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Laboratory 6

Combinational Circuits-II
Multiplexers and Demultiplexers

1. Introduction and Purpose of Experiment

   Students will learn to design, simulate and implement circuits using Multiplexers and Demultiplexers.

2. Aim and Objectives

   Aim: To verify functionality of Mux and Demux and use Multiplexer to implement Boolean functions

   Objectives: At the end of this lab, the student will be able to

   - Verify the functionality of Mux and Demux
   - Use Multiplexers to implement given Boolean Functions

3. Experimental Procedure

   a. Write truth tables and block diagrams for
      I. 4 to 1 Multiplexer
      II. 8 to 1 Multiplexer
      III. 1 to 4 Demultiplexer
      IV. 1 to 8 Demultiplexer

   b. Construct the circuits for 3 (a) (I) to 3 (a) (IV) above using appropriate ICs. Verify the functionality and show the output to the course leader

   c. Use Logisim to simulate the circuits designed above.

   d. Using an example, show how any Boolean Expression in SoP form can be implemented using a Multiplexer. Simulate the same using Logisim.

   Your document should include:

   - Handwritten truth tables and block diagrams for the circuits in 3(a).
   - Logisim screenshots of all the Multiplexers and Demultiplexers.
   - Answer to 3(d)
   - Logisim screenshots for 3(d)

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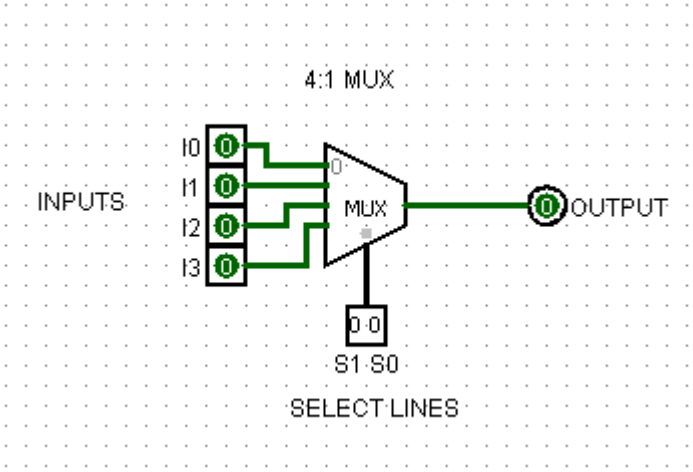
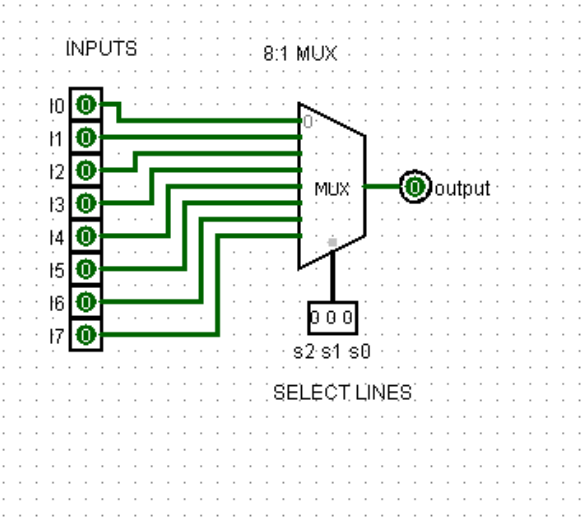
4:1 Multiplexer circuit



Select Data Inputs		Output
S_1	S_0	Y
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3

8:1 Multiplexer



Select Data Inputs			Output
S_2	S_1	S_0	Y
0	0	0	D_0
0	0	1	D_1
0	1	0	D_2
0	1	1	D_3
1	0	0	D_4
1	0	1	D_5
1	1	0	D_6
1	1	1	D_7

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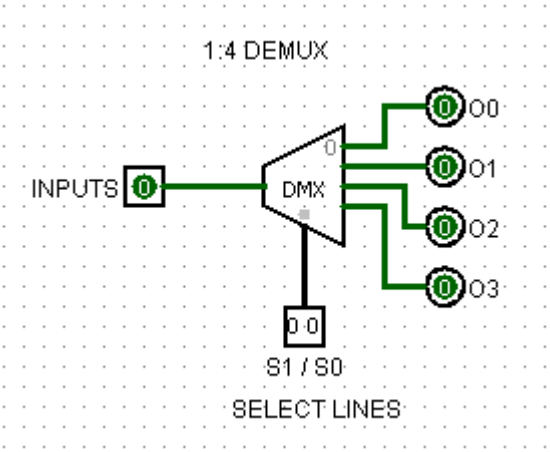
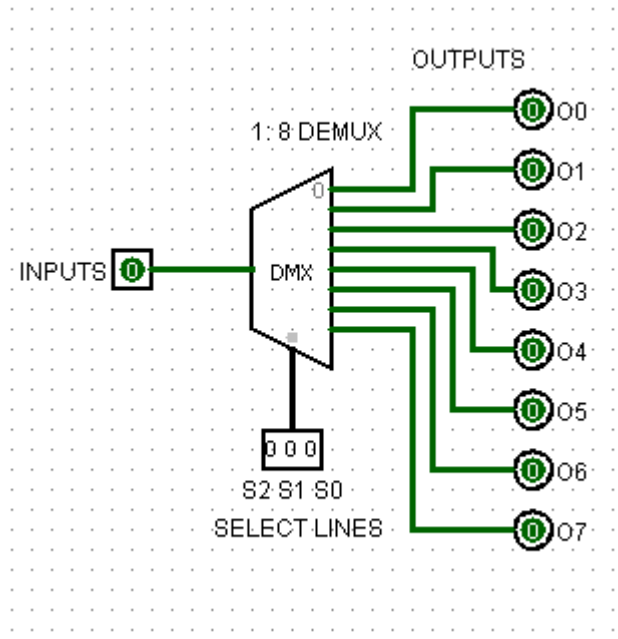
1:4 DeMultiplexer



Data Input	Select Inputs		Outputs			
D	S_1	S_0	Y_3	Y_2	Y_1	Y_0
D	0	0	0	0	0	D
D	0	1	0	0	D	0
D	1	0	0	D	0	0
D	1	1	D	0	0	0

1:8 DeMultiplexer



Data Input	Select Inputs			Outputs							
D	S_2	S_1	S_0	Y_7	Y_6	Y_5	Y_4	Y_3	Y_2	Y_1	Y_0
D	0	0	0	0	0	0	0	0	0	0	D
D	0	0	1	0	0	0	0	0	0	D	0
D	0	1	0	0	0	0	0	0	D	0	0
D	0	1	1	0	0	0	0	D	0	0	0
D	1	0	0	0	0	0	D	0	0	0	0
D	1	0	1	0	0	D	0	0	0	0	0
D	1	1	0	0	D	0	0	0	0	0	0
D	1	1	1	D	0	0	0	0	0	0	0