5.71699e-09 input = B0 output = sum0
tpd                    =  5.71699e-09 input = B0 output = sum1
tpd                    =  5.71699e-09 input = B0 output = sum2
tpd                    =  5.71699e-09 input = B0 output = sum3
tpd                    =  5.71699e-09 input = B1 output = sum0
tpd                    =  5.71699e-09 input = B1 output = sum1
tpd                    =  5.71699e-09 input = B1 output = sum2
tpd                    =  5.71699e-09 input = B1 output = sum3
tpd                    =  5.71699e-09 input = B2 output = sum0
tpd                    =  5.71699e-09 input = B2 output = sum1
tpd                    =  5.71699e-09 input = B2 output = sum2
tpd                    =  5.71699e-09 input = B2 output = sum3
tpd                    =  5.71699e-09 input = B3 output = sum0
tpd                    =  5.71699e-09 input = B3 output = sum1
tpd                    =  5.71699e-09 input = B3 output = sum2
tpd                    =  5.71699e-09 input = B3 output = sum3

```

less than delays

Delay Analysis > lesser_comparator.txt

```
tpd                    =  2.41307e-08 input = A0 output = AlessB
tpd                    =  2.41307e-08 input = A1 output = AlessB
tpd                    =  2.41307e-08 input = A2 output = AlessB
tpd                    =  2.41307e-08 input = A3 output = AlessB
tpd                    =  2.58454e-08 input = B0 output = AlessB
tpd                    =  2.58454e-08 input = B1 output = AlessB
tpd                    =  2.58454e-08 input = B2 output = AlessB
tpd                    =  2.58454e-08 input = B3 output = AlessB
```

more than delays

Delay Analysis > greater_comparator.txt

```
1   tpd                 =  2.39790e-08 input = A0 output = AmoreB
2   tpd                 =  2.39790e-08 input = A1 output = AmoreB
