St. Francis Institute of Technology

Class: SE-ITA/ITB Semester: IV; A.Y. 2023-2024
Subject: Microprocessor Programming Lab

Experiment – 3: Implementation of Multiplexer and Demultiplexer

1. **Aim:** Design and implement multiplexer and demultiplexer.

2. **Prerequisite:** Basic working of logic gates, multiplexer and demultiplexer.

3. **Requirements:** Open-source software tool Logisim

4. **Pre-Experiment Exercise:**

A. Multiplexer:

a. A Multiplexer or Mux is a device that has many inputs and a single output. The selected line decides which input is connected to the output and increases the amount of data that can be sent over a network within a certain time.

b. A multiplexer is also called as a data selector. The best example of the non-electronic circuit of the multiplexer is a single-pole, multi-position switch, which is generally used in many electronics circuits.

c. The main purpose of mux is to perform high-speed switching and is constructed by basic electronic components.

d. These are accomplished by handling both analog and digital applications. In analog applications, these are made up of transistor switches and relays, whereas in digital applications, these are made up of logic gates. When the mux is used in digital applications, it is called a digital multiplexer.

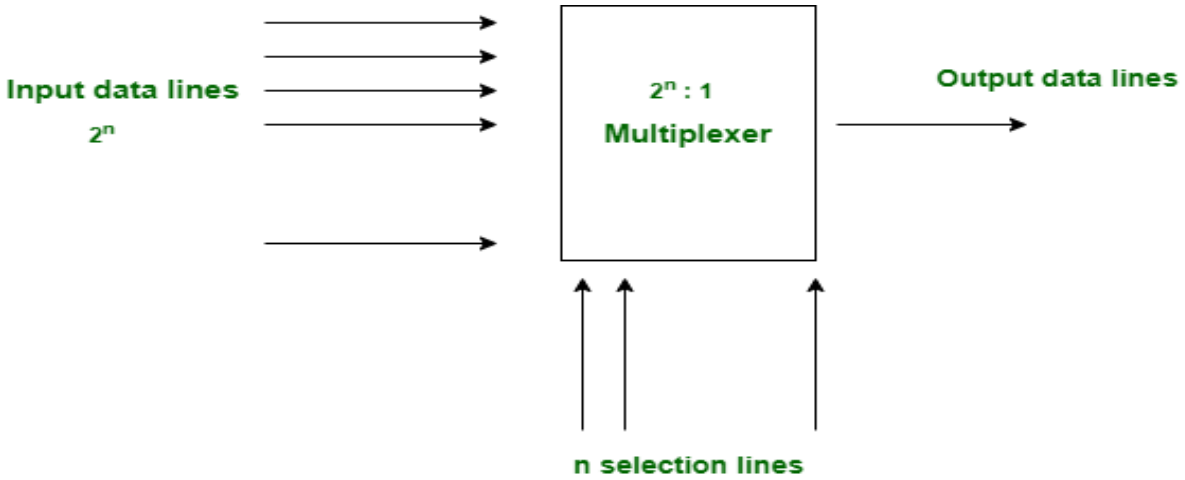


Fig 1: Multiplexer Circuit

B. Demultiplexer:

A demultiplexer or DeMux is a device, that has one input and multiple output lines which are used to send a signal to one of the various devices. The most prominent distinction between a multiplexer and demultiplexer is that a multiplexer takes two or a lot of signals and encodes them on a wire, whereas a demultiplexer reverses what the multiplexer does.

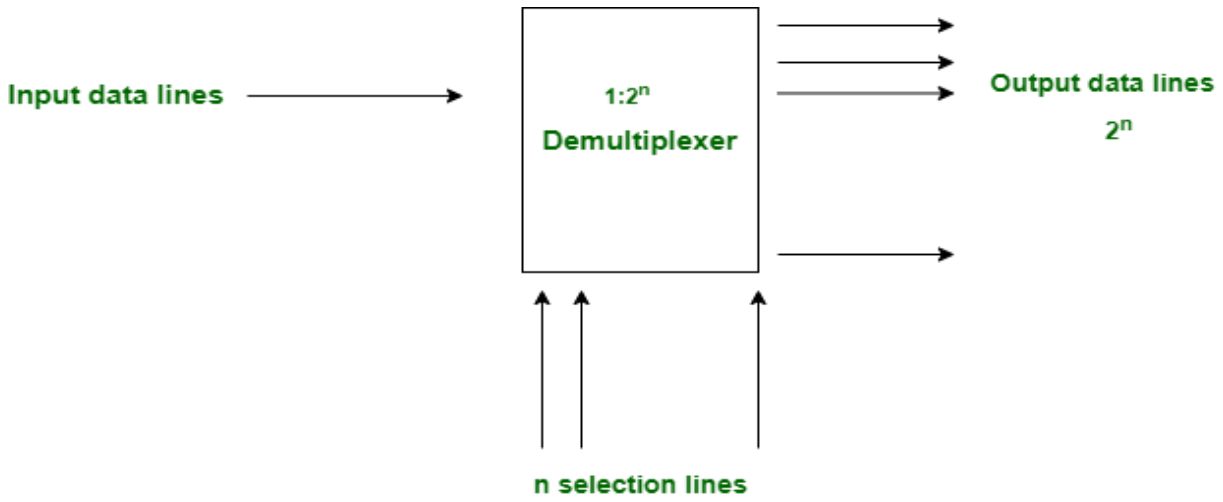


Fig 2: De-multiplexer Circuit

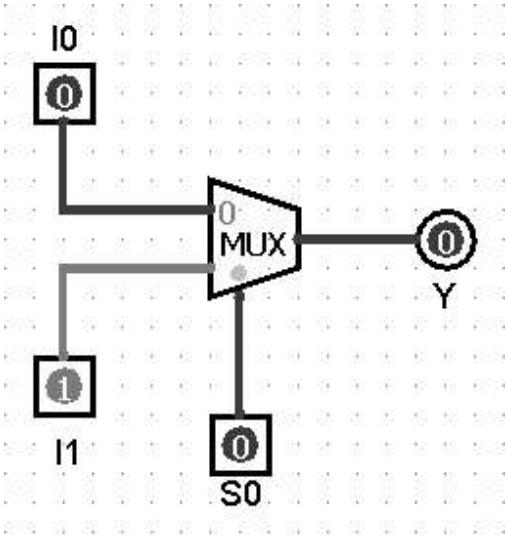
5. **Laboratory Exercise using Logisim:**
   - **A.** Place the Mux/DeMux on the canvas panel.
   - **B.** Add the wires and connect it to the circuit (input andoutput). Add the inputs.
   - **C.** Save, Run and Observe the output.

