



L O V E L Y
P R O F E S S I O N A L
U N I V E R S I T Y

Practical submission worksheets

**WORKSHOP ON ANALOG DESIGN USING
CADENCE VIRTUOSO**

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COURSE CODE: ECE390.

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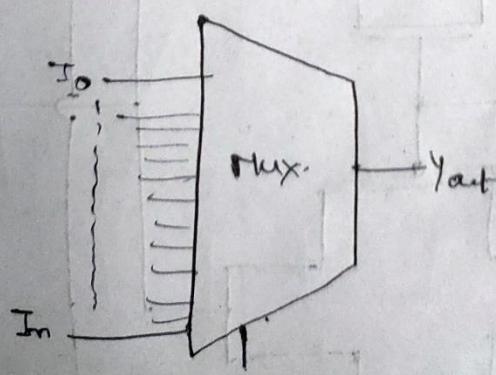
**School of Electronics and Electrical
Engineering.**

→ AIM :- Designing of 8x1 Multiplexers using CMOS Technology in Cadence Virtuoso.

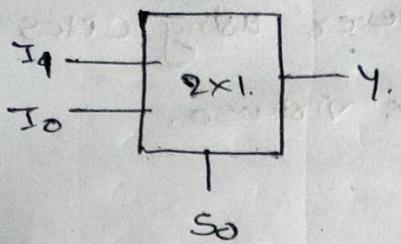
→ Introduction :-

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 encoders & decoders, 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