3   tpd                 =  2.39790e-08 input = A2 output = AmoreB
4   tpd                 =  2.39790e-08 input = A3 output = AmoreB
5   tpd                 =  2.32674e-08 input = B0 output = AmoreB
6   tpd                 =  2.32674e-08 input = B1 output = AmoreB
7   tpd                 =  2.32674e-08 input = B2 output = AmoreB
8   tpd                 =  2.32674e-08 input = B3 output = AmoreB
```

equal to delays

Delay Analysis > equals_comparator.txt

```
1   tpd                 =  2.90845e-08 input = A0 output = AequalsB
2   tpd                 =  2.90845e-08 input = A1 output = AequalsB
3   tpd                 =  2.90845e-08 input = A2 output = AequalsB
4   tpd                 =  2.90845e-08 input = A3 output = AequalsB
5   tpd                 =  2.50111e-08 input = B0 output = AequalsB
6   tpd                 =  2.50111e-08 input = B1 output = AequalsB
7   tpd                 =  2.50111e-08 input = B2 output = AequalsB
8   tpd                 =  2.50111e-08 input = B3 output = AequalsB
```

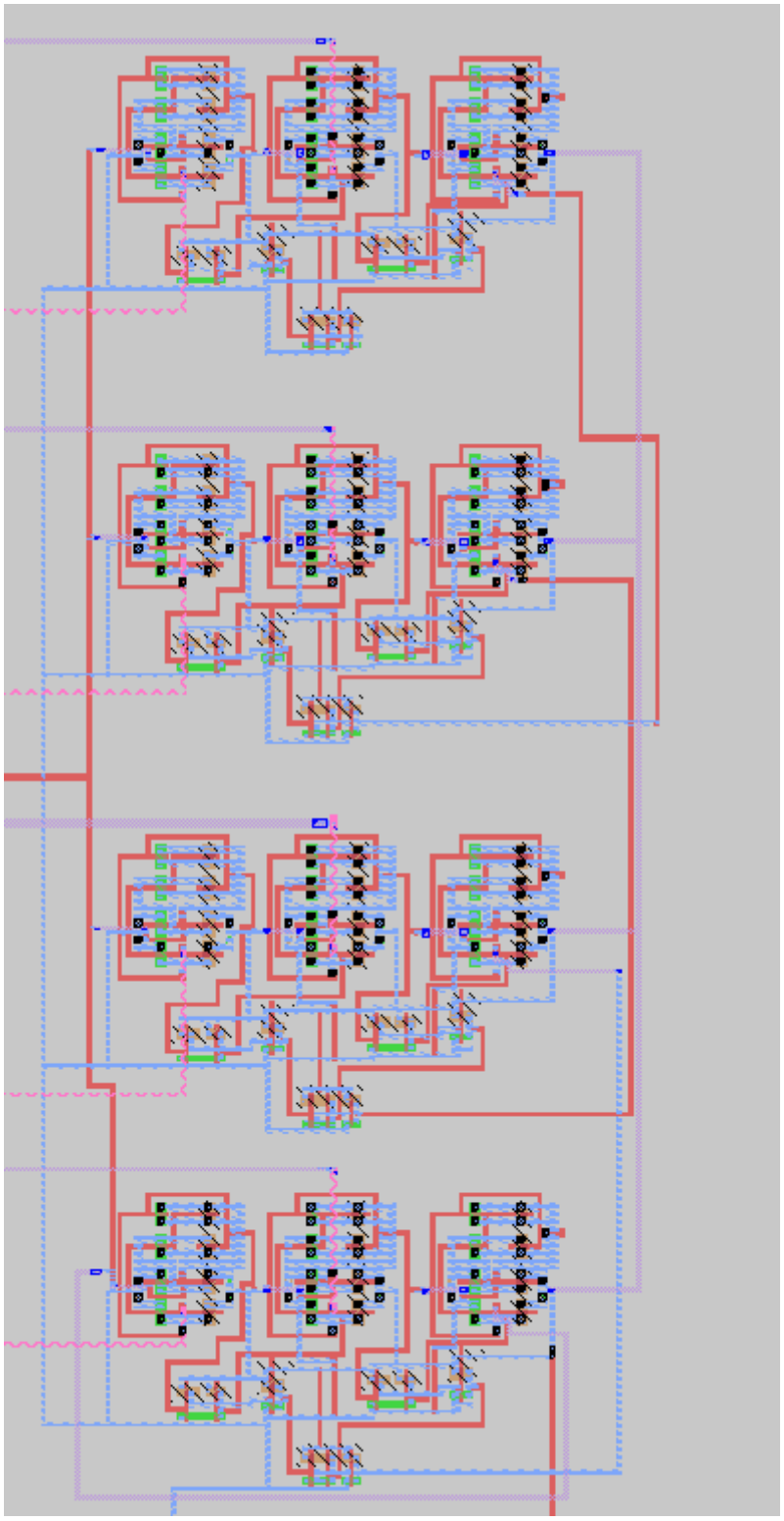
and delays

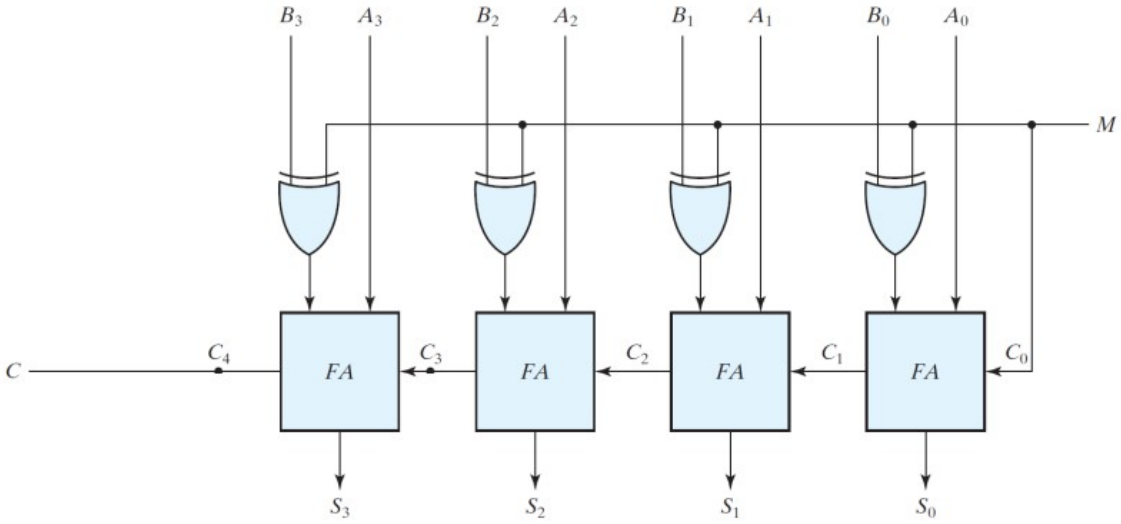
Delay Analysis > delay_and.txt

```
1   tpd                    =  5.93404e-09 input = A0 output = and_oper_out0
2   tpd                    =  5.93496e-09 input = A0 output = and_oper_out1
3   tpd                    =  5.92186e-09 input = A0 output = and_oper_out2
4   tpd                    =  5.90653e-09 input = A0 output = and_oper_out3
5   tpd                    =  5.93404e-09 input = A1 output = and_oper_out0
6   tpd                    =  5.93496e-09 input = A1 output = and_oper_out1
7   tpd                    =  5.92186e-09 input = A1 output = and_oper_out2
8   tpd                    =  5.90653e-09 input = A1 output = and_oper_out3
9   tpd                    =  5.93404e-09 input = A2 output = and_oper_out0
