Joseph Nguyen

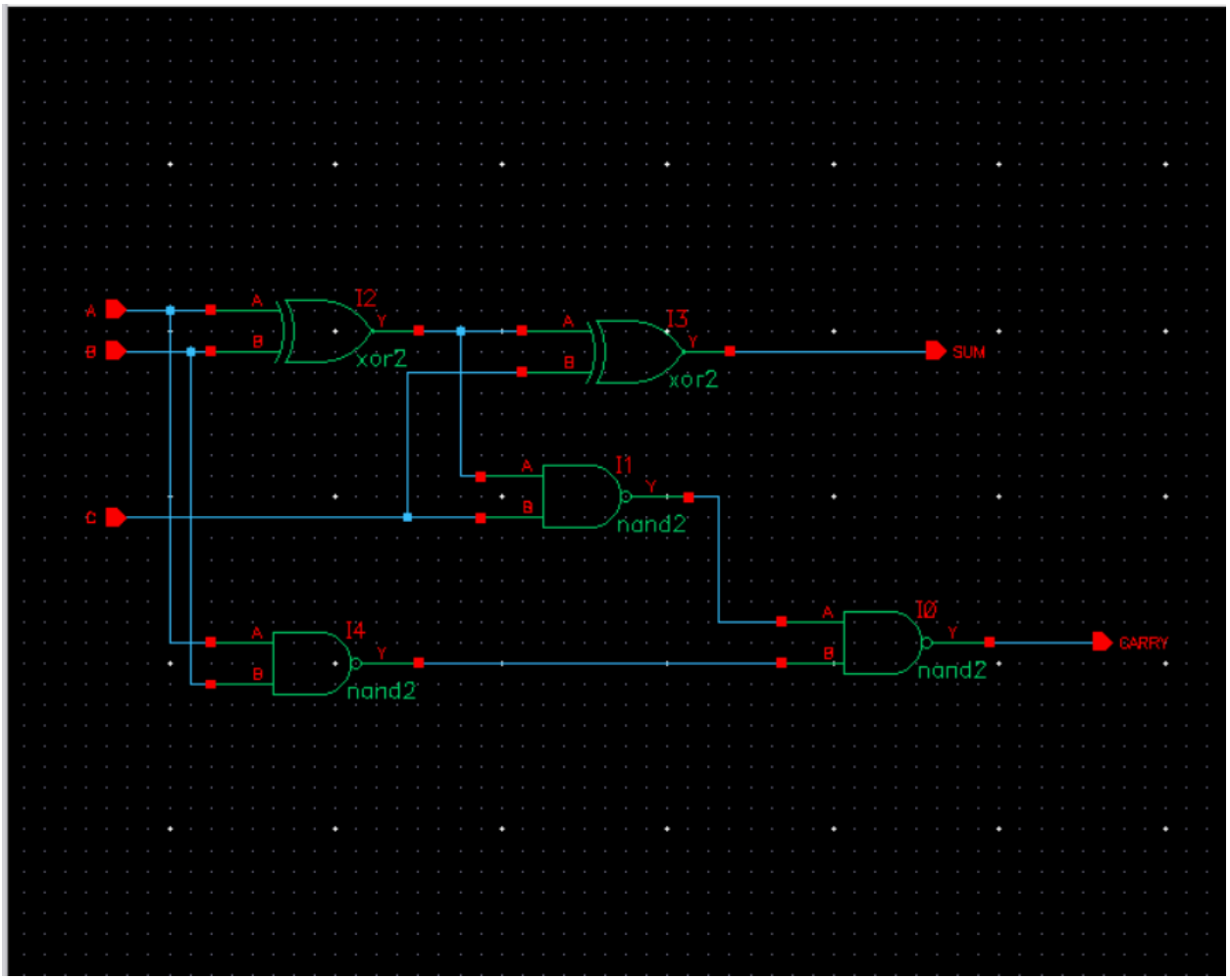
ECEN 454 Section 510

Lab date: 5 September 2024

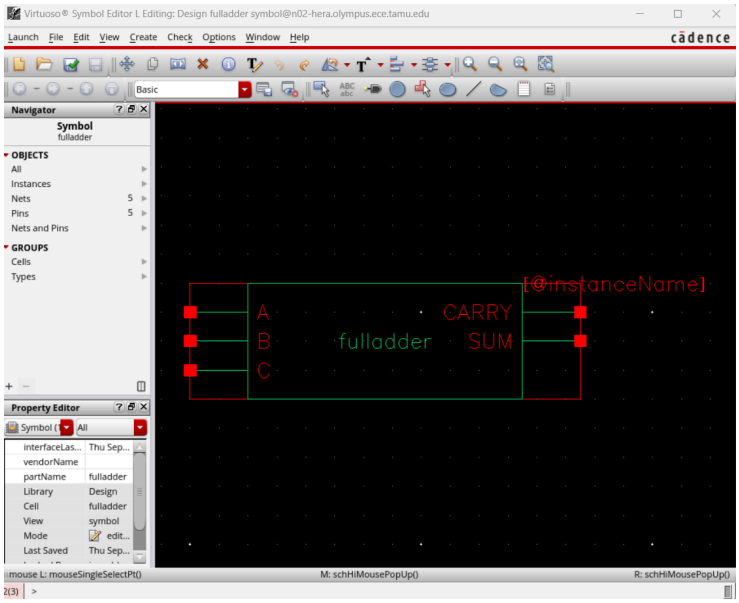
Due date: 14 September 2024

