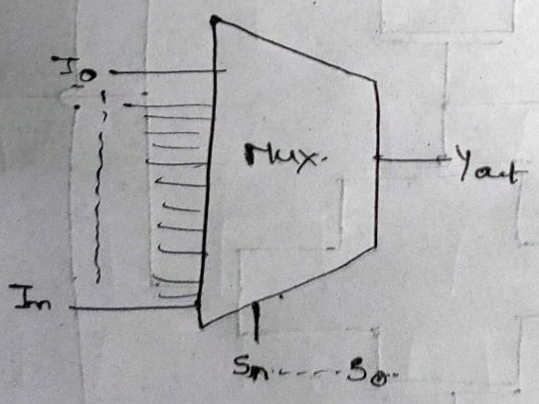
→ **AIM** :- Designing of 4X1 Multiplexer using CMOS Technology in Cadence Virtuoso.

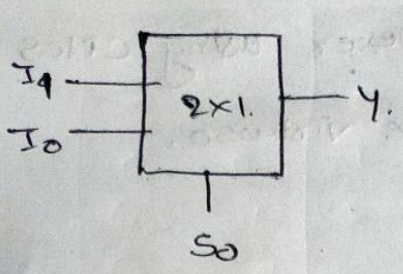
→ **Introduction** :-

A Multiplexer is a Combinational circuit that has 2^n input lines and single output line. Simply, the Multiplexer is a Multi-input and single-output Combinational circuit. The binary information is received from the input lines. On the basis of the values of the selection lines, one of these data inputs will be Connected to the output.

Unlike encoder & decoder, there are n selection lines and 2^n input lines. So, there is a total of 2^N possible combinations of inputs. A multiplexer is also treated as Mux.