10  tpd                    =  5.93496e-09 input = A2 output = and_oper_out1
11  tpd                    =  5.92186e-09 input = A2 output = and_oper_out2
12  tpd                    =  5.90653e-09 input = A2 output = and_oper_out3
13  tpd                    =  5.93404e-09 input = A3 output = and_oper_out0
14  tpd                    =  5.93496e-09 input = A3 output = and_oper_out1
15  tpd                    =  5.92186e-09 input = A3 output = and_oper_out2
16  tpd                    =  5.90653e-09 input = A3 output = and_oper_out3
17  tpd                    =  5.72707e-09 input = B0 output = and_oper_out0
18  tpd                    =  5.74510e-09 input = B0 output = and_oper_out1
19  tpd                    =  5.72853e-09 input = B0 output = and_oper_out2
20  tpd                    =  5.71699e-09 input = B0 output = and_oper_out3
21  tpd                    =  5.72707e-09 input = B1 output = and_oper_out0
22  tpd                    =  5.74510e-09 input = B1 output = and_oper_out1
23  tpd                    =  5.72853e-09 input = B1 output = and_oper_out2
24  tpd                    =  5.71699e-09 input = B1 output = and_oper_out3
25  tpd                    =  5.72707e-09 input = B2 output = and_oper_out0
26  tpd                    =  5.74510e-09 input = B2 output = and_oper_out1
27  tpd                    =  5.72853e-09 input = B2 output = and_oper_out2
28  tpd                    =  5.71699e-09 input = B2 output = and_oper_out3
29  tpd                    =  5.72707e-09 input = B3 output = and_oper_out0
30  tpd                    =  5.74510e-09 input = B3 output = and_oper_out1
31  tpd                    =  5.72853e-09 input = B3 output = and_oper_out2
32  tpd                    =  5.71699e-09 input = B3 output = and_oper_out3
```

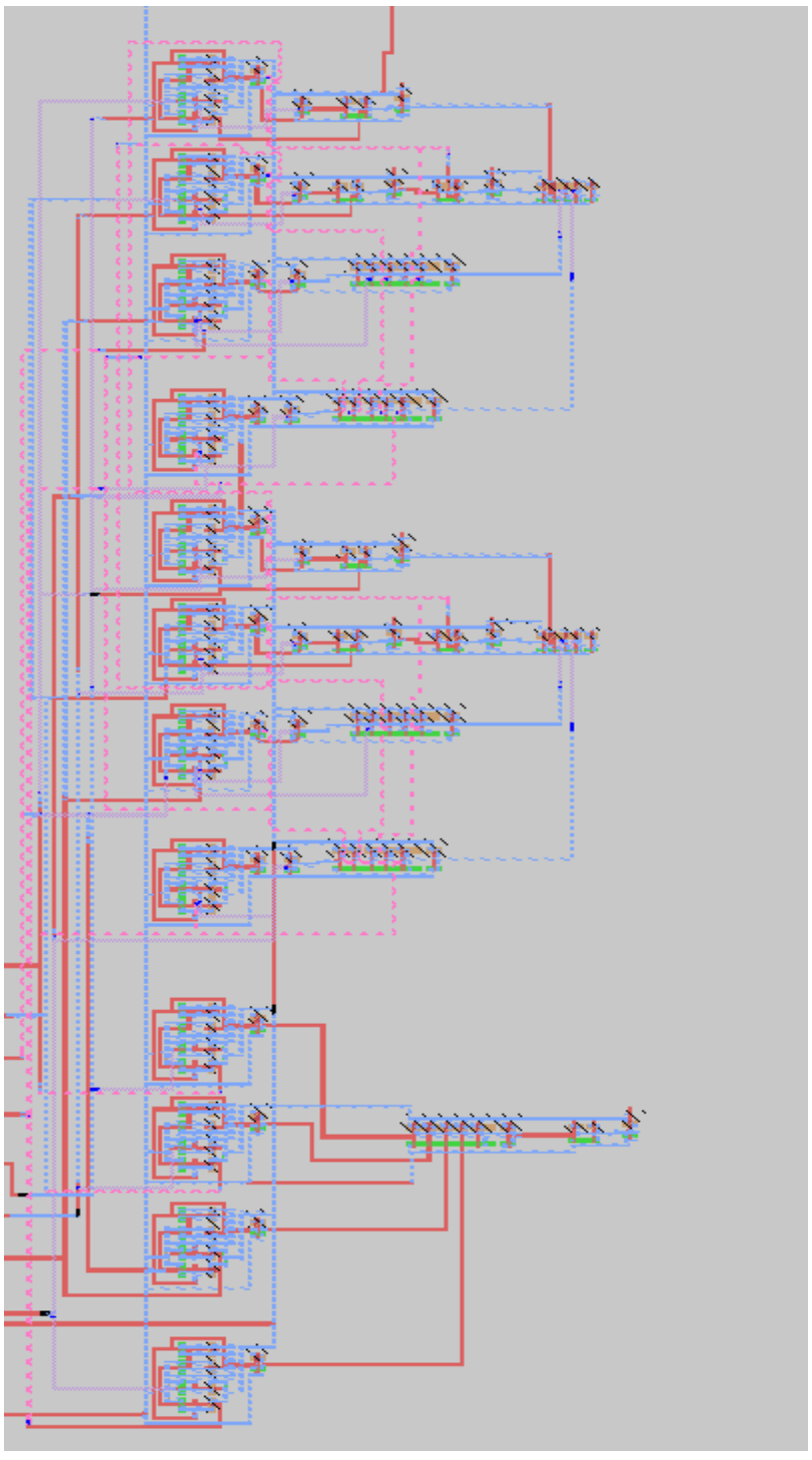