Lab 1: Introduction to Cadence Schematic Design & Simulation

1-bit Full Adder Schematic:



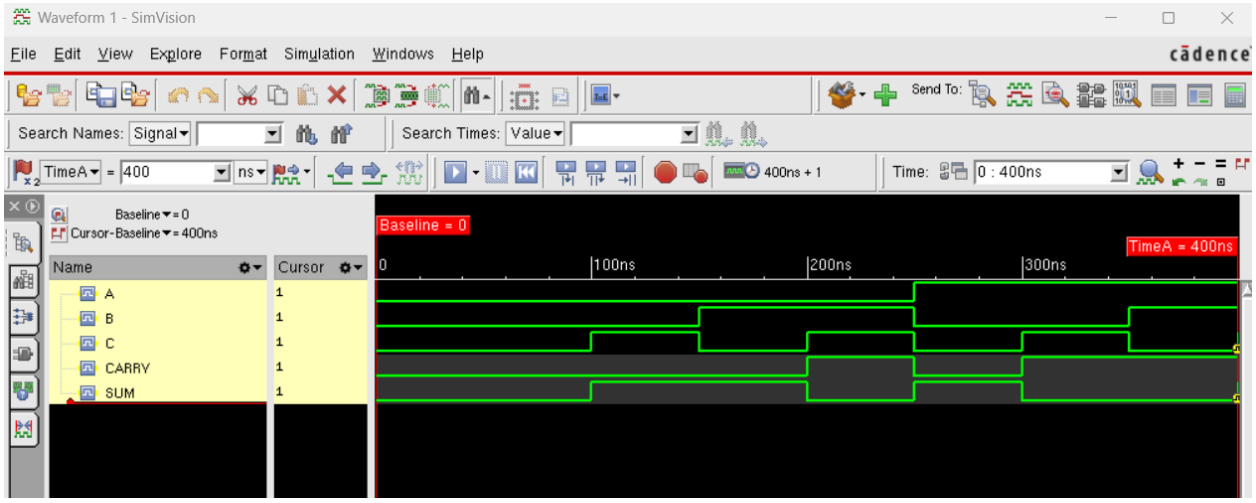
1-bit Full Adder Symbol:



1-bit Full Adder Verilog:

```
// Verilog stimulus file.
// Please do not create a module in this file.


// Default verilog stimulus.

initial
$monitor ($time," A=%b, B=%b, C=%b, SUM=%b, CARRY=%b", A, B, C, SUM, CARRY);


initial
begin

   A = 1'b0;
   B = 1'b0;
   C = 1'b0;

#50 A=1'b0; B=1'b0; C=1'b1;             //ABC=001
#50 A=1'b0; B=1'b1; C=1'b0;             //ABC=010
#50 A=1'b0; B=1'b1; C=1'b1;             //ABC=011
#50 A=1'b1; B=1'b0; C=1'b0;             //ABC=100
#50 A=1'b1; B=1'b0; C=1'b1;             //ABC=101
#50 A=1'b1; B=1'b1; C=1'b0;             //ABC=110
#50 A=1'b1; B=1'b1; C=1'b1;             //ABC=111
end
```

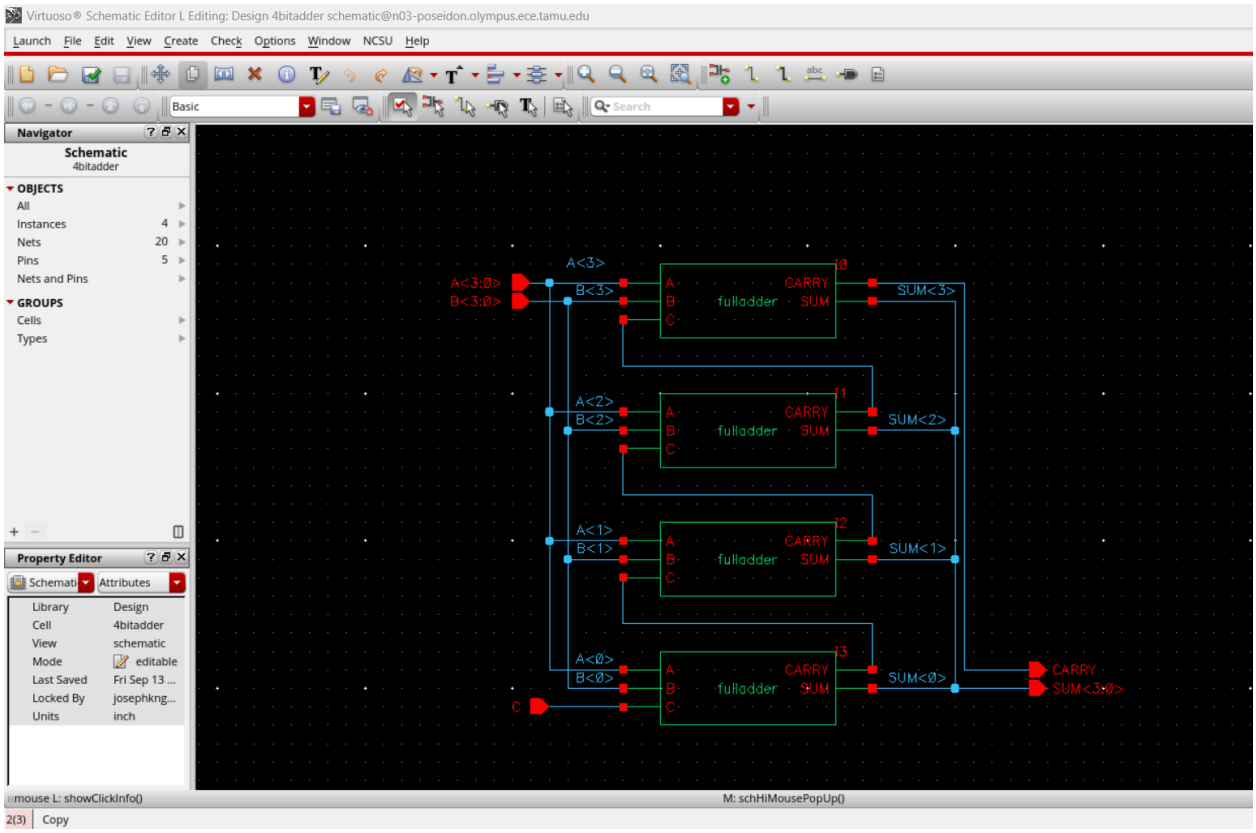
1-bit Full Adder Simulation Waveform:



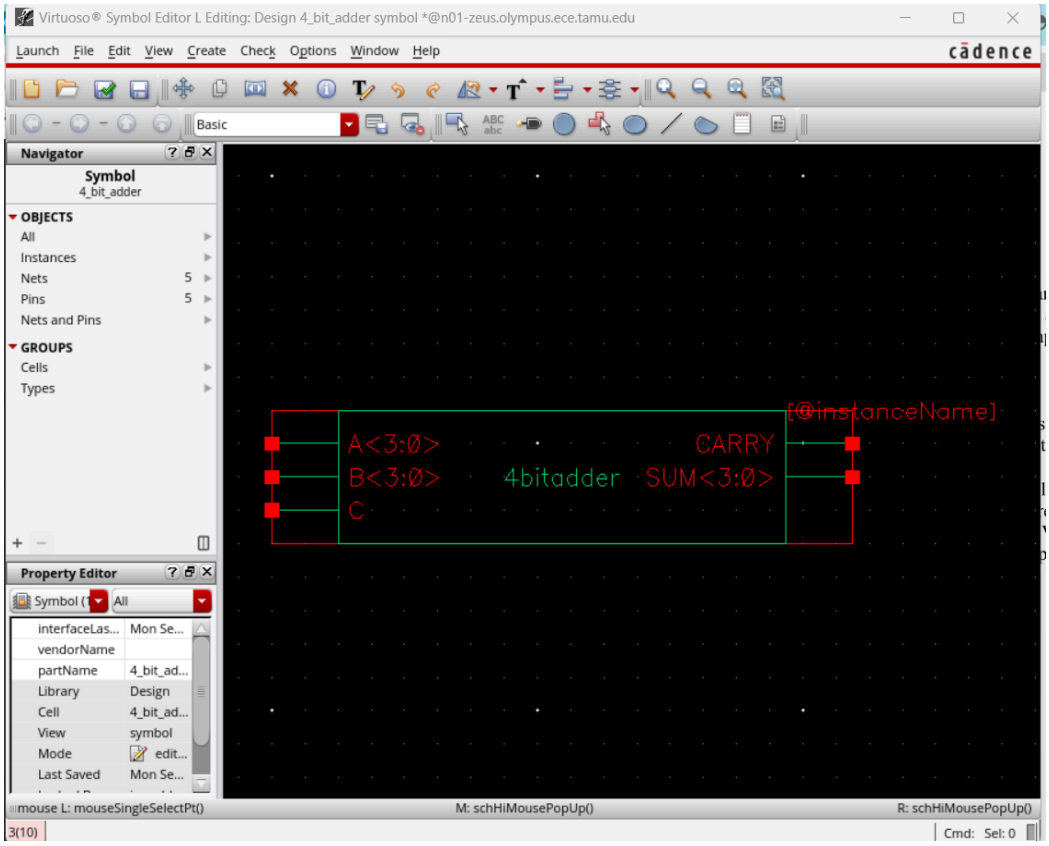
1-bit Full Adder Simout:

```
-------------------------------------
Relinquished control to SimVision...
ncsim>
ncsim> source /opt/coe/cadence/INCISIVE152/tools/inca/files/ncsimrc
ncsim> database -open shmWave -shm -default -into shm.db
Created default SHM database shmWave
ncsim> probe -create -shm test  -all   -depth 1
Created probe 1
ncsim> run
                   0 A=0, B=0, C=0, SUM=0, CARRY=0
                 100 A=0, B=0, C=1, SUM=1, CARRY=0
                 150 A=0, B=1, C=0, SUM=1, CARRY=0
                 200 A=0, B=1, C=1, SUM=0, CARRY=1
                 250 A=1, B=0, C=0, SUM=1, CARRY=0
                 300 A=1, B=0, C=1, SUM=0, CARRY=1
                 350 A=1, B=1, C=0, SUM=0, CARRY=1
                 400 A=1, B=1, C=1, SUM=1, CARRY=1
ncsim> run
ncsim> TOOL:    ncxlmode        15.20-s086: Exiting on Sep 05, 2024
```

4-bit Adder Schematic:



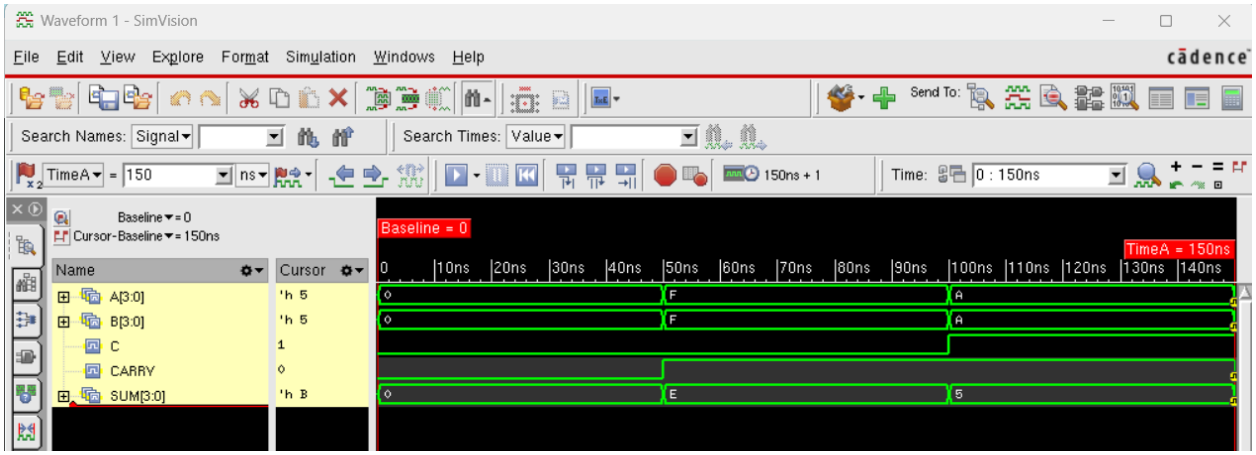
4-bit Adder Symbol:



4-bit Adder Verilog:

```
// Verilog stimulus file.
// Please do not create a module in this file.


// Default verilog stimulus.
initial
$monitor ($time," A=%b, B=%b, C=%b, SUM=%b, CARRY=%b", A, B, C, SUM, CARRY);

initial
begin

   A[3:0] = 4'b0000;

   B[3:0] = 4'b0000;

   C = 1'b0;
#50 A=4'b1111; B=4'b1111; C=1'b0;              //ABC=111111110
#50 A=4'b1010; B=4'b1010; C=1'b1;              //ABC=101010101
#50 A=4'b0101; B=4'b0101; C=1'b1;              //ABC=010101010
end

initial
$monitor ($time," A=%b, B=%b, C=%b, SUM=%b, CARRY=%b", A, B, C, SUM, CARRY);
initial
$monitor ($time," A=%b, B=%b, C=%b, SUM=%b, CARRY=%b", A, B, C, SUM, CARRY);
initial
$monitor ($time," A=%b, B=%b, C=%b, SUM=%b, CARRY=%b", A, B, C, SUM, CARRY);
```