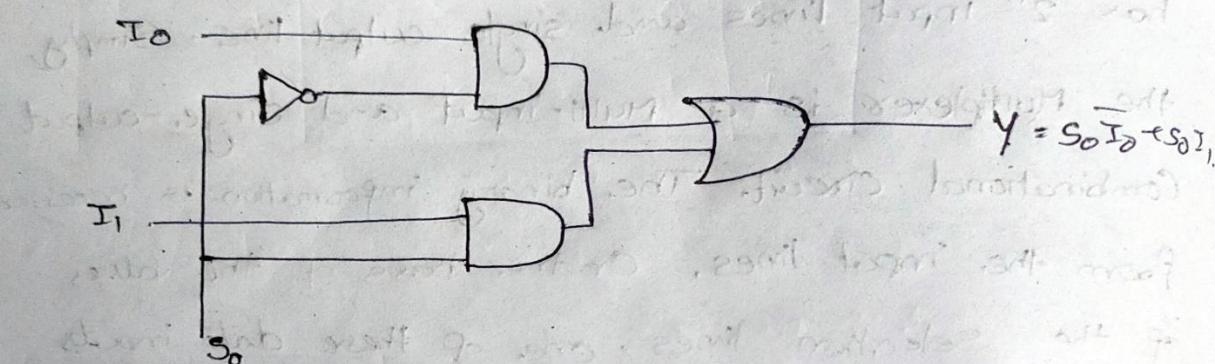


Logic Table

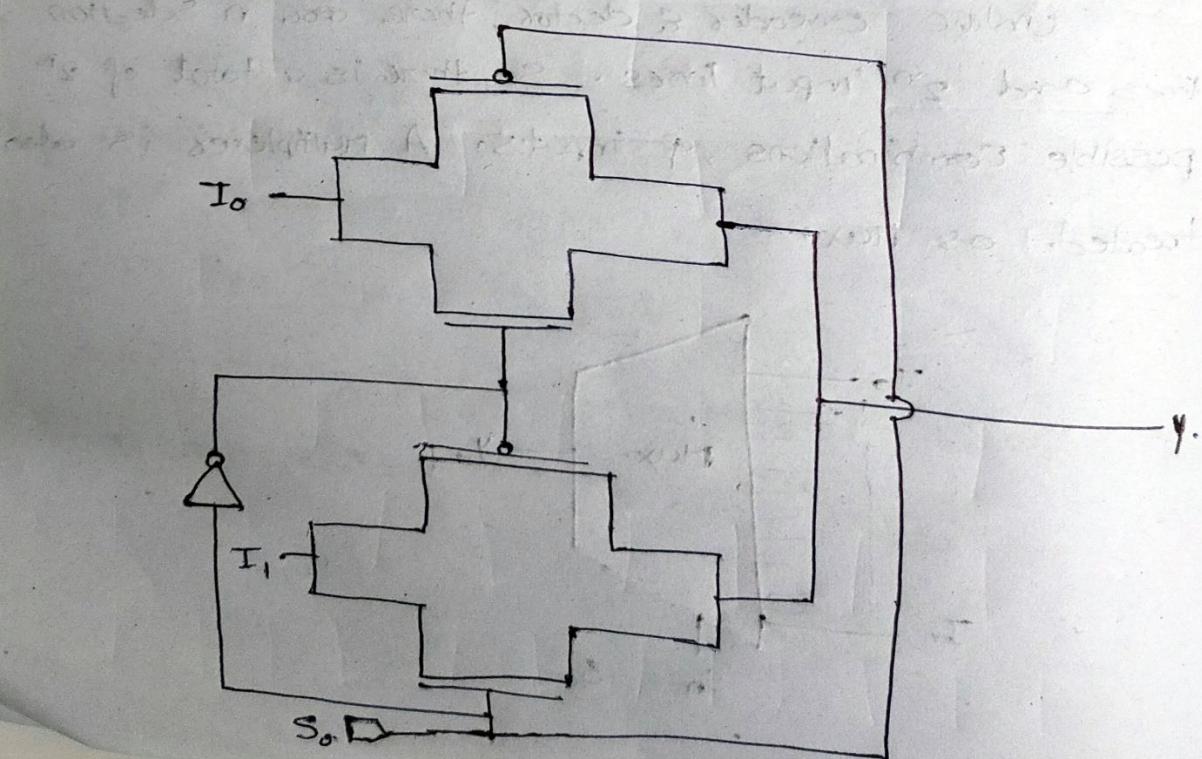
S0	Y
0	I0
1	I1

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

2×1 using basic Gates :-

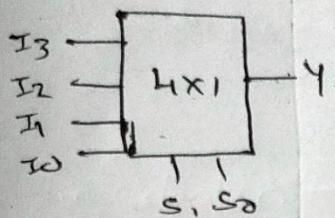