magic :

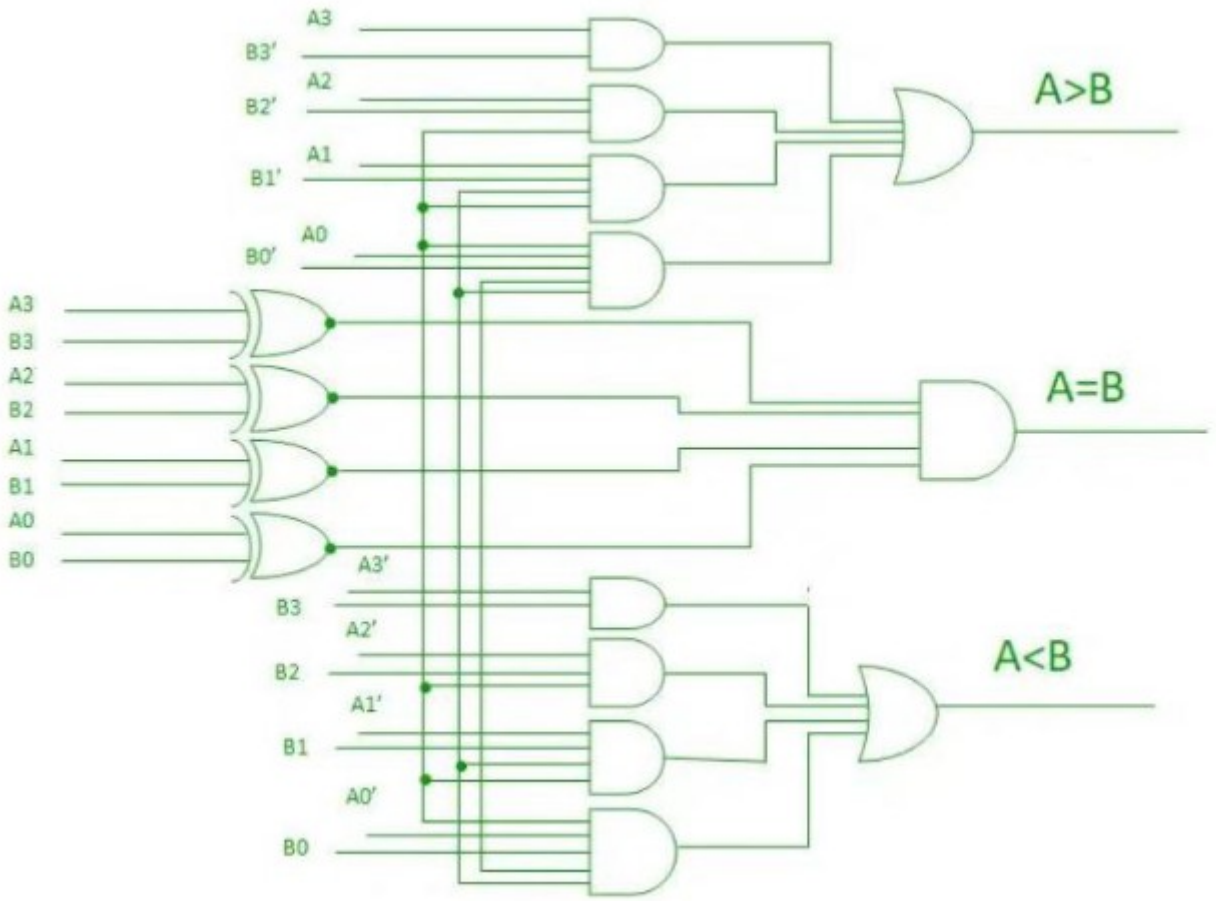
Adder subtractor



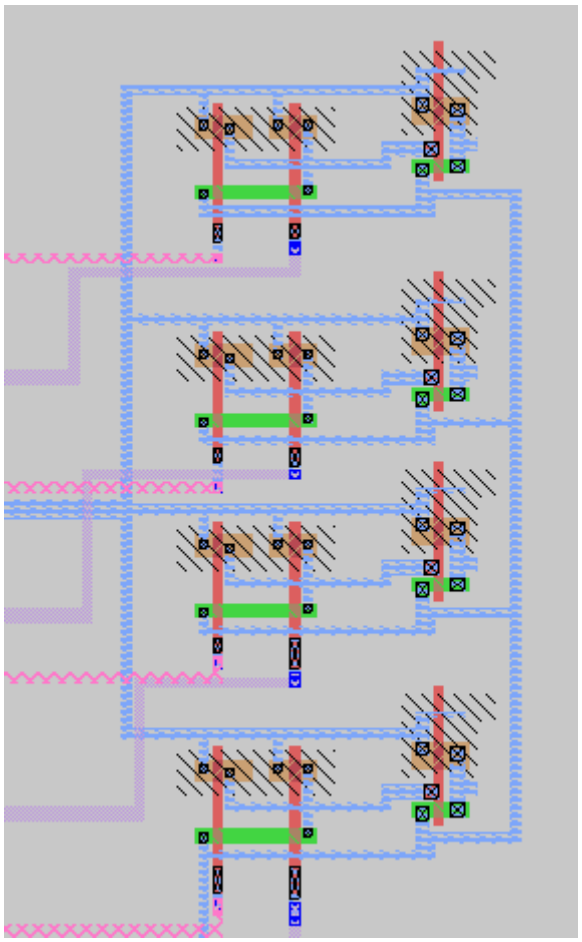


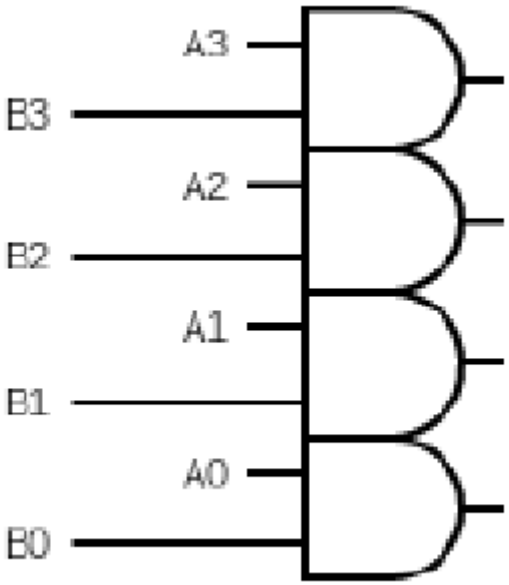
comparator



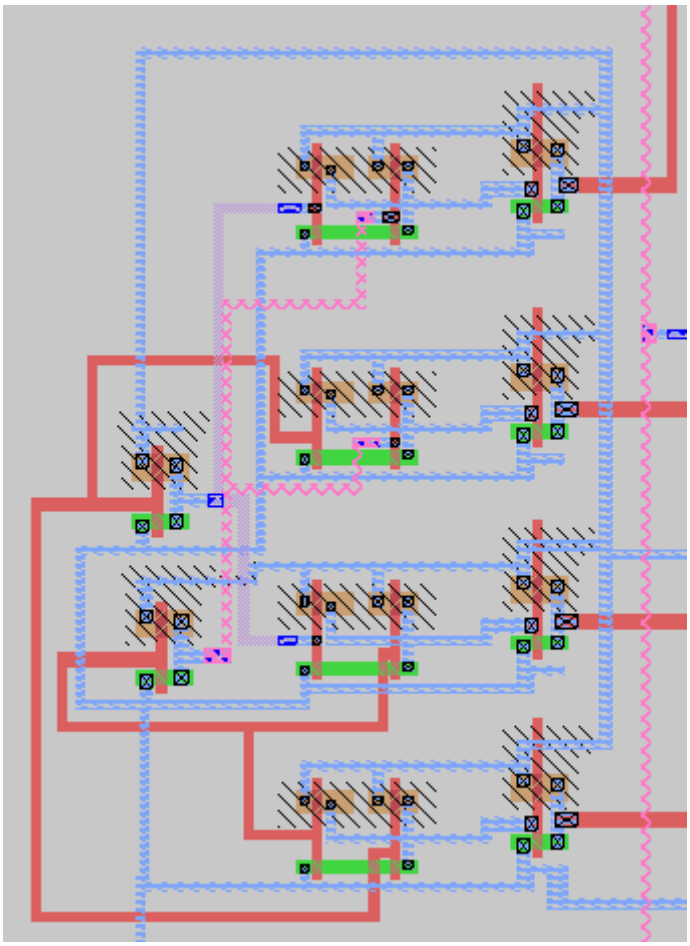

A3
B3'
A2
B2'
A1
B1'
A0
B0'
A>B
A3
B3
A2
B2
A1
B1
A0
B0
A=B
A3'
B3
A2'
B2
A1'
B1
A0'
B0
A<B

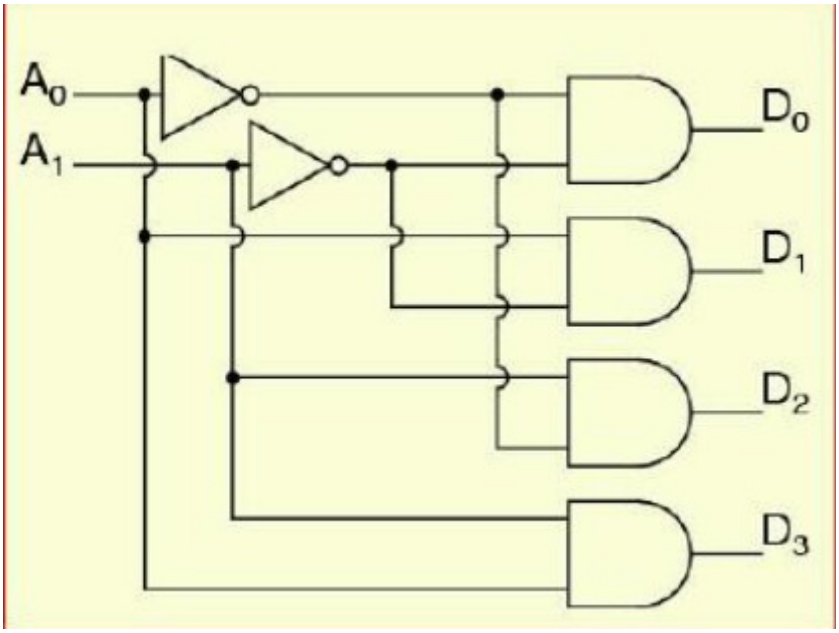
and block:



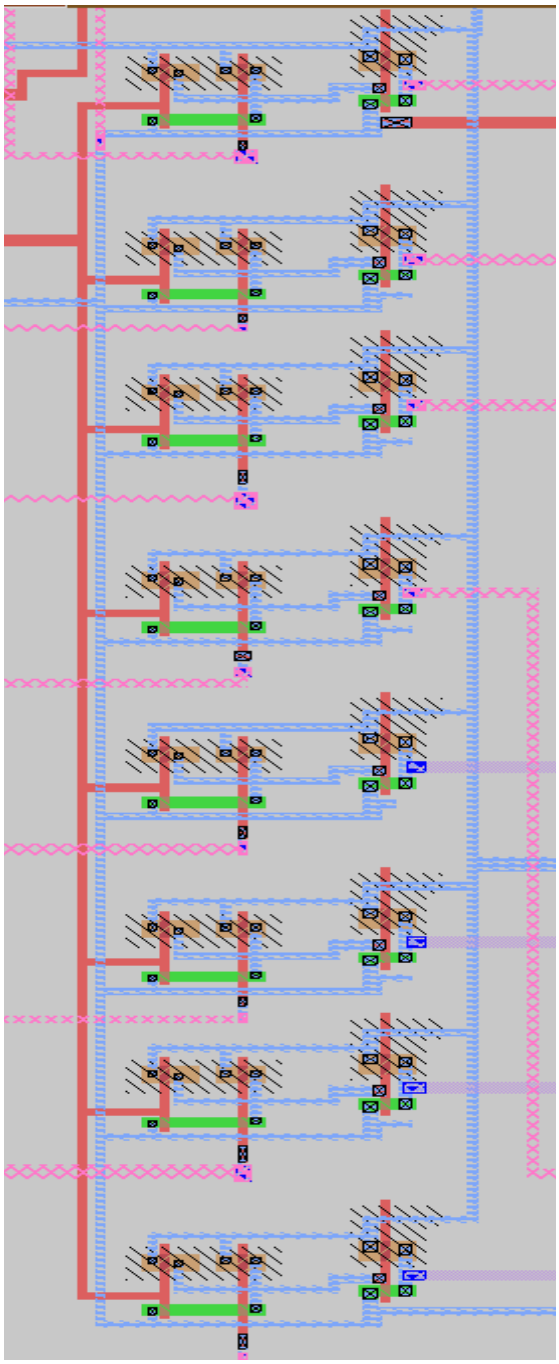


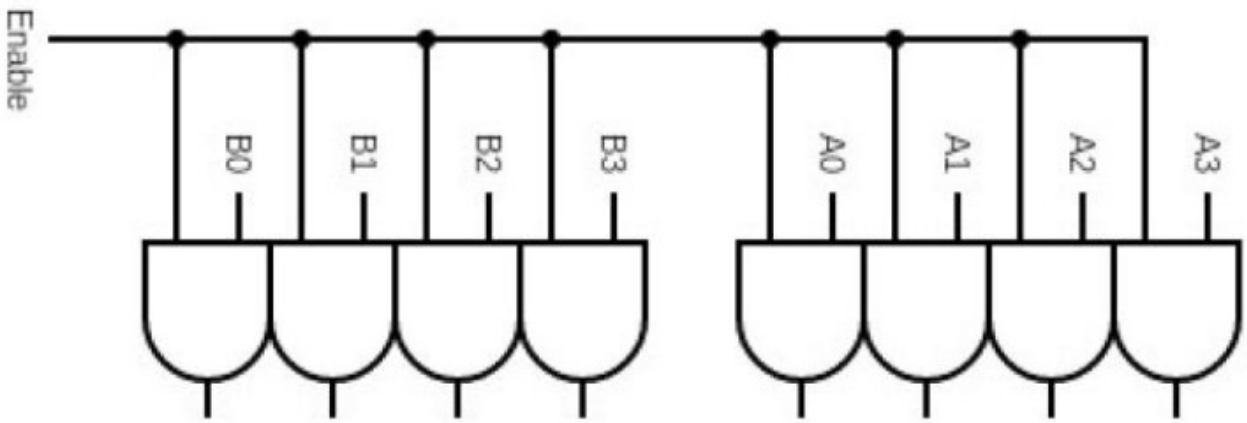
decoder:





one of the enable:





Issues with the magic:

label on my magic doesn’t show up, I have to zoom in completely to see.
There’s a lot of delays and overshoot in my adder subtractor magic

Enable of adder subtractor

-I took D0 and D1 from the decoder and OR’d it
-In my comparator :
even when enable is low for comparator, AequalsB will show high since my inputs then would be a- 0000 and b- 0000.
In order to avoid it, I AND’d the output with D3