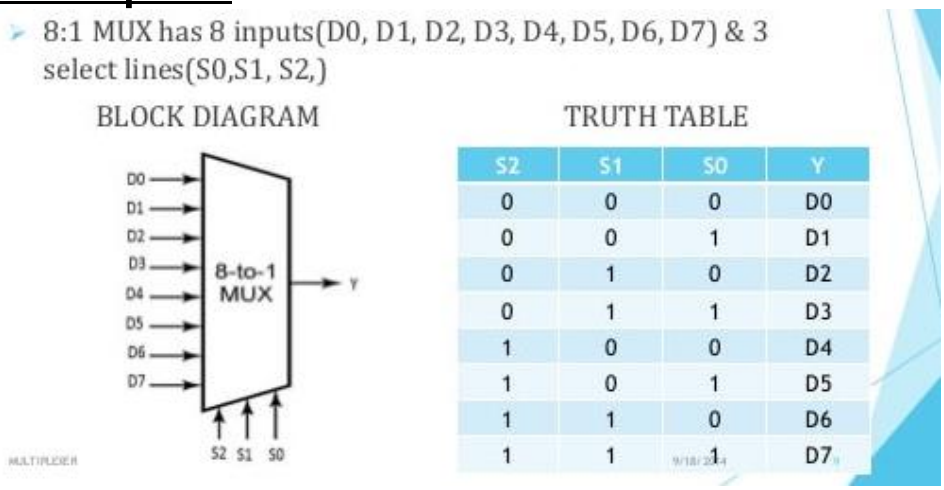
Digital Systems Lab Assignment-2(B)

Name: Pranav Sutar

Roll no. - CS20B029

- **OBJECTIVES:**
  1) To learn to apply 8x1 MUX
  2) To build a signed adder and subtractor in a single circuit for any n-bits number
  3) Building an Unsigned Comparator and generalizing it for a pair of N bit numbers
  4) To build an N-bit unsigned multiplier.
  5) To build a signed multiplier and unsigned multiplier in a single circuit and extend it to N bits
  6) To build a circuit that accepts three inputs of N bits and performs addition and multiplication sequentially on them.
  7) To learn to call one module in another module

- **Description**



Mux is a device That has 2^n input Lines. But Only One has Output Line. Where n= number of input selector line. Mux is A device which is used to Convert Multiple Input line into one Output Line. At a time only one Input Line will Connect to the output line.

An 8X1 mux accepts 8 inputs and using 3 select lines, it selects 1 input and passes it to the output. In our circuit, we are using 8X1 MUX to select the correct operation we need to perform on the Numbers.

Importance of MUX:

1. Mux makes the transmission circuit economical and less complex.

2. Analog switching current is low of order 10mA-20mA. Due to such a low magnitude of the current, the heat dissipation is very low.
3. The ability of Mux to switch digital signals can be extended to switch to a video signal, audio signals etc.

Applications of MUX:

MUX is implemented in various domains where there is a necessity of transmitting a large amount of data with the use of single line.

1. Communication system: A Mux is implemented in communication system to increase efficiency. Using a single transmission line, various types of data (audio, video, etc.) are transmitted at same instant.
2. Computer Memory: In a computer, the huge quantity of memory is implemented by means of the Mux. It also has an Advantage of a reduction in the number of copper lines which are used for the connectionof memory toother parts of computer