→ 2×1 Multiplexer

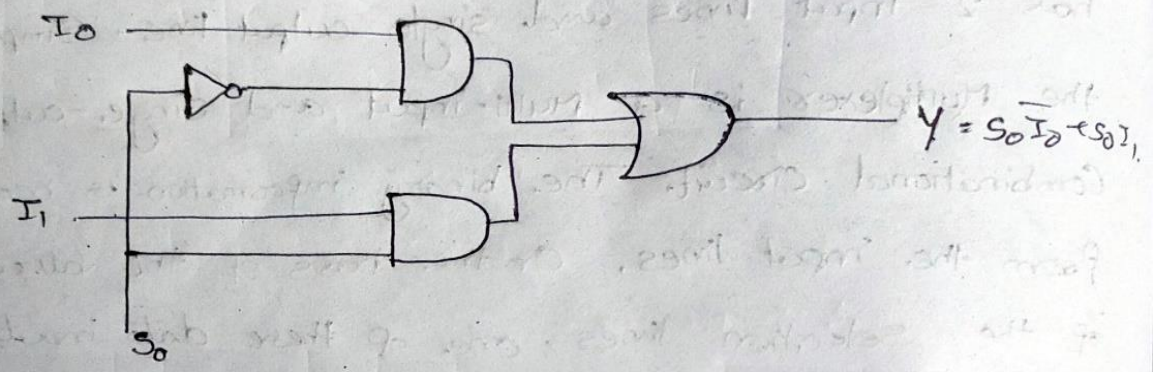


Logic Table

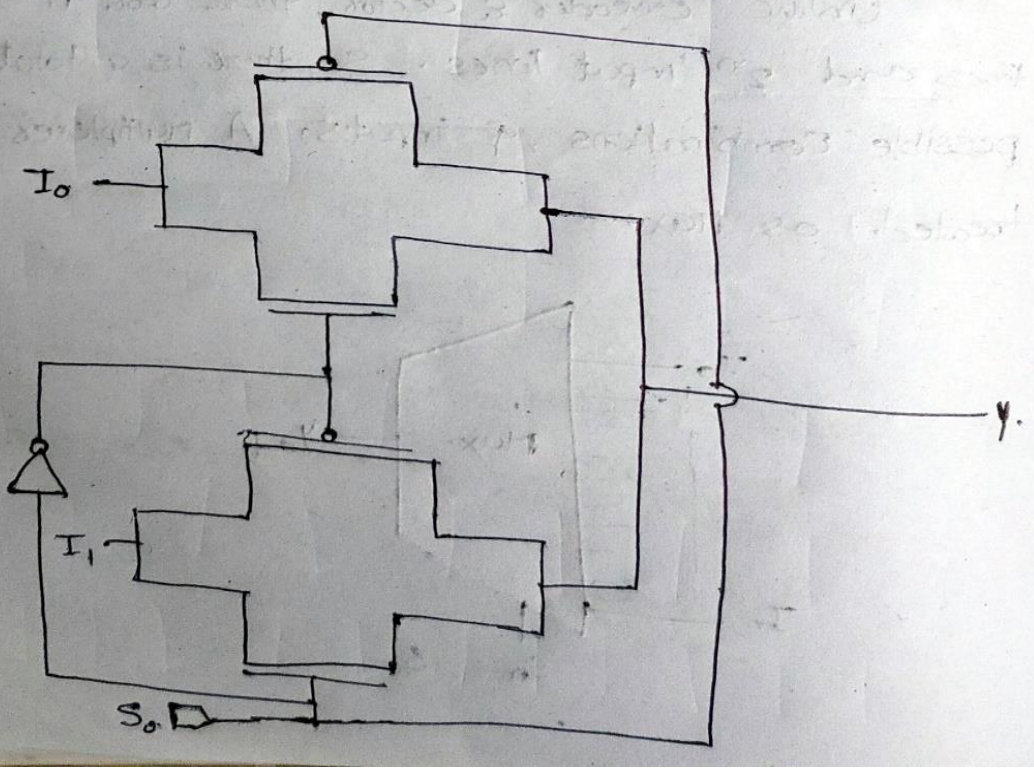
S_0	Y
0	I_0
1	I_1

Expression = $Y = S_0\bar{I}_0 + S_0 I_1$

2×1 using basic Gates :-



2×1 using CMOS :-



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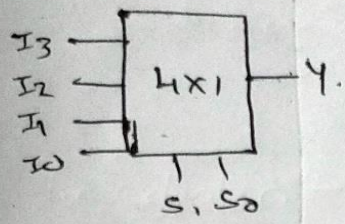
→ Implementation of 4X1 :

4X1 MUX.

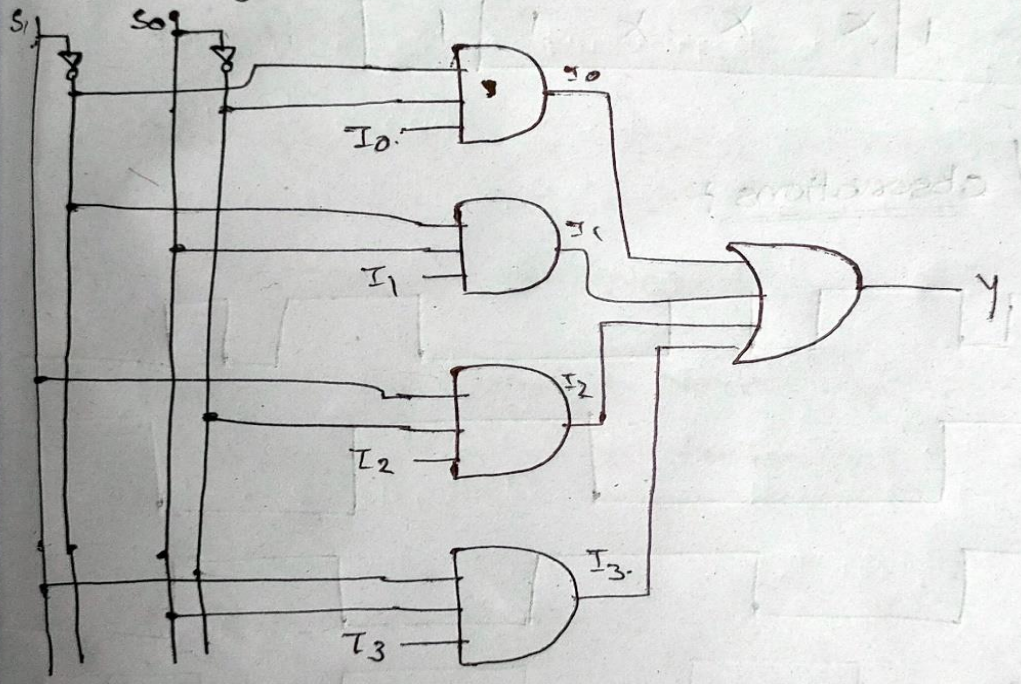


Logic Table.