6. **Post-Experiments Exercise**
   - **A. Results/Calculations/Observations:**
     a. Draw the truth tables for four types of Multiplexers: 2:1, 4:1, 8:1, 16:1
     b. Draw the truth tables for four types of De-multiplexers: 1:2, 1:4, 1:8, 16:1
   - **B. Questions:**
     a. Differentiate between Multiplexer and Demultiplexer.
     b. Draw 8:1 multiplexer using two 4:1 multiplexer and one 2:1 multiplexer.
     c. Draw 1:8 demultiplexer using one 1:2 de-multiplexer and two 1:4 de-multiplexers.
   - **C. Conclusion:**
     Draw conclusion based on the experiment performed. Also mention few applications based on above experiment.
   - **D. References:**
     Mention two book references and two web references.

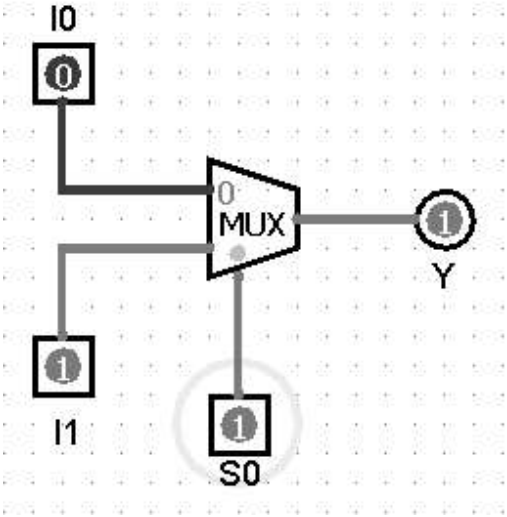
NAME:VISHAL RAJESH MAHAJAN **EXP NO:02**
CLASS:SE-INFT A3 **ROLL NO:63**