2×1 using CMOS :-



→ Implementation of ~~4x1~~ ~~Mux~~ using basic gates

4x1 Mux

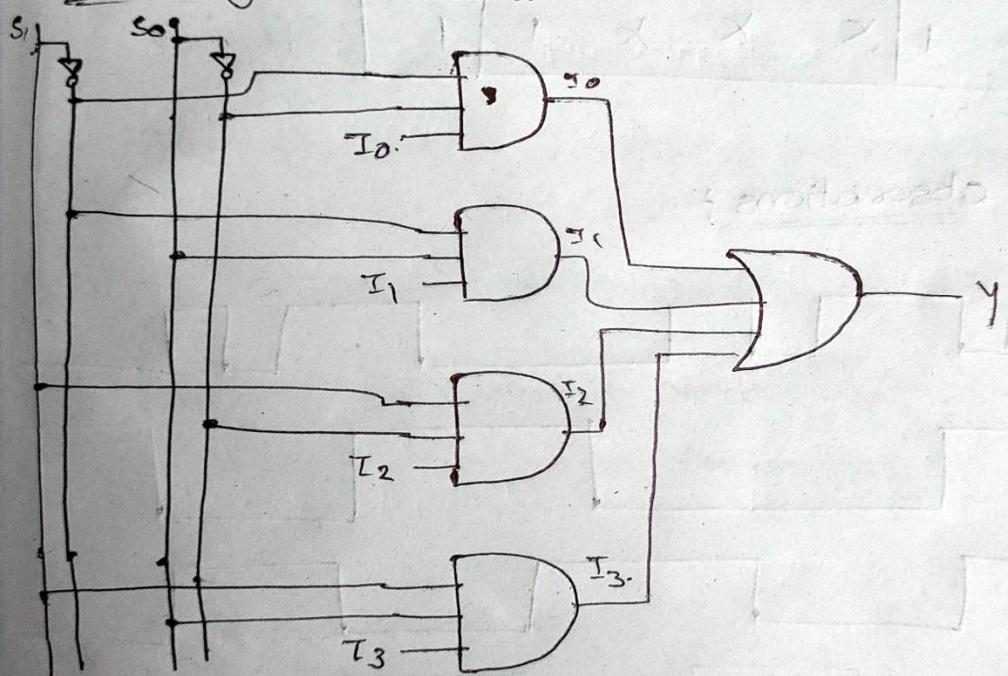


Logic Table

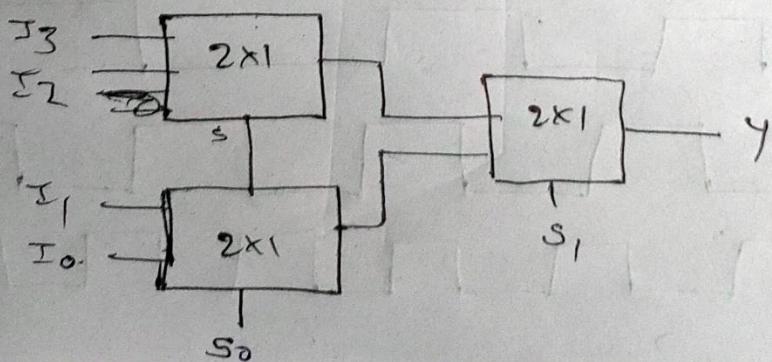
S ₁	S ₀	Y
0	0	I ₀
0	1	I ₁
1	0	I ₂
1	1	I ₃