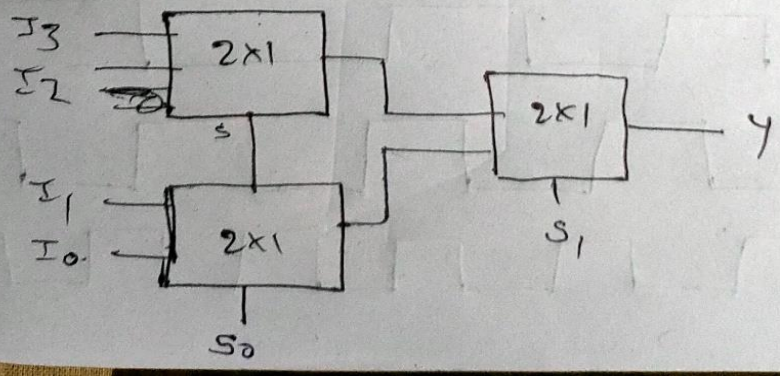
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

$$Y = S_1'S_0'I_0 + S_1'S_0I_2 + S_1S_0'I_2 + S_1S_0I_3$$

4X1 using Basic Gates :



4X1 using 2X1 Mux :



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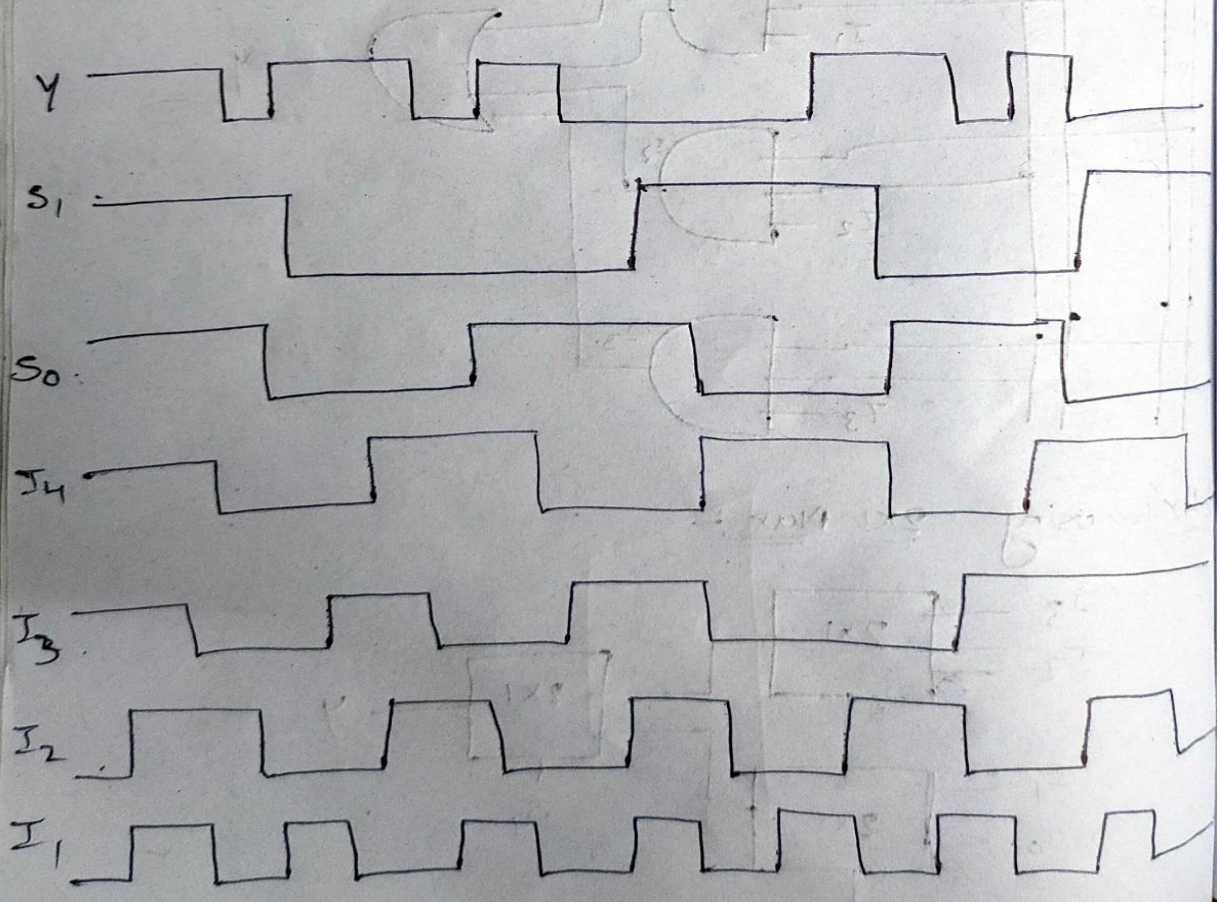
→ Characteristic Equation Table.