2:1 Multiplexer

1.When S0 is 0, Y is 0 i.e I0

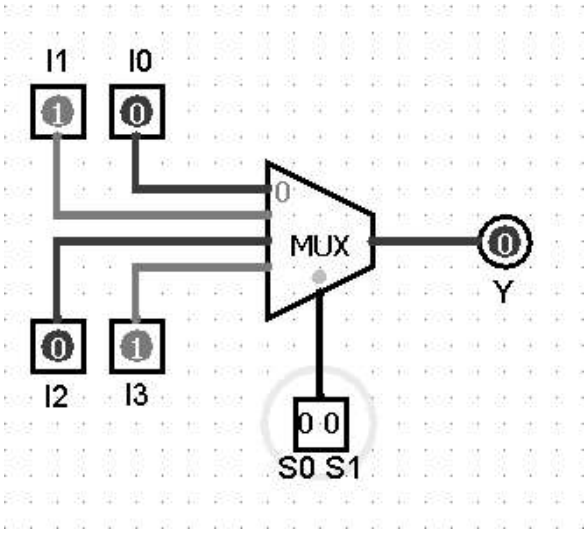


2.When S0 is 1, Y is 1 i.e I1

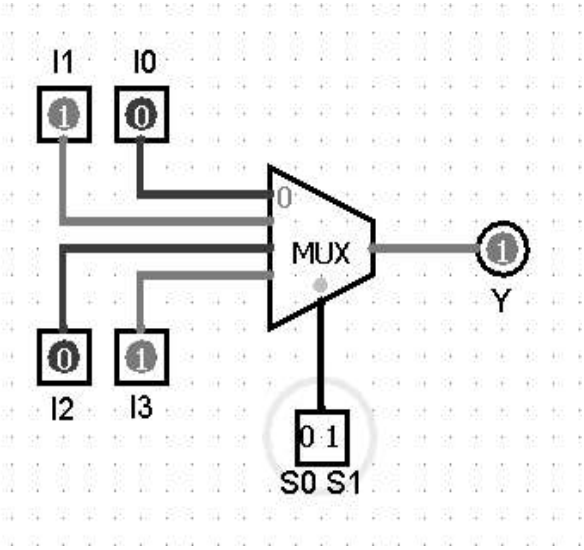


4:1 Multiplexer

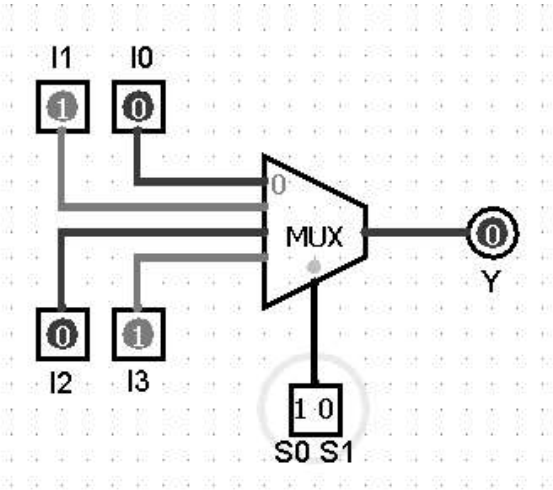
1.When S0 is 0, S1 is 0 ,Y is 0 i.e I0



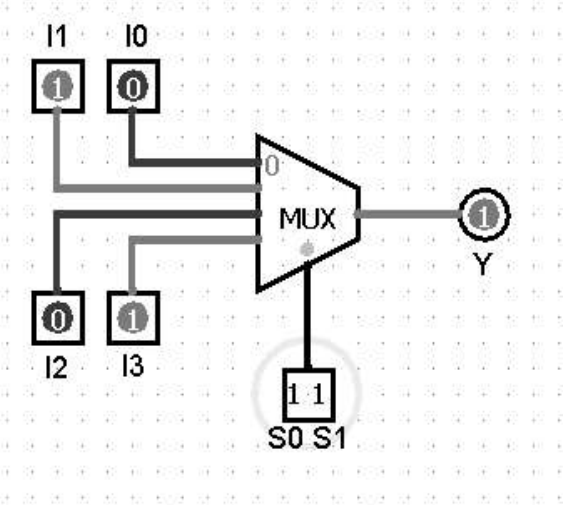
2.When S0 is 0 ,S1 is 1, Y is 1 i.e I1



3.When S0 is 1, S1 is 0, Y is 0 i.e I2

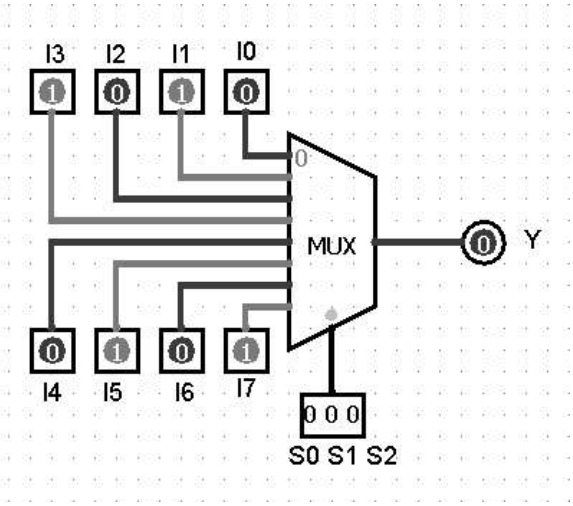


4.When S0 is 1, S1 is 1, Y is i.e I3

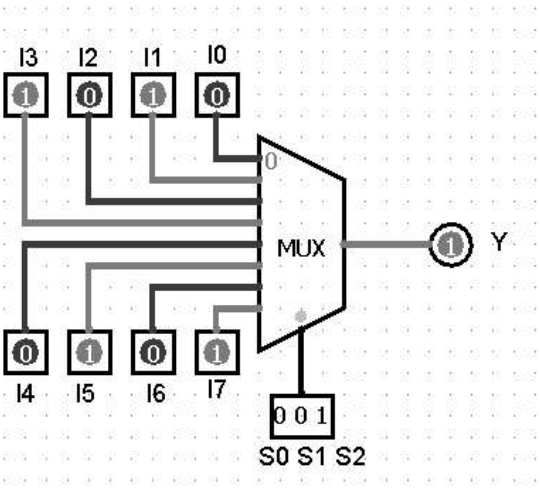


8:1 Multiplexer

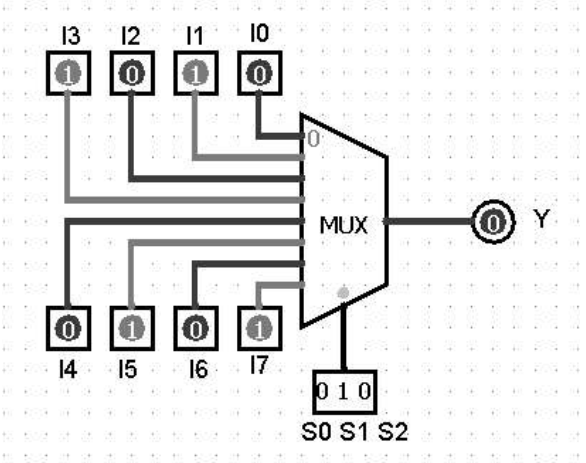
1.When S0 is 0 , S1 is 0 ,S2 is 0 ,Y is 0 i.e I0



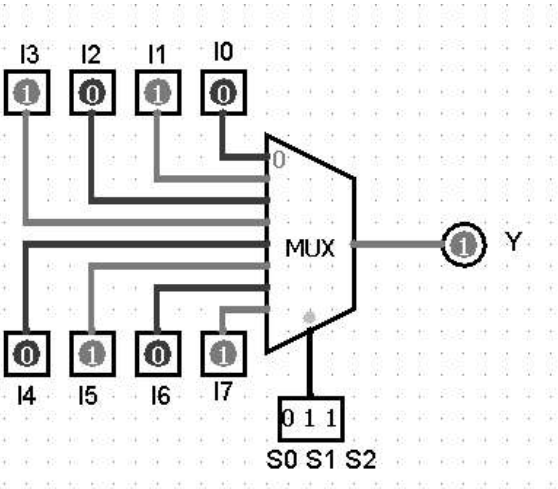
2.When S0 is 0 , S1 is 0 ,S2 is 1 ,Y is 1 i.e I1



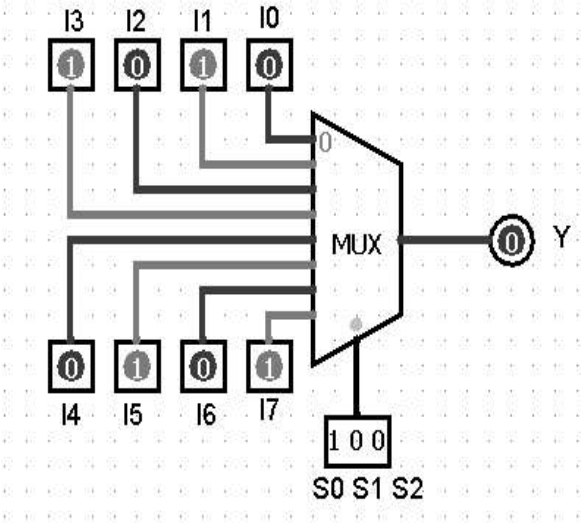
3.When S0 is 0 , S1 is 1 ,S2 is 0 ,Y is 0 i.e I2