$$Y = S_1' S_0' I_0 + S_1' S_0 I_1 + S_1 S_0' I_2 + S_1 S_0 I_3$$

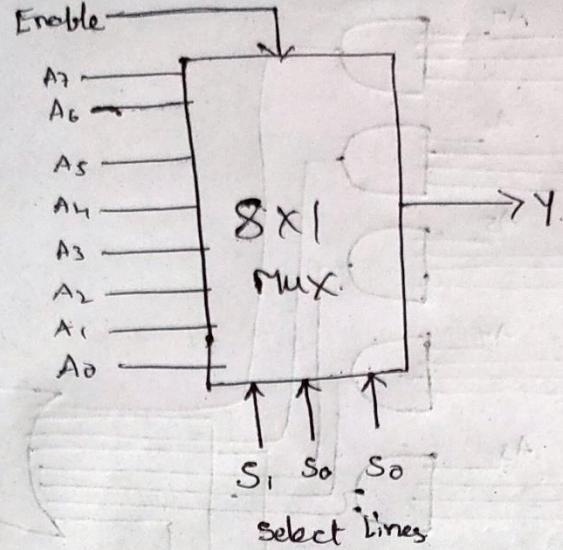
4x1 using Basic Gates:



4x1 using 2x1 Mux:



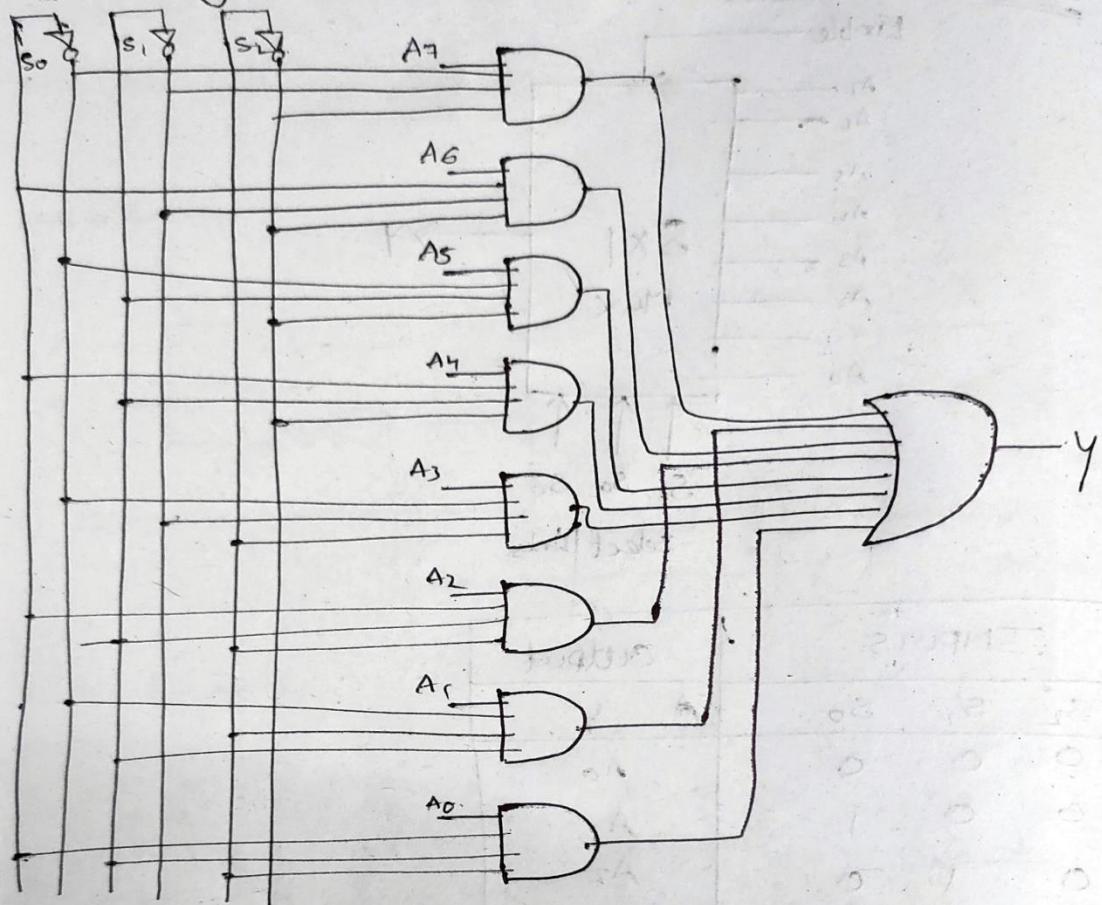
8 to 1 Multiplexers



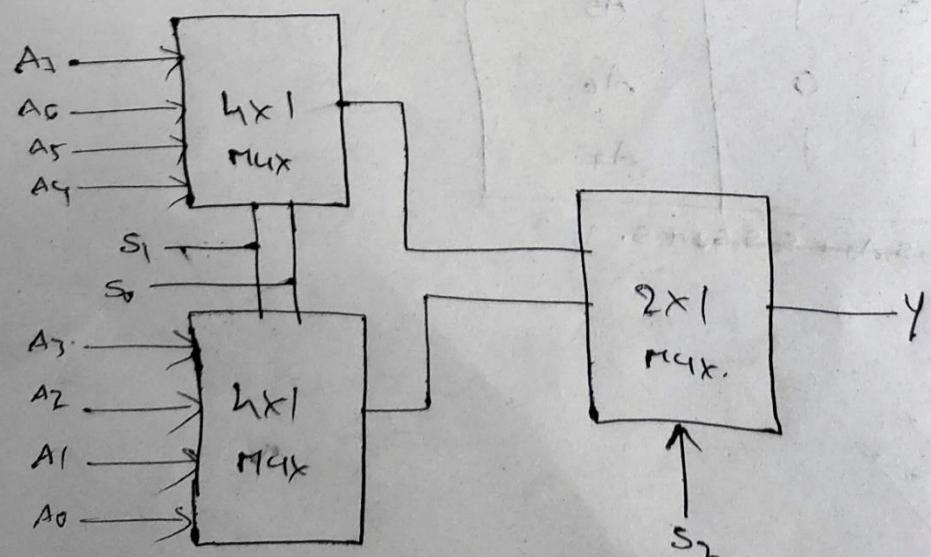
INPUTS			Output	
S ₂	S ₁	S ₀	A	Y
0	0	0	A ₀	
0	0	1	A ₁	
0	1	0	A ₂	
0	1	1	A ₃	
1	0	0	A ₄	
1	0	1	A ₅	
1	1	0	A ₆	
1	1	1	A ₇	

~~Y = S₂S₁S₀ + S₂S₁S₀~~

8x1 using Logic Gates



8x1 using Lx1.



