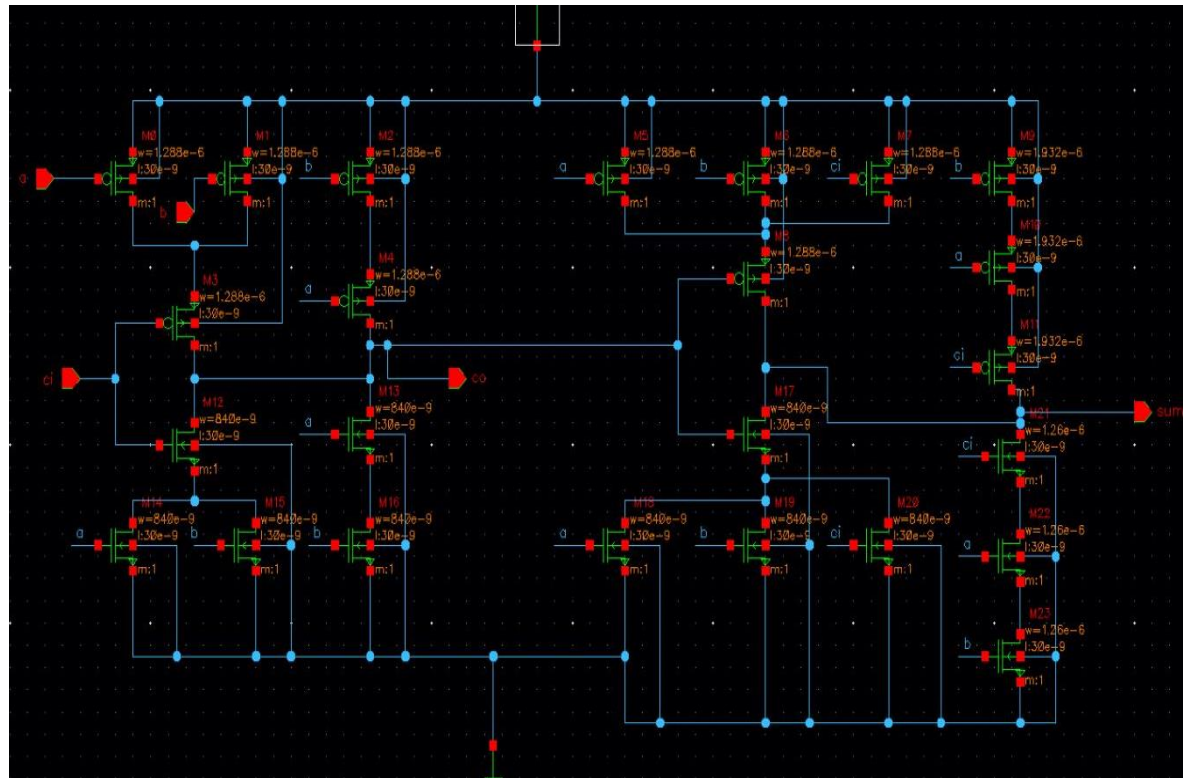


# EEE 591

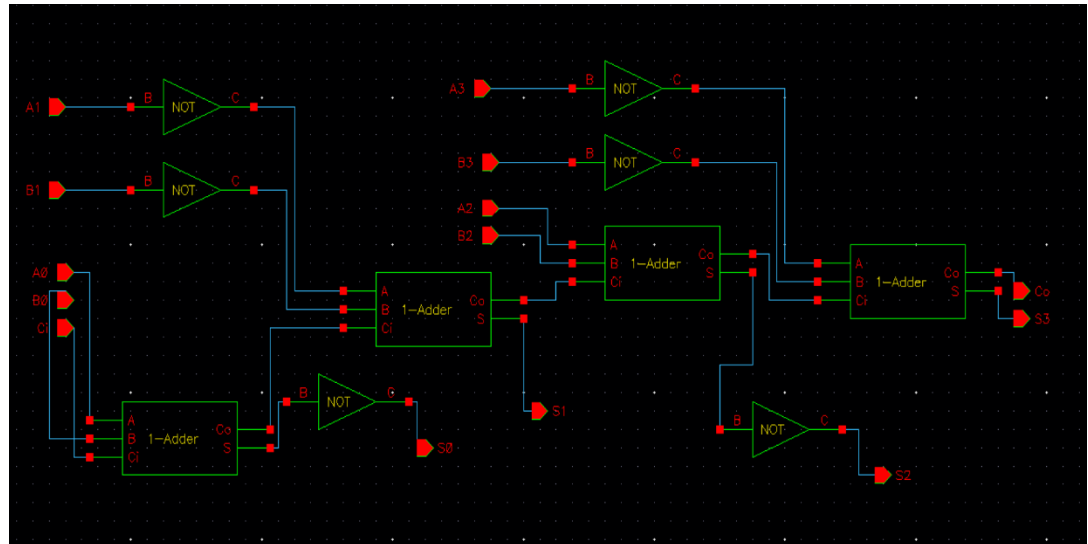
## LAB #04

1. Full adder schematic and sizing
  - a. Explain the sizing criteria used  
Width of NMOS is 420nm  
Width of PMOS as 630nm.
  - b. Provide the sizes (W/L) of all your transistors