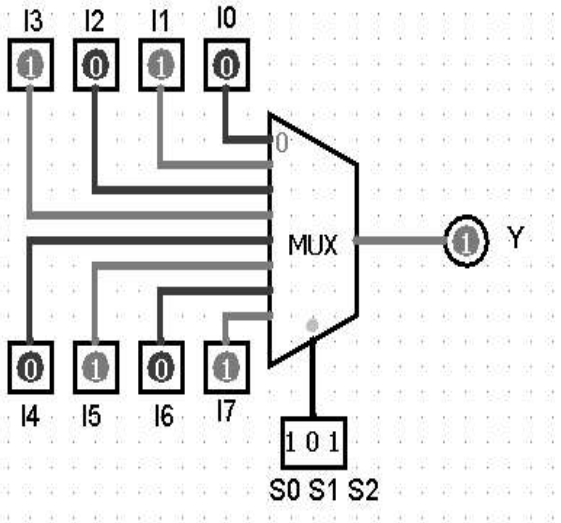
4.When S0 is 0 , S1 is 1 ,S2 is 1 ,Y is 1 i.e I3



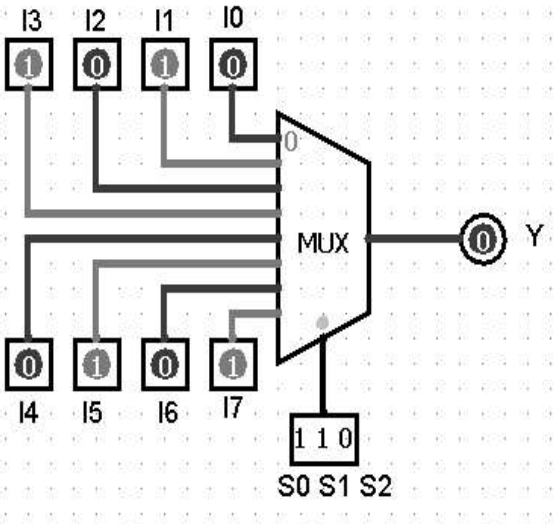
5.When S0 is 1 , S1 is 0 ,S2 is 0 ,Y is 0 i.e I4



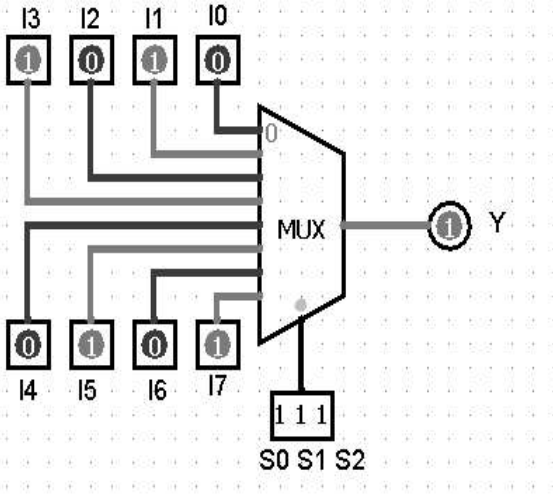
6.When S0 is 1 , S1 is 0 ,S2 is 1 ,Y is 1 i.e I5