→ Learning Outcomes :-

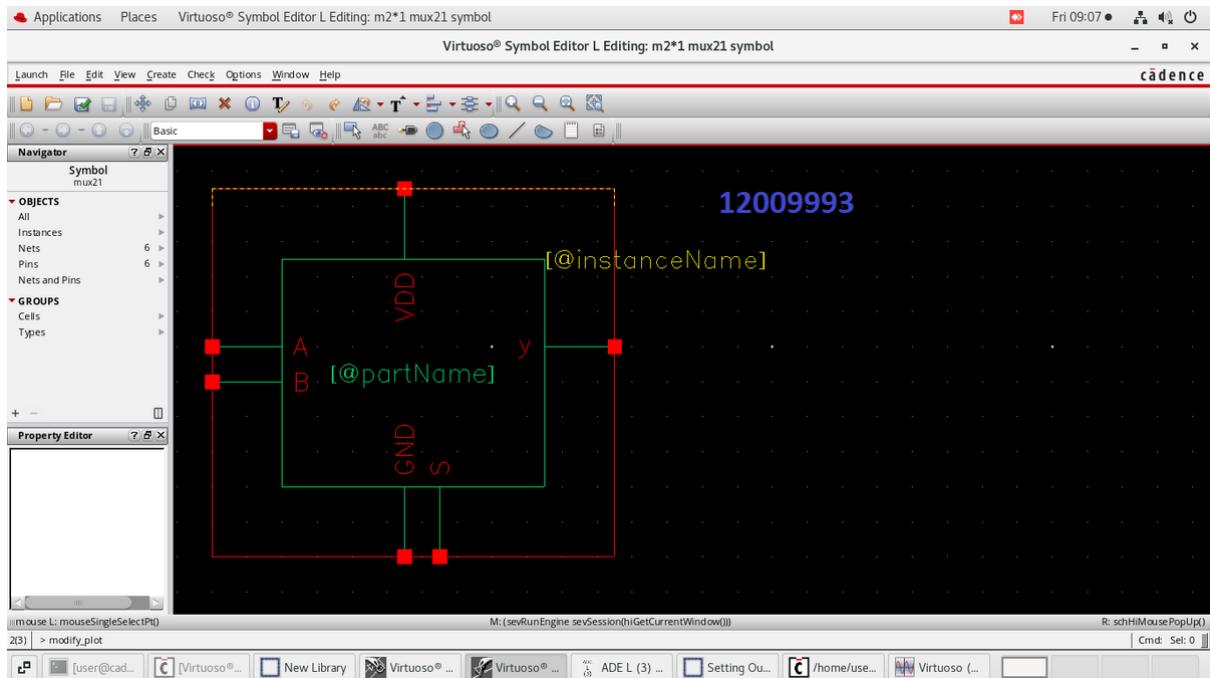
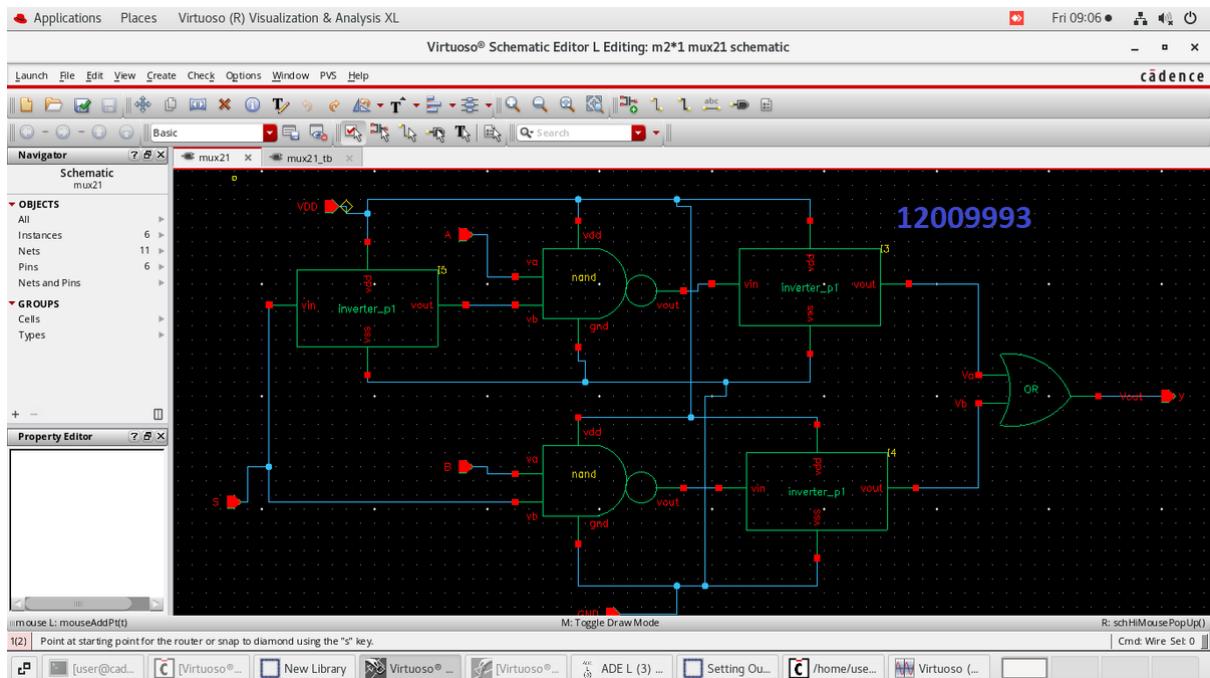
- * We have learned about the Implementation of Multiplexers using CMOS Technology.
- * Working & Functionalities of Multiplexers.
- * Designing of Multiplexers in various types like Using Basic gates, using CMOS, & from one MUX to another Multiplexer.
- * Logic tables & Expressions of Multiplexers.
- * Waveforms of the various multiplexers.