TRANSISTORS	TYPE	WIDTHS
M0-M9	pmos	1.288 $\mu$ m
M9-M11	pmos	1.932 $\mu$ m
M12-M20	nmos	840nm
M21-M23	nmos	1.260 $\mu$ m

- c. Provide the schematic of your 4-bit design



- d. Provide any scaling you choose to do for the 4-bit design and justification for the choice  
No scaling is required because met all the requirements.

## 2. Simulation results

- a. Include the worst-case delay plots



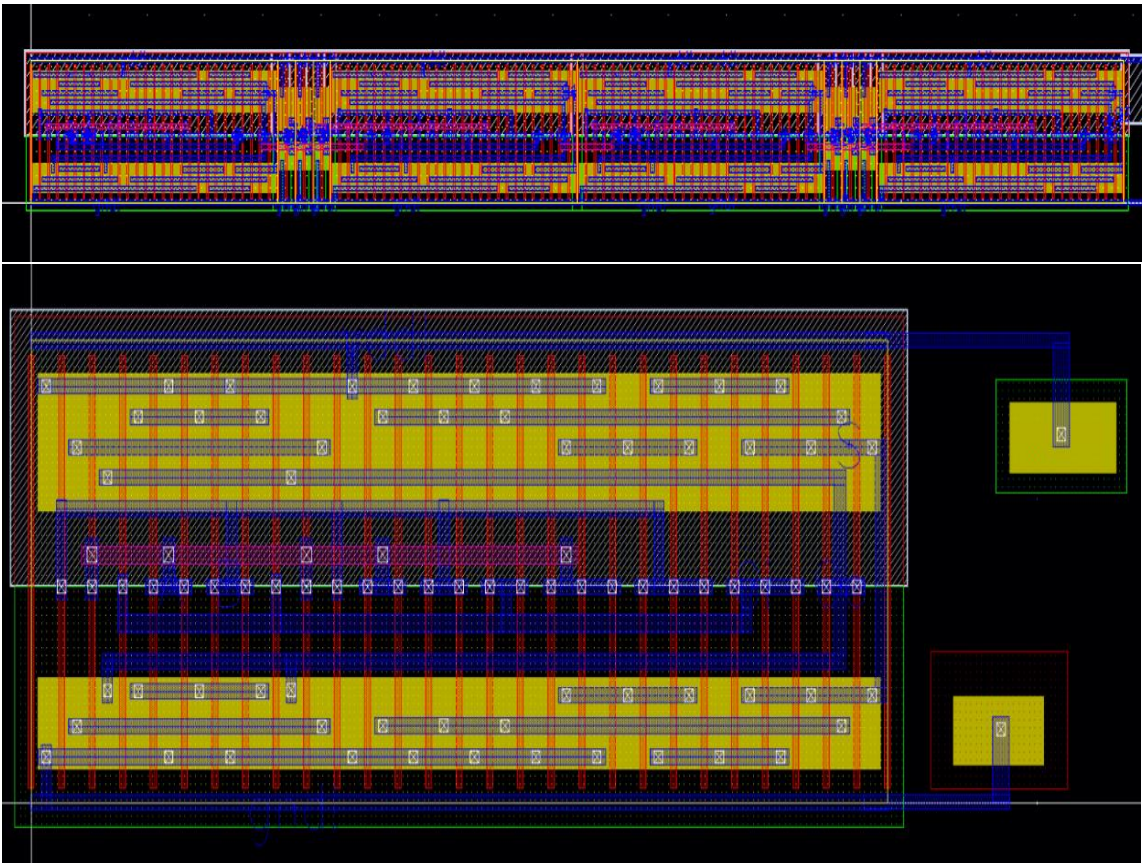
- b. Include the power consumption analysis results

```
$DATA1 SOURCE='HSPICE' VERSION='K-2015.06-2 linux64'
.TITLE '.temp 25'
pow      totcurrent      temper      alter#
7.879e-05 -4.2411e-13      25.00000      1
```

Power consumption = 78.79 micro watts.