7.When S0 is 1 , S1 is 1 ,S2 is 0 ,Y is 0 i.e I6

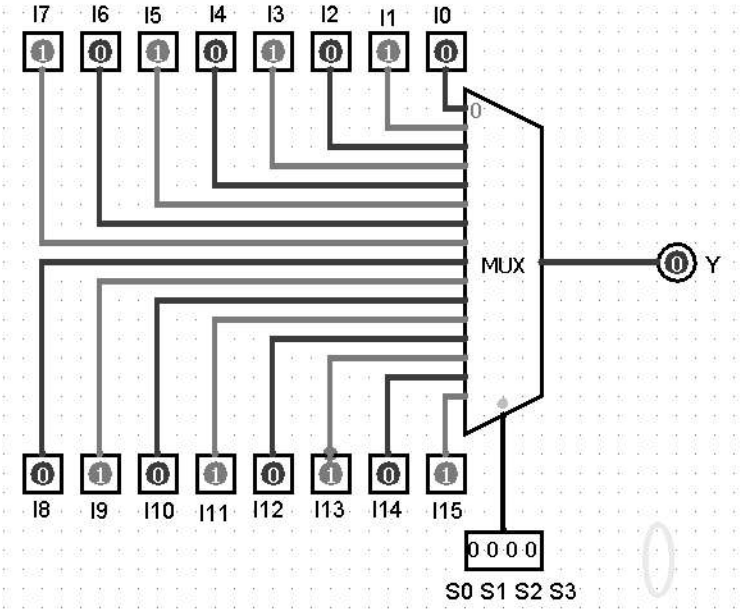


8.When S0 is 1 , S1 is 1 ,S2 is 1 ,Y is 1 i.e I7

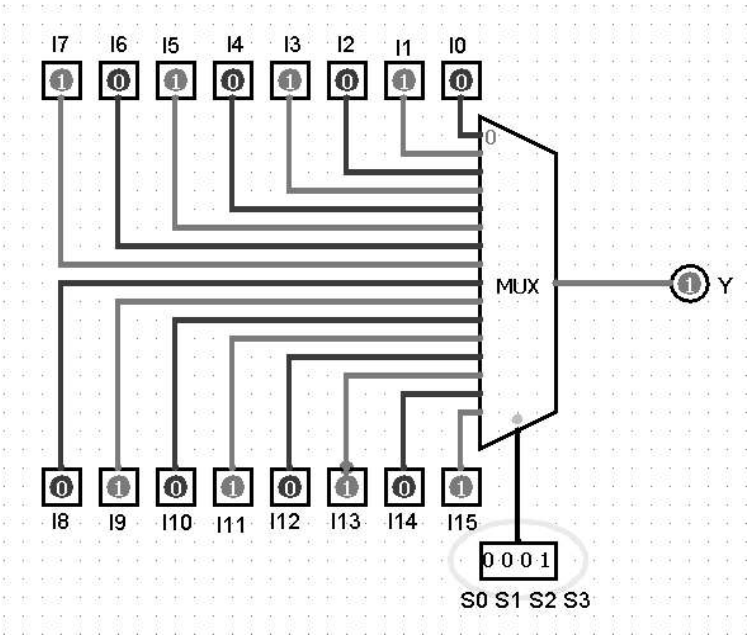


16:1 Multiplexer

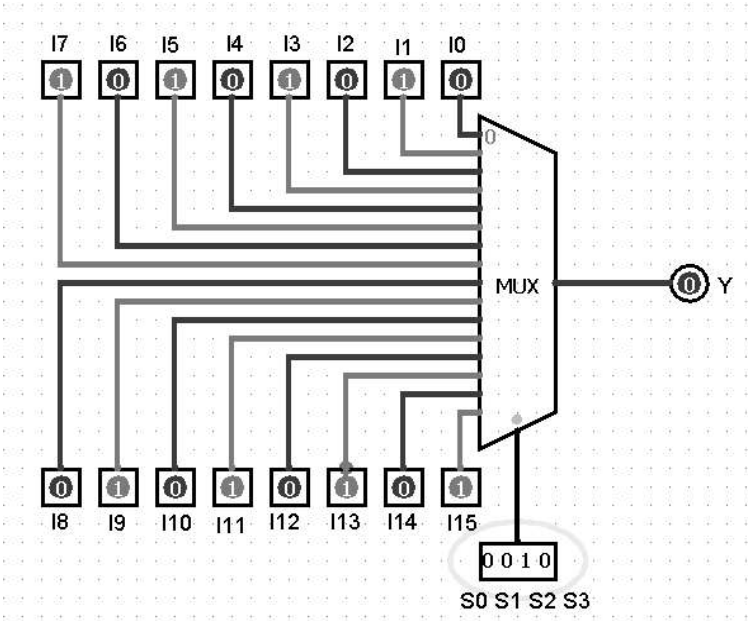
1. When S0 is 0, S1 is 0 ,S2 is 0 ,S3 is 0 ,Y is 0 i.e I0



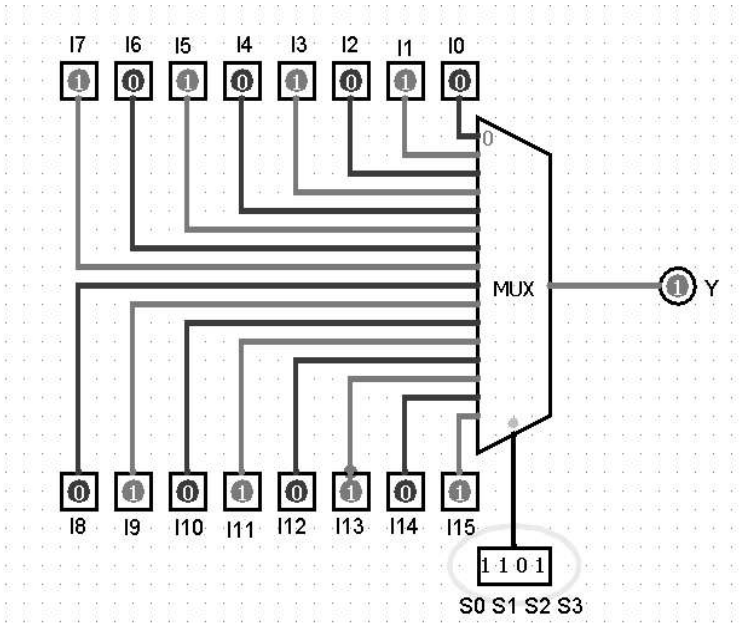
2. When S0 is 0, S1 is 0 ,S2 is 0 ,S3 is 1 ,Y is 1 i.e I1



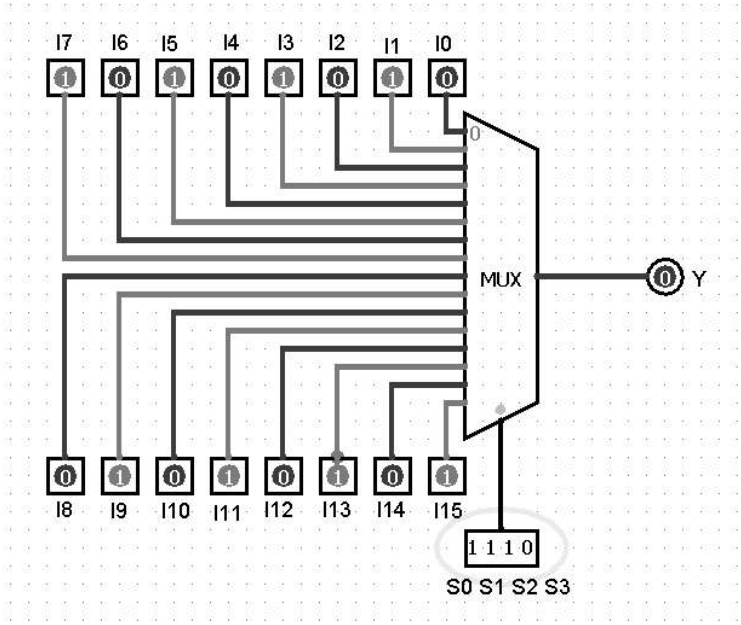
3. When S0 is 0, S1 is 0 ,S2 is 1 ,S3 is 0 ,Y is 0 i.e I2



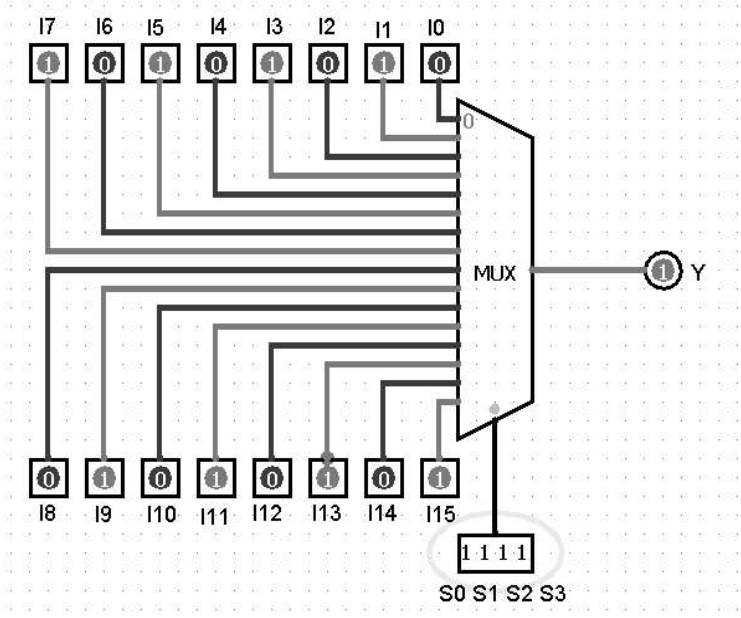
4. When S0 is 1, S1 is 1 ,S2 is 0 ,S3 is 1,Y is 1 i.e I13