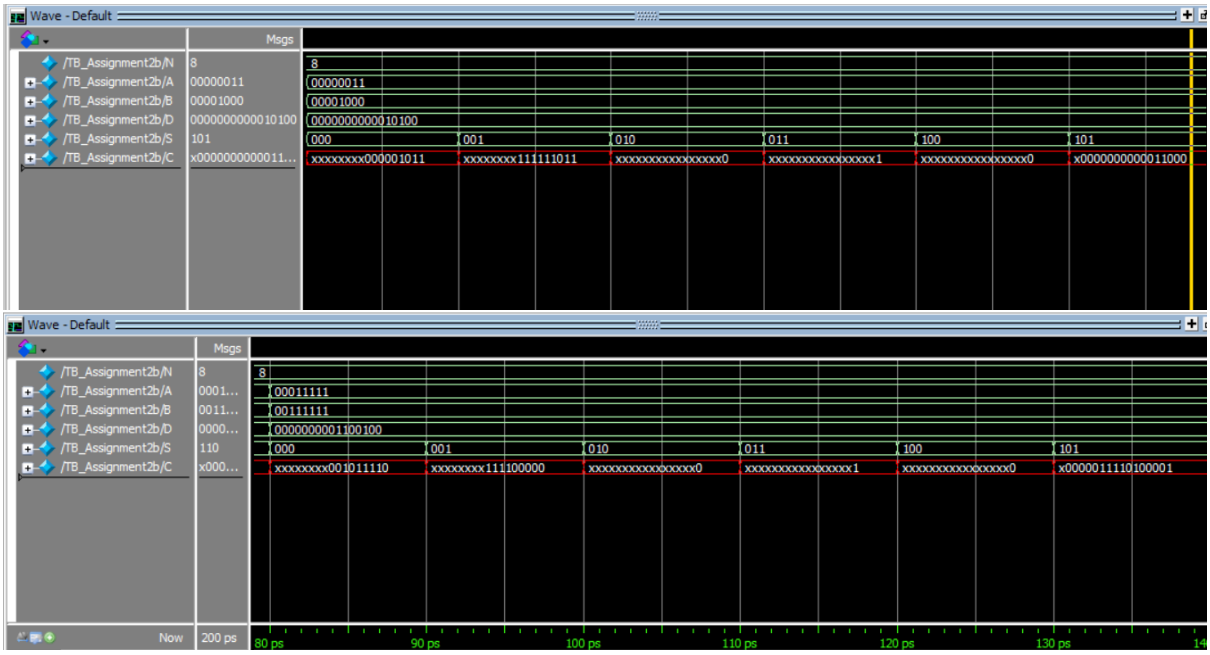
- ## Procedure

  The following modules are used in the main module to implement the circuit.

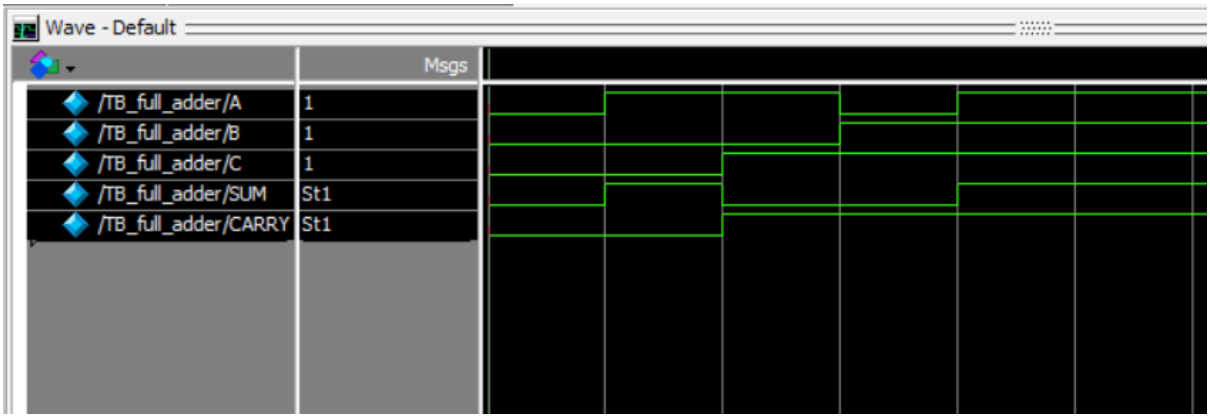
  - half_adder – It adds 2 bits and gives output in sum and carry form.
  - full_adder – It extends the above operation for three bits.
  - Nbit_add_sub – Adds the numbers when k = 0, and subtracts them when k = 0. The numbers are signed binary numbers.
  - comparator - It tells whether the bit is greater than or lesser than or equal to another bit
  - Nbit_comparator - It extends the above concept to N bits
  - signed_multiplier – It multiplies two numbers of different size and and gives the corresponding output. It can perform signed as well as unsigned multiplication. Baugh-Wooley method is used to do signed multiplication
  - MAC_signed – It peforms C = A.B+D operation, where all are in bit inputs in signed form.
  - Assignment2b – Main module that includes MUX and all other required modules.