→ Applications of Multiplexers :-

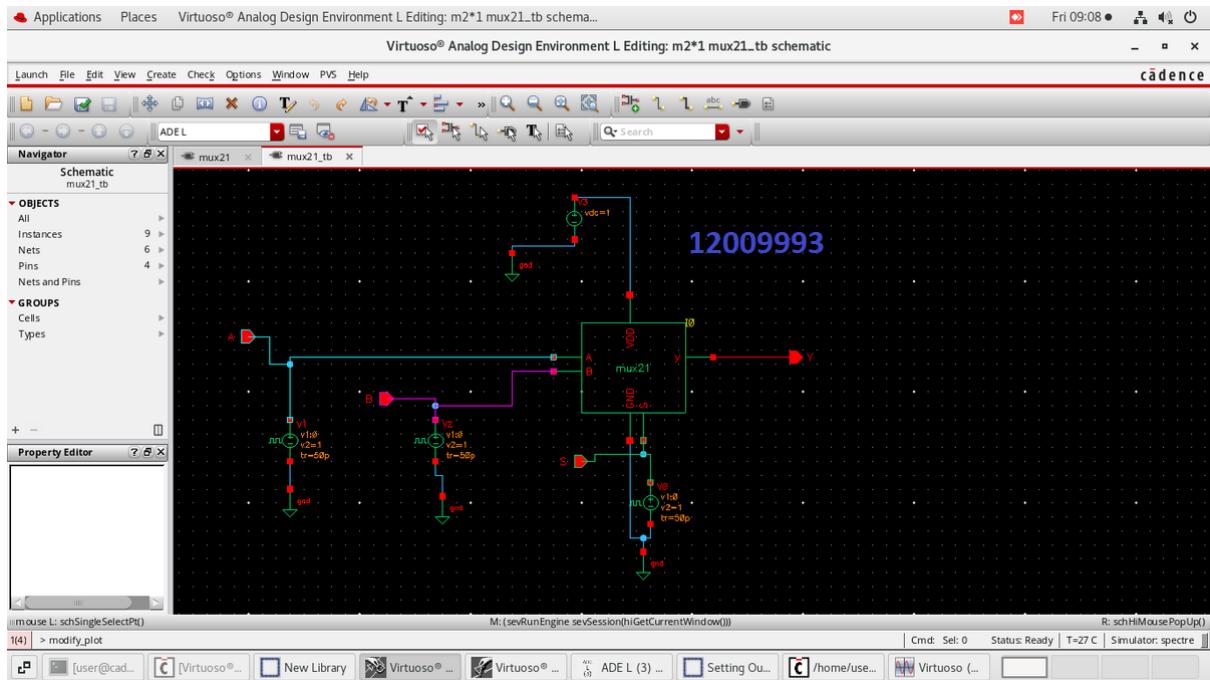
- * Multiplexers are used in various applications where multiple data need to be transmitted by using a single line.
- * Communication Systems.
- * Computer Memory & Telephone Networks.
- * Transmission from the Computer System of a Satellite.