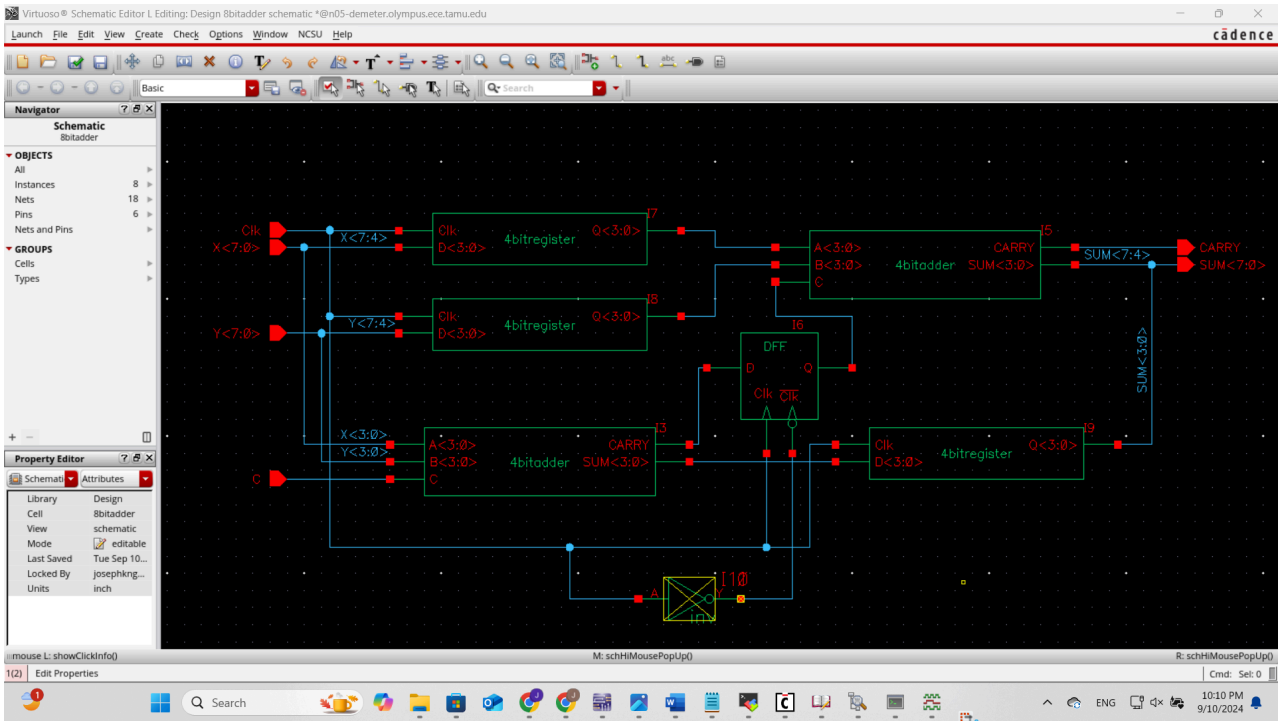
4-bit Adder Simulation Waveform:



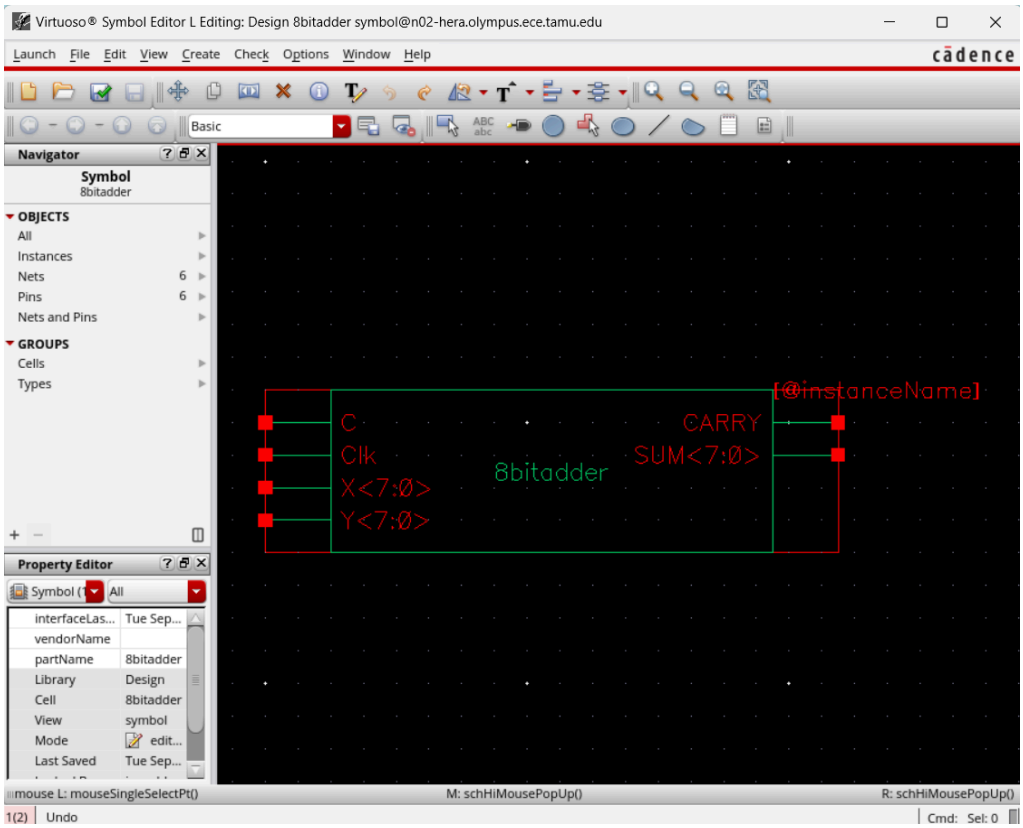
4-bit Adder Simout:

```
Relinquished control to SimVision...
ncsim>
ncsim> source /opt/coe/cadence/INCISIVE152/tools/inca/files/ncsimrc
ncsim> database -open shmWave -shm -default -into shm.db
Created default SHM database shmWave
ncsim> probe -create -shm test  -all   -depth 1
Created probe 1
ncsim> run
                   0 A=0000, B=0000, C=0, SUM=0000, CARRY=0
                  50 A=1111, B=1111, C=0, SUM=1110, CARRY=1
                 100 A=1010, B=1010, C=1, SUM=0101, CARRY=1
                 150 A=0101, B=0101, C=1, SUM=1011, CARRY=0
ncsim>
```