- **Result:**

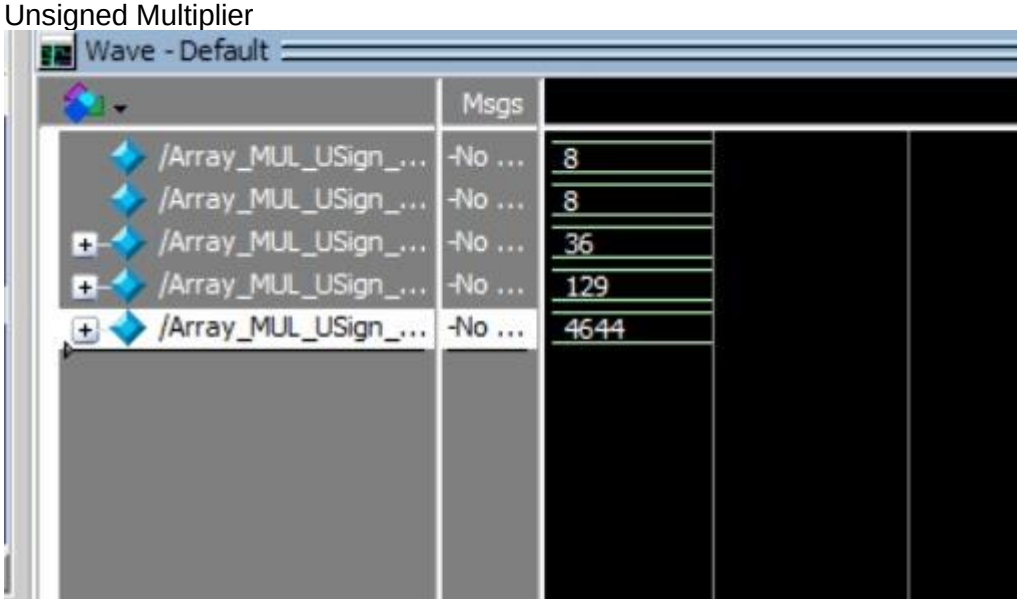
Final Test Module:



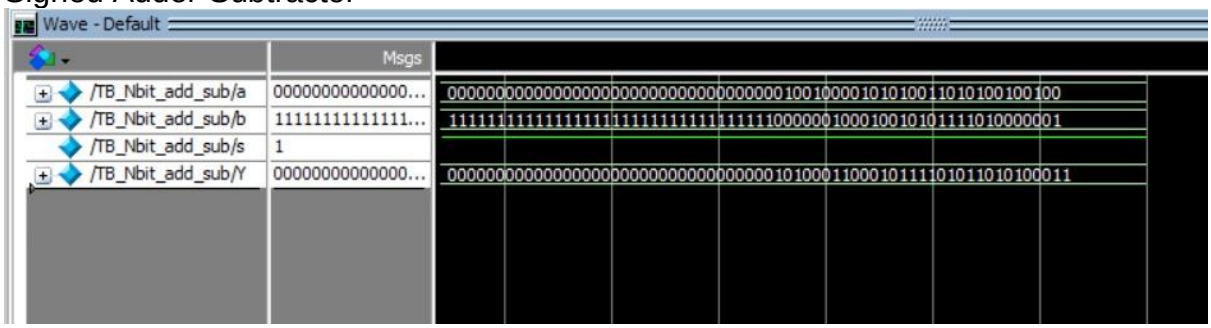
FULL Adder



Unsigned Multiplier



Signed Adder-Subtractor



Comparators