S_1	S_0	I_0	I_1	I_2	I_3	Y
0	0	0	x	x	x	0
0	0	1	x	x	x	1
0	1	x	0	x	x	0
0	1	x	1	x	x	1
1	0	x	x	0	x	0
1	0	x	x	1	x	1
1	1	x	x	x	0	0
1	1	x	x	x	1	1

Results / observations :-



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→ Learning Outcomes :-

* We have learned about the Implementation of Multiplexers using CMOS Technology.
* working & Functionalities of Multiplexers.
* Designing of multiplexers in various types like using Basic gates, using CMOS, & from one MUX to another multiplexer.
* Logic tables & Expressions of Multiplexers.
* Wave forms of the various multiplexers.

→ Applications of Multiplexers :-

* Multiplexers are used in various applications where multiple data need to be transmitted by using a single line.
* Communication Systems.
* Computer Memory & Telephone Networks.
* Transmission from the Computer System of a Satellite.

Schematics from cadence virtuoso

2*1 mux

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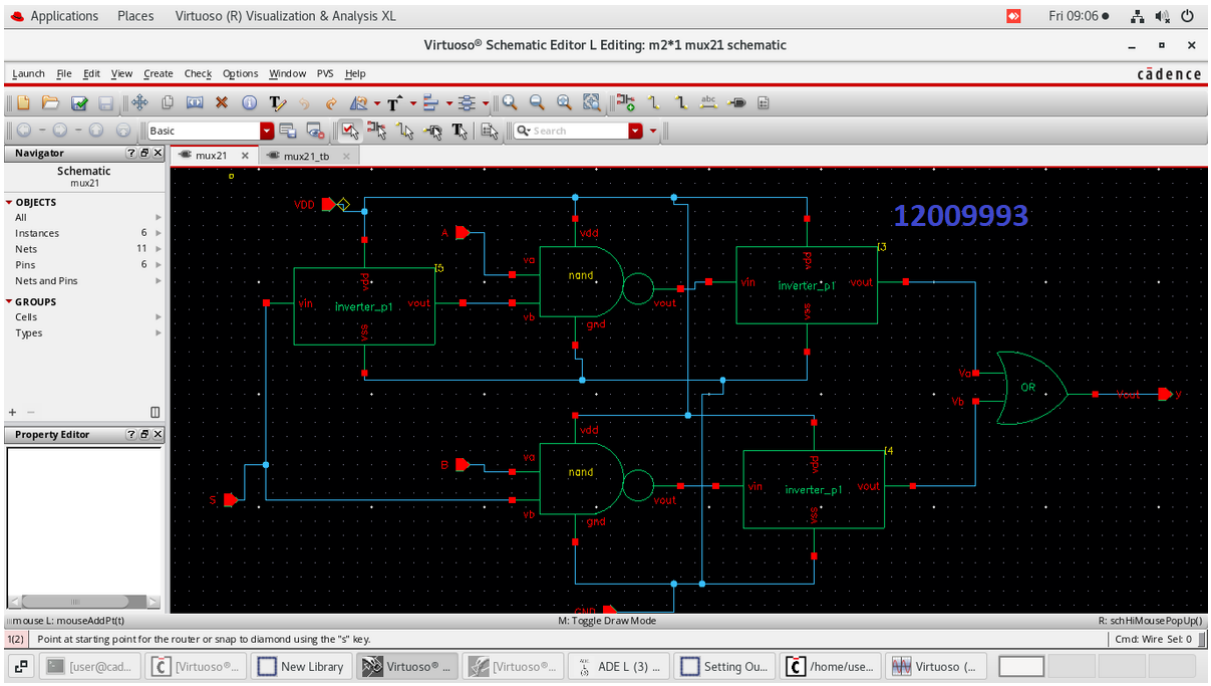