Schematics from cadence virtuoso

2*1 mux

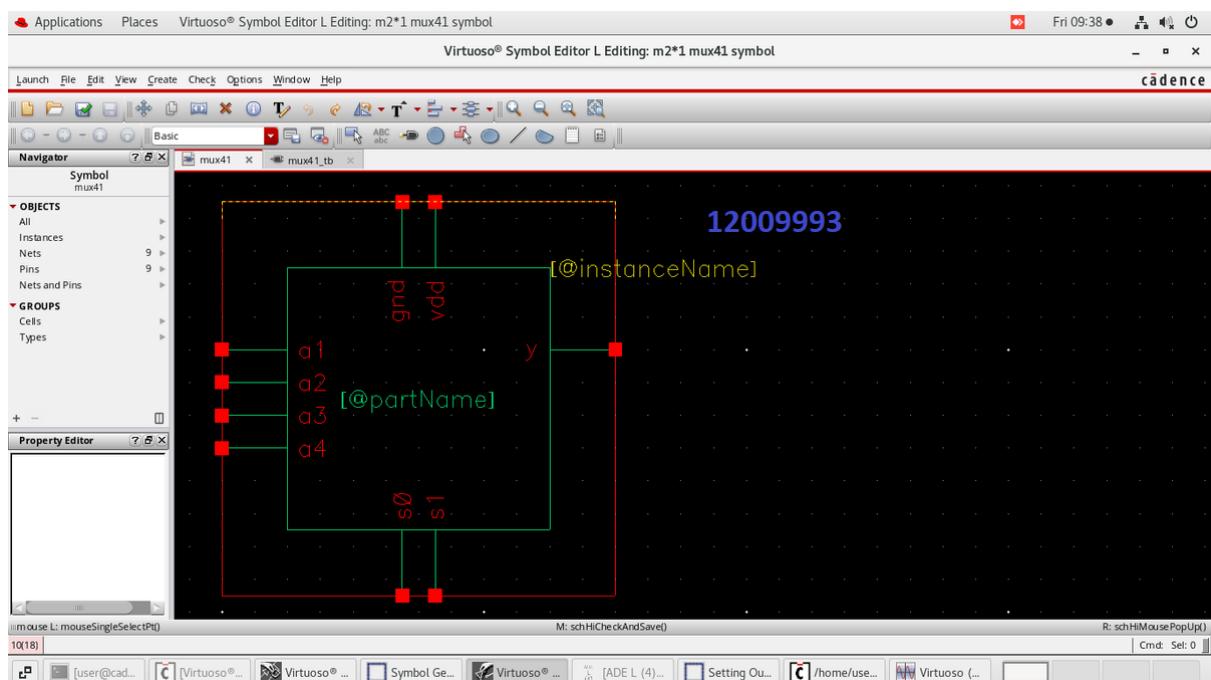
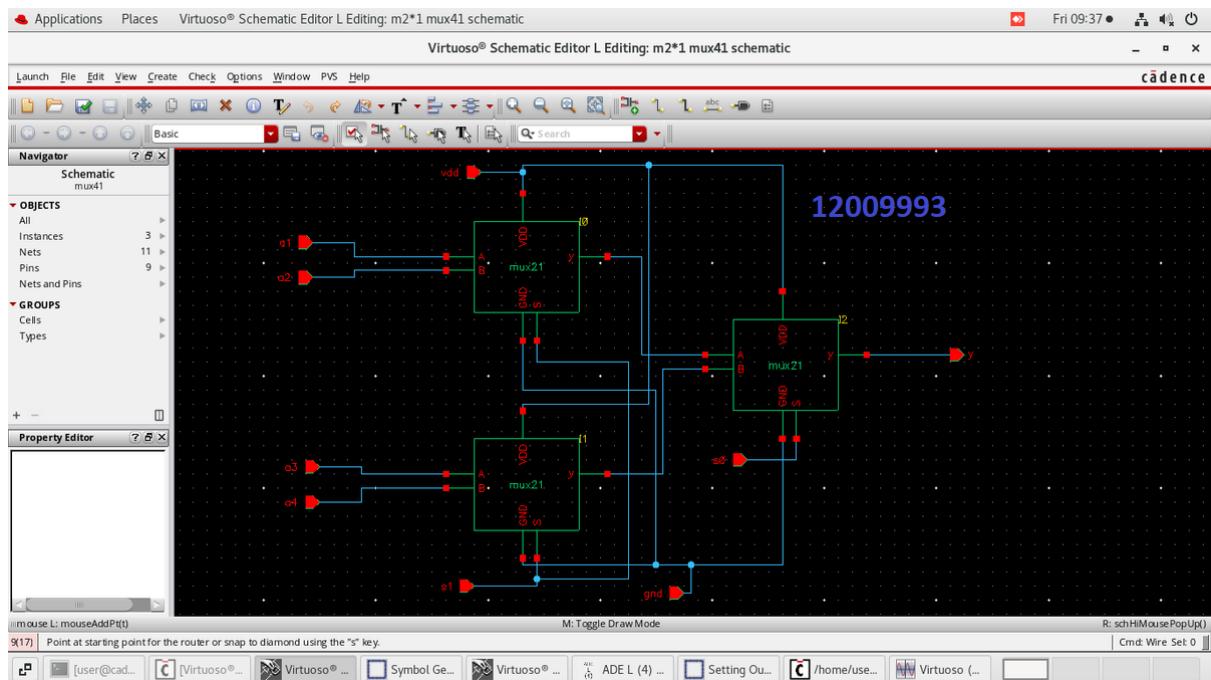