8-bit Adder Schematic:



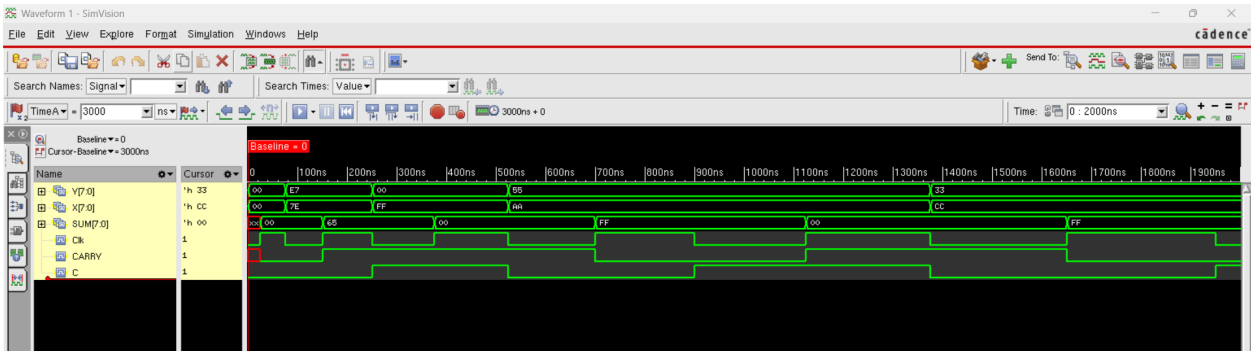
8-bit Adder Symbol:

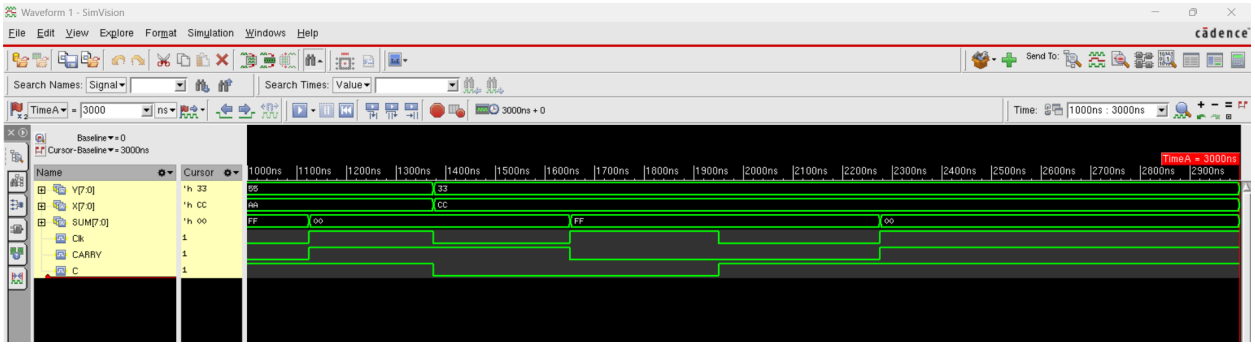


8-bit Adder Verilog:

```
// Verilog stimulus file.
// Please do not create a module in this file.


// Default verilog stimulus.

initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);

initial
begin

   C = 1'b0;
   Clk = 1'b0;
   X[7:0] = 8'b00000000;

   Y[7:0] = 8'b00000000;

#25 Clk=1'b1; X=8'b00000000; Y=8'b00000000; C=1'b0;
#50 Clk=1'b0; X=8'b01111110; Y=8'b11100111; C=1'b0;

#75 Clk=1'b1; X=8'b01111110; Y=8'b11100111; C=1'b0;
#100 Clk=1'b0; X=8'b11111111; Y=8'b00000000; C=1'b1;

#125 Clk=1'b1; X=8'b11111111; Y=8'b00000000; C=1'b1;
#150 Clk=1'b0; X=8'b10101010; Y=8'b01010101; C=1'b0;

#175 Clk=1'b1; X=8'b10101010; Y=8'b01010101; C=1'b0;
#200 Clk=1'b0; X=8'b10101010; Y=8'b01010101; C=1'b1;

#225 Clk=1'b1; X=8'b10101010; Y=8'b01010101; C=1'b1;
#250 Clk=1'b0; X=8'b11001100; Y=8'b00110011; C=1'b0;

#275 Clk=1'b1; X=8'b11001100; Y=8'b00110011; C=1'b0;
#300 Clk=1'b0; X=8'b11001100; Y=8'b00110011; C=1'b1;

#325 Clk=1'b1; X=8'b11001100; Y=8'b00110011; C=1'b1;
#350 Clk=1'b1; X=8'b11001100; Y=8'b00110011; C=1'b1;

#375 $finish;
end

initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
initial
$monitor ($time," X=%b, Y=%b, C=%b, SUM=%b, CARRY=%b", X, Y, C, SUM, CARRY);
```

8-bit Adder Simulation Waveforms:





8-bit Adder Simout:

```
Relinquished control to SimVision...
ncsim>
ncsim> source /opt/coe/cadence/INCISIVE152/tools/inca/files/ncsimrc
ncsim> database -open shmWave -shm -default -into shm.db
Created default SHM database shmWave
ncsim> probe -create -shm test  -all   -depth 1
Created probe 1
ncsim> run
                   0 X=00000000, Y=00000000, C=0, SUM=xxxxxxxx, CARRY=x
                  25 X=00000000, Y=00000000, C=0, SUM=00000000, CARRY=0
                  75 X=01111110, Y=11100111, C=0, SUM=00000000, CARRY=0
                 150 X=01111110, Y=11100111, C=0, SUM=01100101, CARRY=1
                 250 X=11111111, Y=00000000, C=1, SUM=01100101, CARRY=1
                 375 X=11111111, Y=00000000, C=1, SUM=00000000, CARRY=1
                 525 X=10101010, Y=01010101, C=0, SUM=00000000, CARRY=1
                 700 X=10101010, Y=01010101, C=0, SUM=11111111, CARRY=0
                 900 X=10101010, Y=01010101, C=1, SUM=11111111, CARRY=0
                1125 X=10101010, Y=01010101, C=1, SUM=00000000, CARRY=1
                1375 X=11001100, Y=00110011, C=0, SUM=00000000, CARRY=1
                1650 X=11001100, Y=00110011, C=0, SUM=11111111, CARRY=0
                1950 X=11001100, Y=00110011, C=1, SUM=11111111, CARRY=0
                2275 X=11001100, Y=00110011, C=1, SUM=00000000, CARRY=1
Simulation complete via $finish(1) at time 3 US + 0
./testfixture.verilog:41 #375 $finish;
ncsim>
```