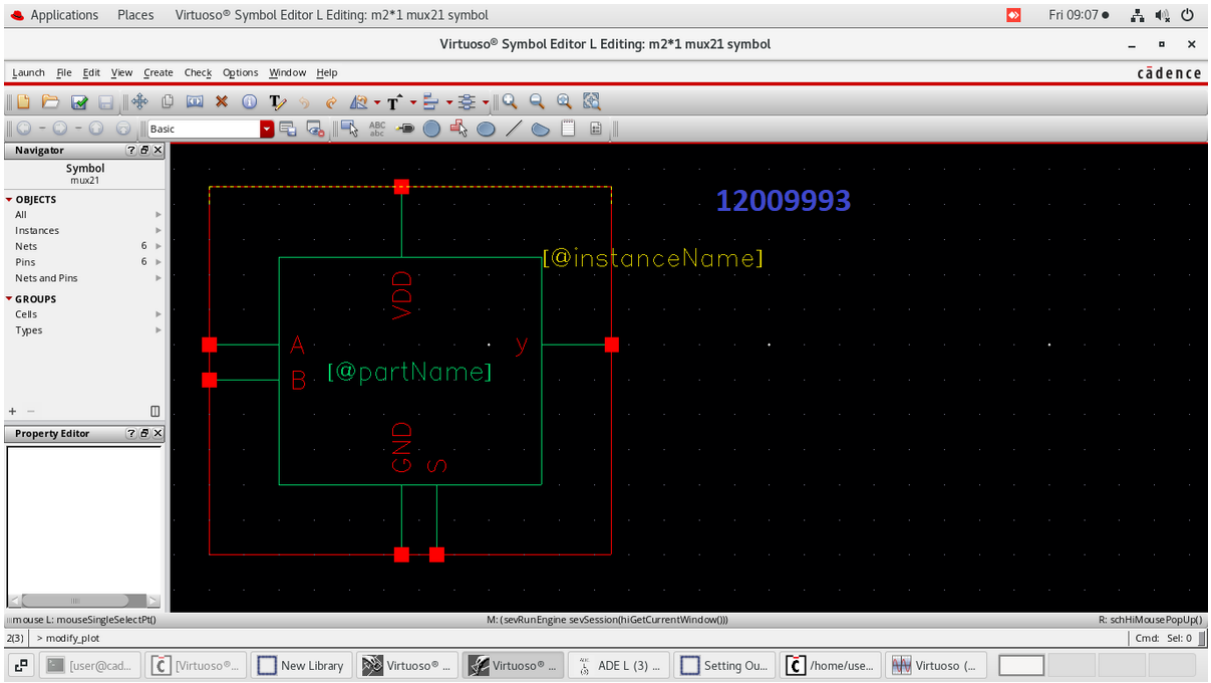

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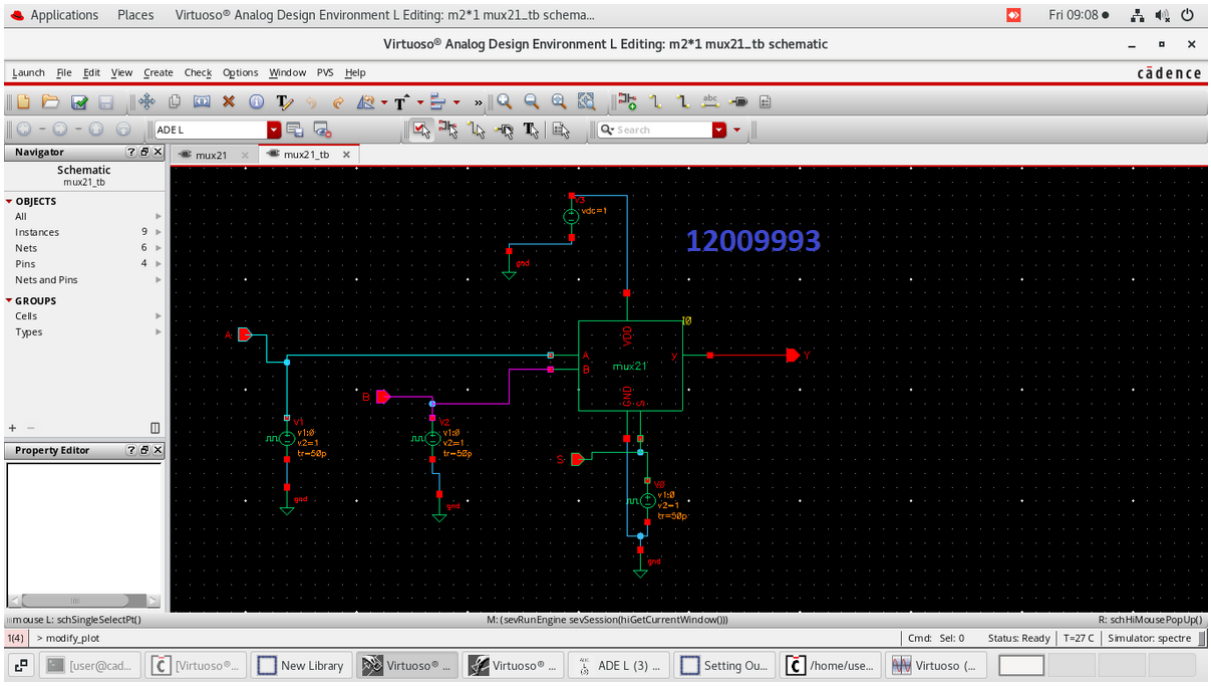