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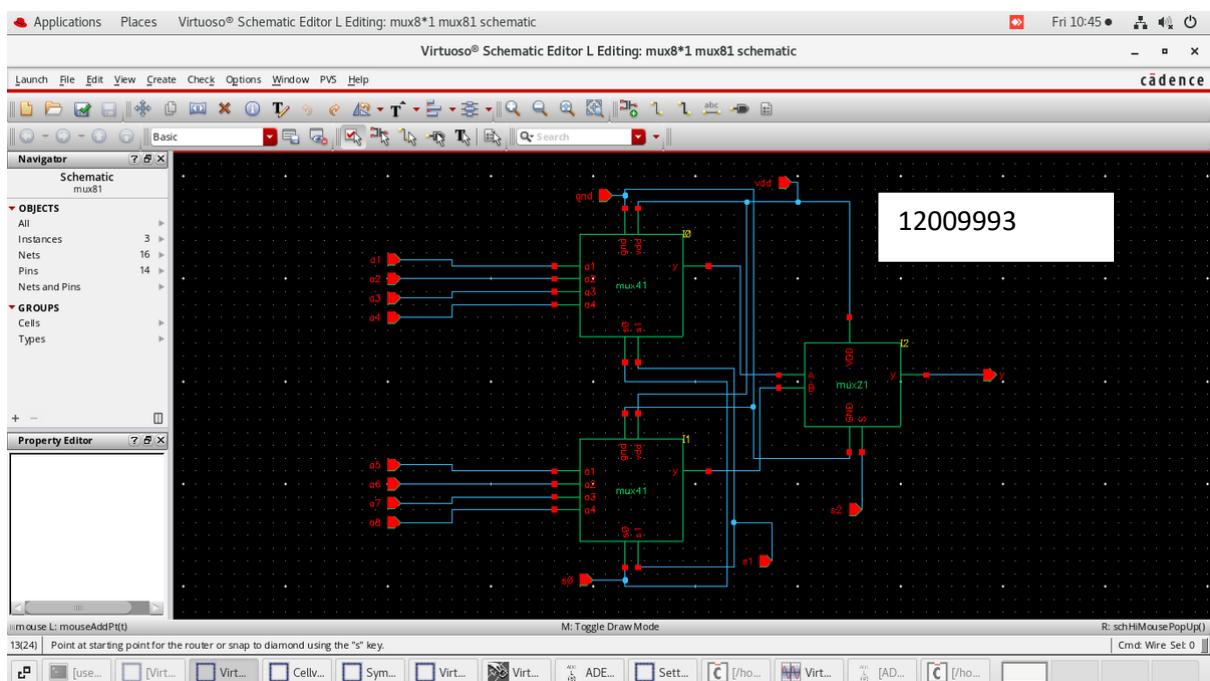
4*1 mux



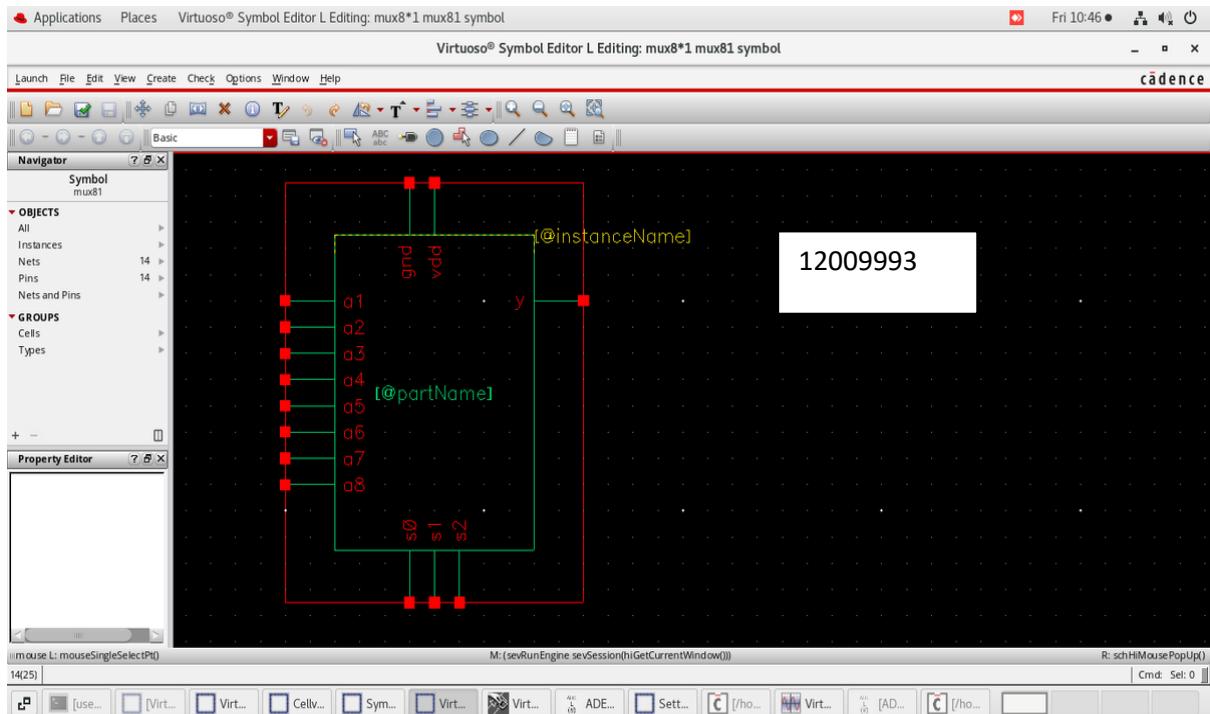
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8*1 mux



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