## 3. Include confirmation of

- a. Layout & DRC Pass



## LAYOUT ERRORS RESULTS

CLEAN

Model: Intel(R) Xeon(R) E-2136 CPU @ 3.30GHz

### DRC Error Statistics

Library name: 1bitadder.gds0ut  
Structure name: 1bitadder  
Generated by: IC Validator RHEL64 0-2018.06-SPI.4289877 2018/07/23  
Runset name: ../iPDK/icv/drc/saed32nm\_lp9m\_drc\_rules.rs  
User name: cchoudar  
Time started: 2022/11/18 08:52:42PM  
Time ended: 2022/11/18 08:53:07PM

Called as: /usr/local/synopsys/icv\_2018.06-SPI/icvalidator/0-2018.06-SPI/bin/LINUX.64/icv -vue -c 1bitadder -i 1bitadder.gds0ut

## LAYOUT ERRORS RESULTS

CLEAN

Model: Intel(R) Xeon(R) E-2136 CPU @ 3.30GHz

### DRC Error Statistics

Library name: 4bitadder.gdsOut  
Structure name: 4bitadder  
Generated by: IC Validator RHEL64 0-2018.06-SP1.4289877 2018/07/23  
Runset name: ../IPDK/icv/drc/saed32nm\_1p9m\_drc\_rules.rs  
User name: cchoudar  
Time started: 2022/11/18 08:44:39PM  
Time ended: 2022/11/18 08:45:02PM

Called as: /usr/local/synopsys/icv\_2018.06-SP1/icvalidator/0-2018.06-SP1/bin/LINUX.64/icv -vue -c 4bitadder -i 4bitadder.gdsOut

b. Layout & LVS Pass

## TOP BLOCK COMPARE RESULTS

PASS

[1bitadder, 1bitadder]

Model: Intel(R) Xeon(R) E-2136 CPU @ 3.30GHz

### Netlist Extraction Statistics

Library name: 1bitadder.gdsOut  
Structure name: 1bitadder  
Generated by: IC Validator RHEL64 0-2018.06-SP1.4289877 2018/07/23  
Runset name: ../IPDK/icv/lvs/saed32nm\_1p9m\_lvs\_rules.rs  
User name: cchoudar  
Time started: 2022/11/18 07:54:36PM  
Time ended: 2022/11/18 07:55:46PM

Called as: /usr/local/synopsys/icv\_2018.06-SP1/icvalidator/0-2018.06-SP1/bin/LINUX.64/icv -vue -c 1bitadder -i 1bitadder.gdsOut

### Layout vs. Schematic Statistics

Schematic: /afs/asu.edu/users/c/j/h/cchoudar/425\_lab/lvs/1bitadder.sch\_out

LVS Errors:

1 successful equivalencies  
0 failed equivalencies

## TOP BLOCK COMPARE RESULTS

PASS

[4bitadder, 4bitadder]

Model: Intel(R) Xeon(R) E-2136 CPU @ 3.30GHz

### Netlist Extraction Statistics

Library name: 4bitadder.gdsOut  
Structure name: 4bitadder  
Generated by: IC Validator RHEL64 0-2018.06-SP1.4289877 2018/07/23  
Runset name: ../IPDK/icv/lvs/saed32nm\_1p9m\_lvs\_rules.rs  
User name: cchoudar  
Time started: 2022/11/18 08:39:05PM  
Time ended: 2022/11/18 08:39:48PM

Called as: /usr/local/synopsys/icv\_2018.06-SP1/icvalidator/0-2018.06-SP1/bin/LINUX.64/icv -vue -c 4bitadder -i 4bitadder.gdsOut

### Layout vs. Schematic Statistics

Schematic: /afs/asu.edu/users/c/j/h/cchoudar/425\_lab/26656/4bitadder.sch\_out

LVS Errors:

1 successful equivalencies  
0 failed equivalencies

4. Report the total area of your layout

$$\text{Total Area} = 1.52 \times 21.542 \mu\text{m} = 32.743 \mu\text{m}^2$$

5. Report your overall score as outlined in the lab document

$$\text{Score} = (400\text{ps}/\text{Delay}) + (100\mu\text{W}/\text{Power}) + (150 \mu\text{m}^2/\text{Area})$$

$$\text{Score} = (400\text{ps}/80.4\text{ps}) + (100\mu\text{W}/78.79\mu\text{W}) + (150 \mu\text{m}^2/32.743 \mu\text{m}^2)$$

$$\text{Score} = 10.825$$

Name :- Chandra Rohith Choudary.

ASUID:-1226277600

PARAMETERS	VALUE'S
Delay	80.4ps
Power Consumption	78.79 $\mu$ W
Area	32.74 $\mu$ m <sup>2</sup>
Score	10.825