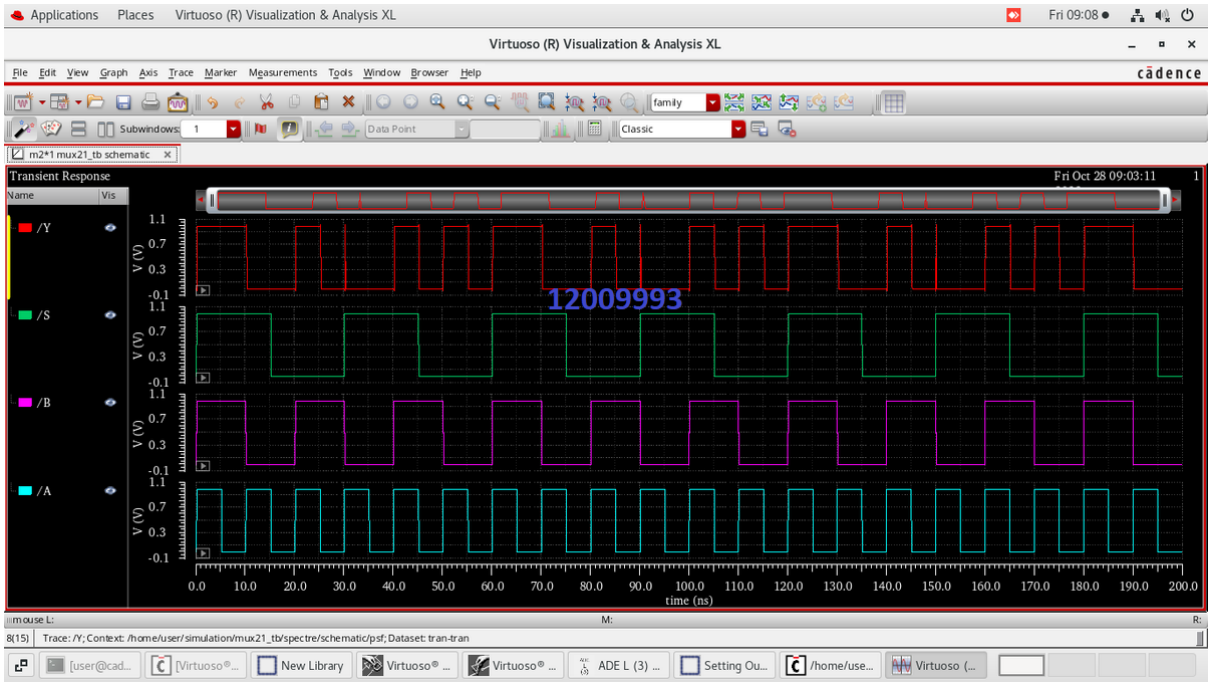

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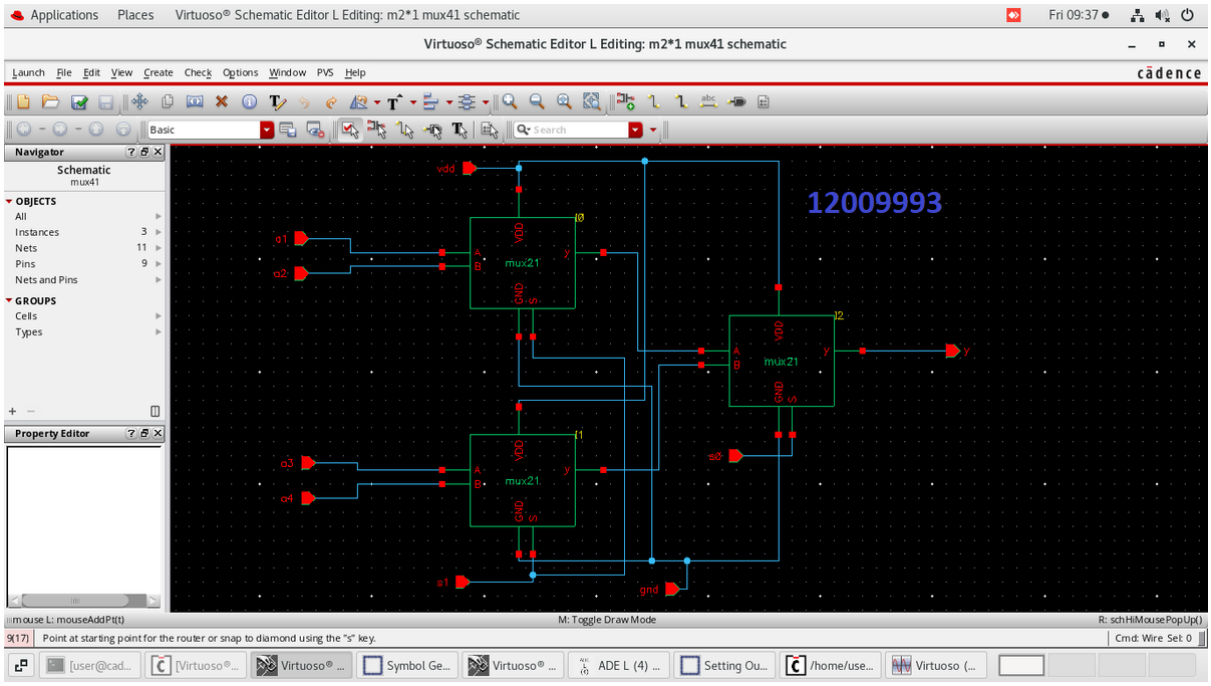
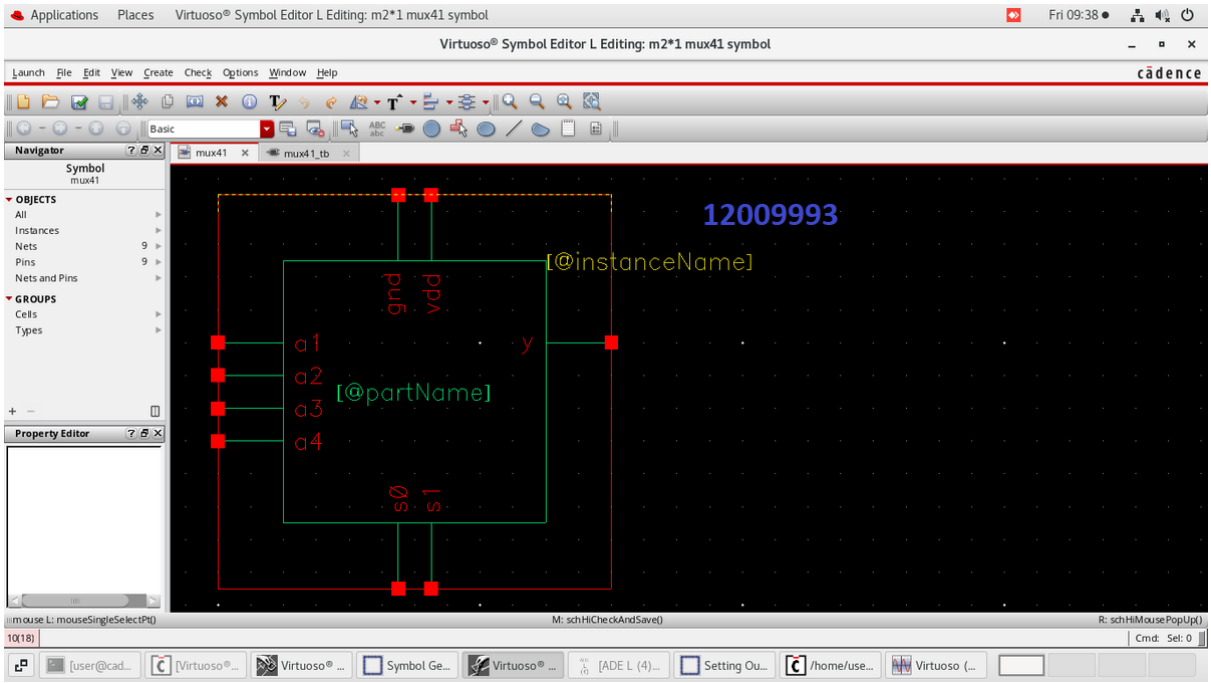
4*1 mux





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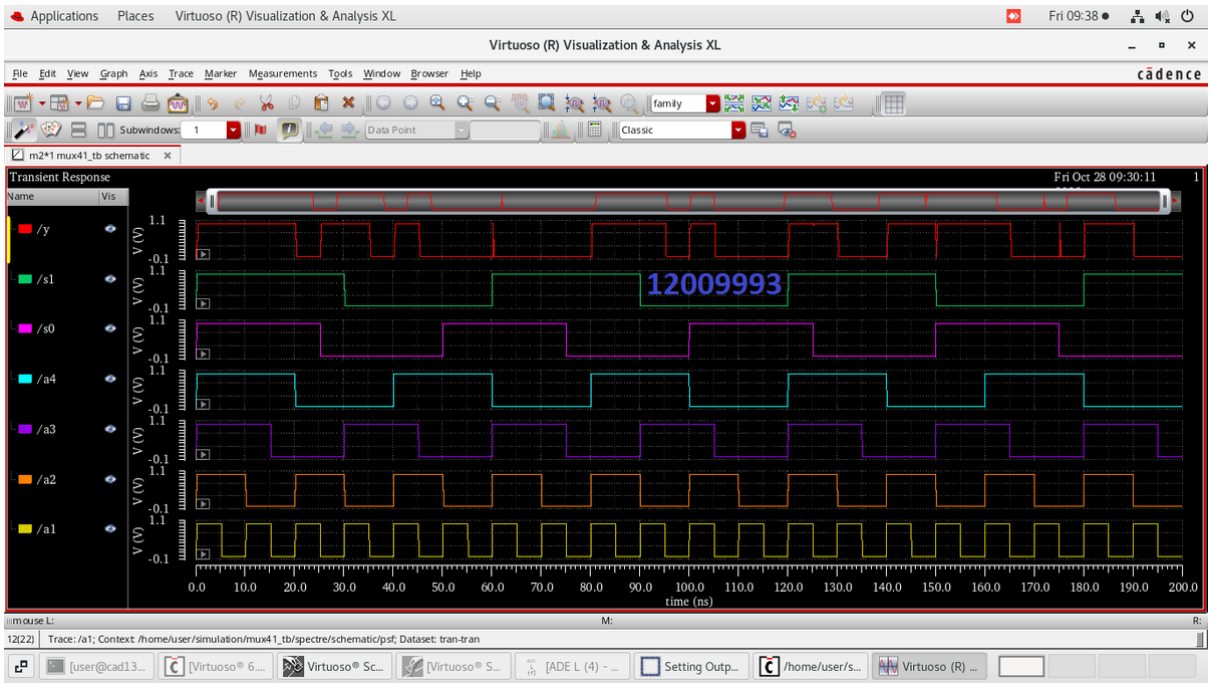

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