5. When S0 is 1, S1 is 1 ,S2 is 1,S3 is 0,Y is 0 i.e I14

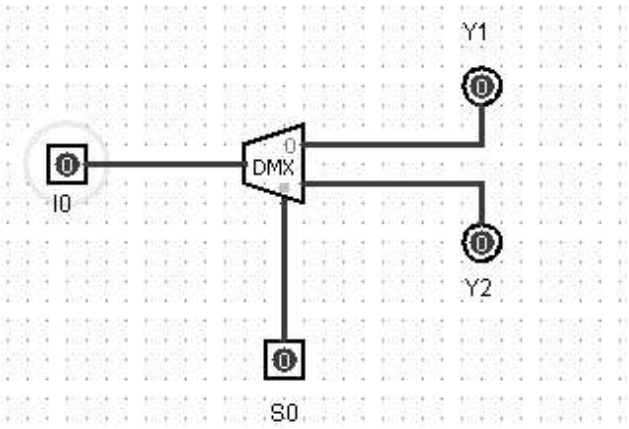


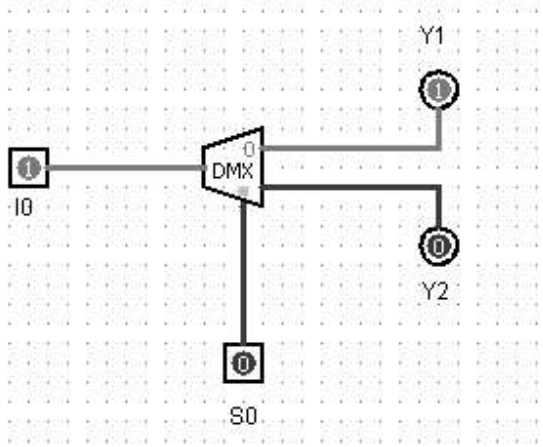
6. When S0 is 1, S1 is 1 ,S2 is 1 ,S3 is 1 ,Y is 1 i.e I15

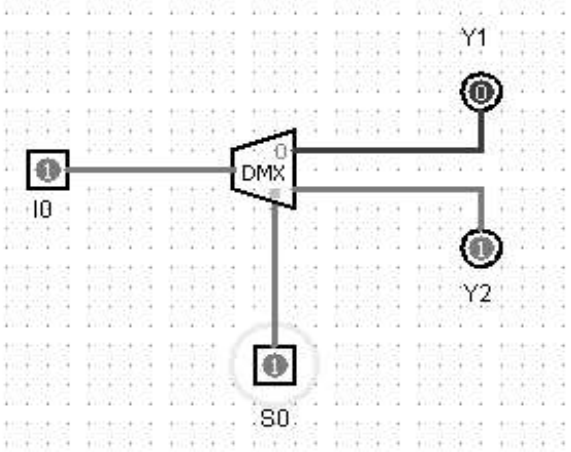


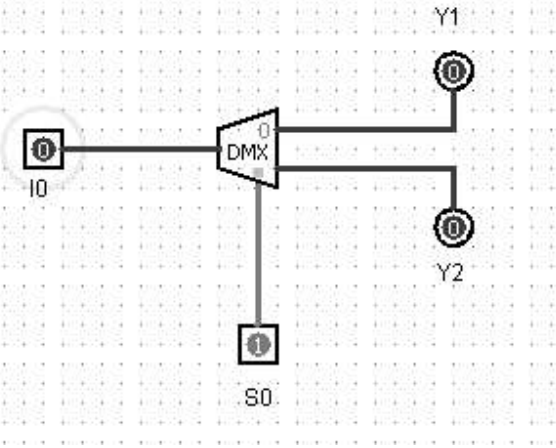
DEMUX:

1:2 DE-MULTIPLEXER:

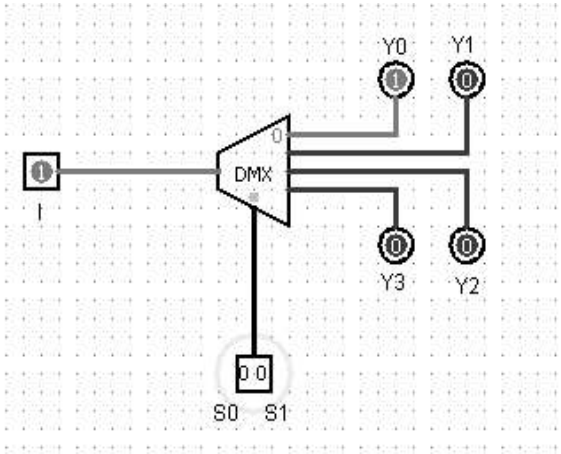


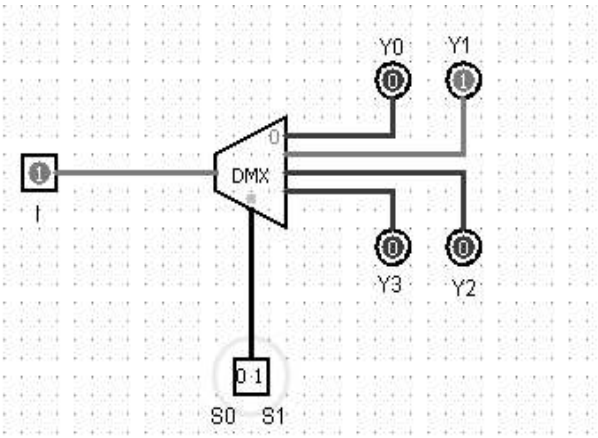


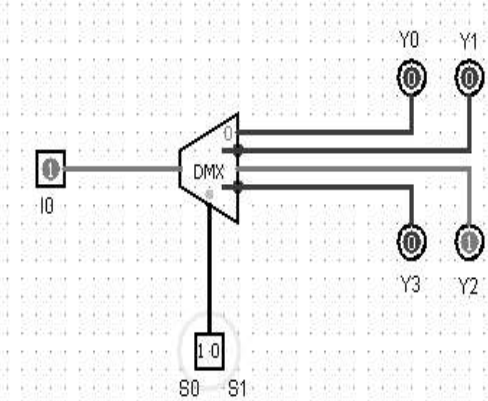


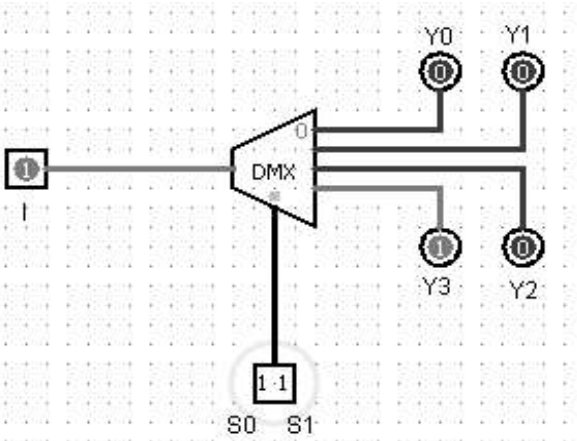


1:4 DE-MULTIPLEXER:

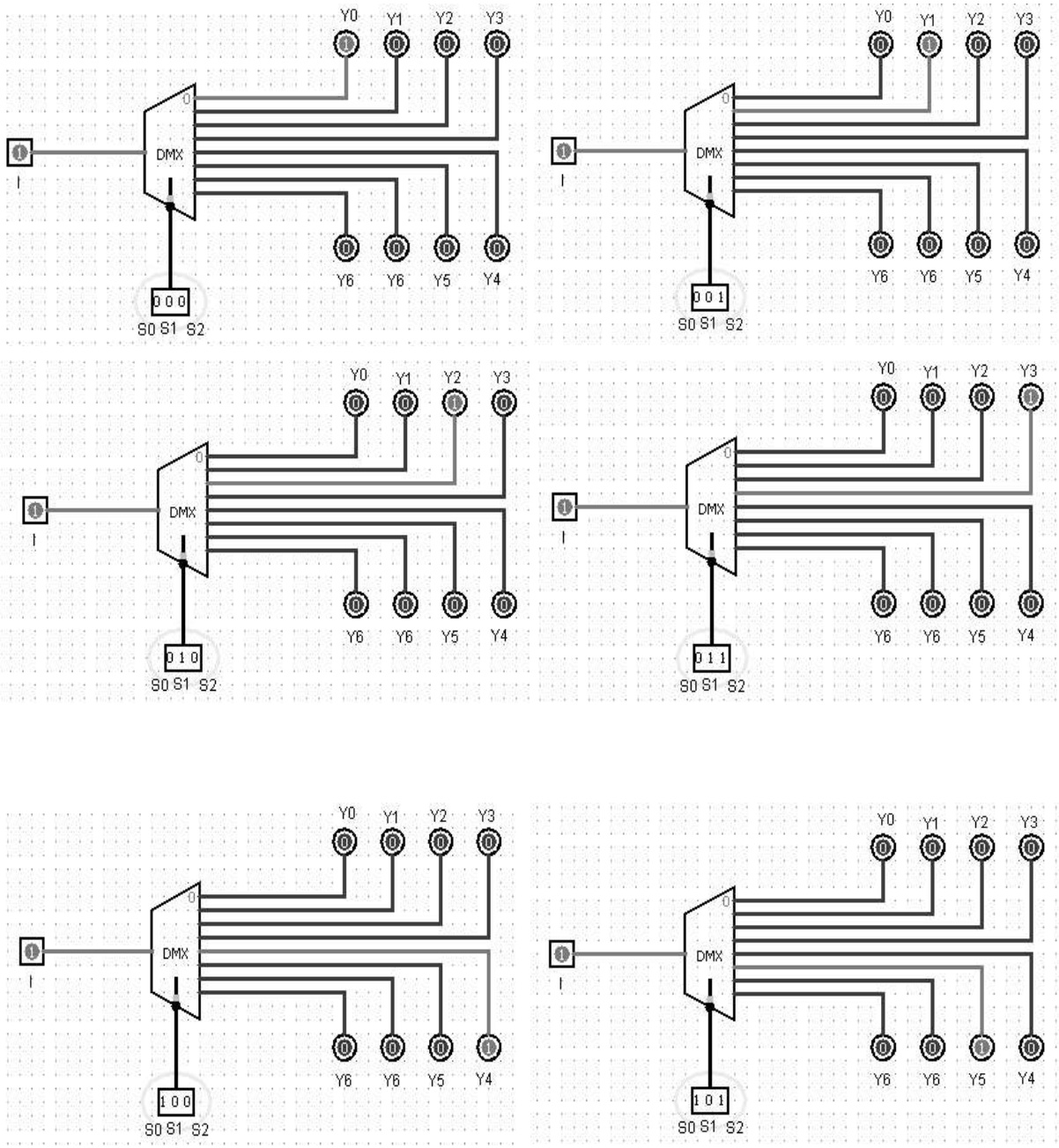




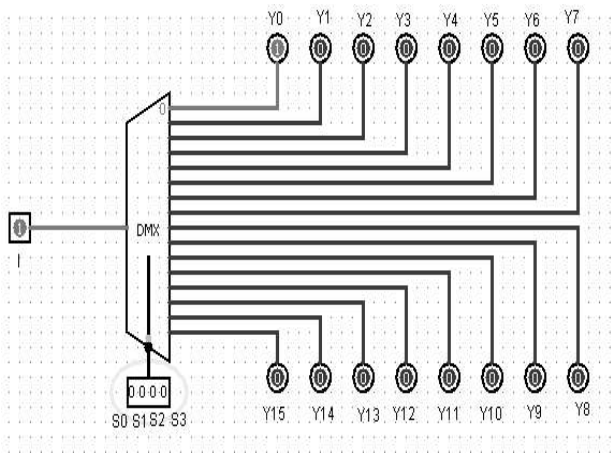


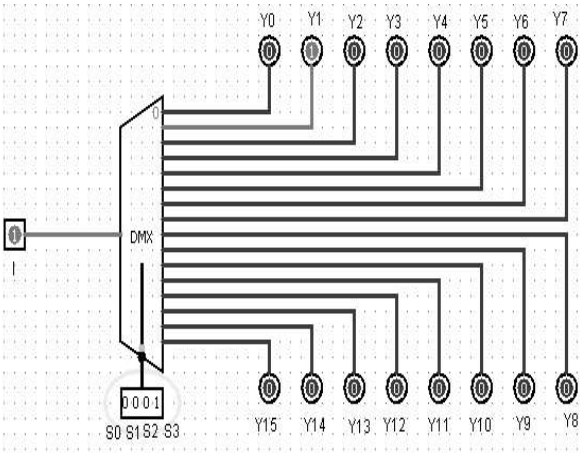


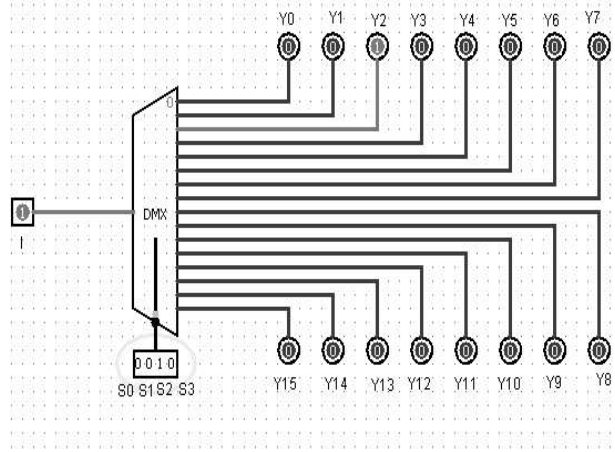
1:8 DE-MULTIPLEXER:

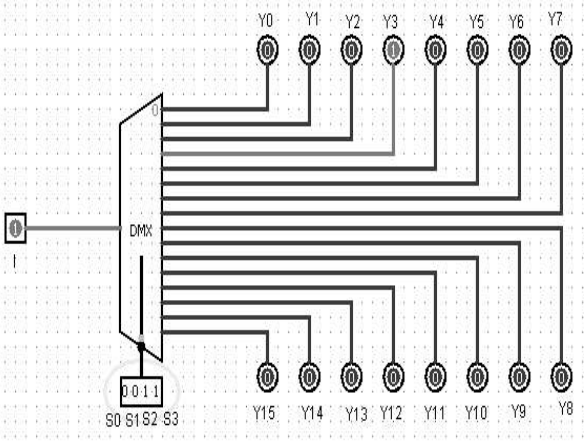


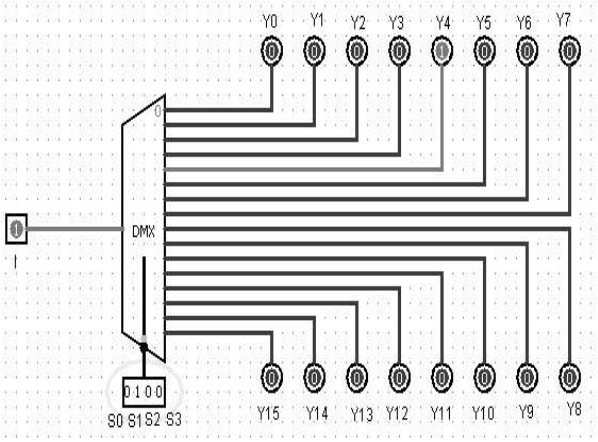
1:16 DE-MULTIPLEXER:

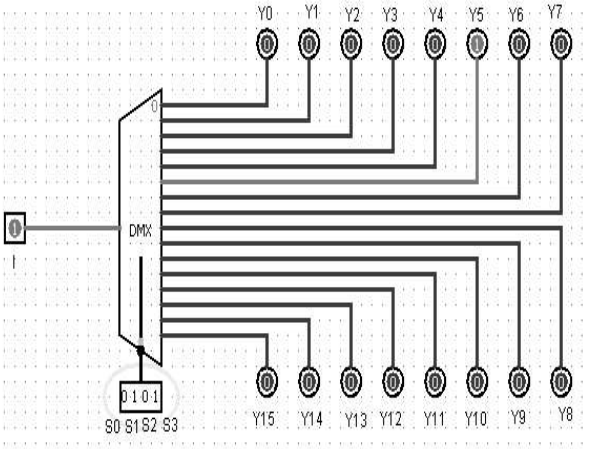


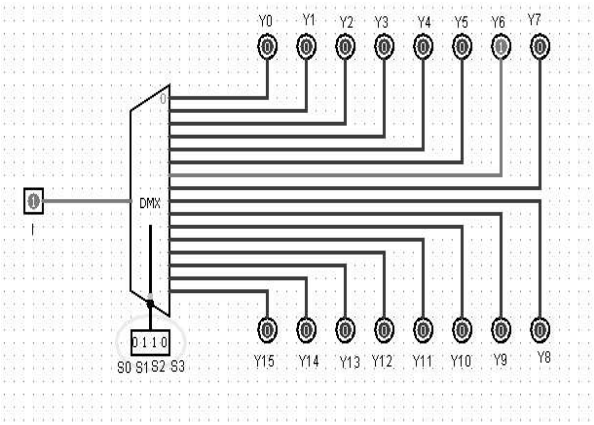








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DMX
I
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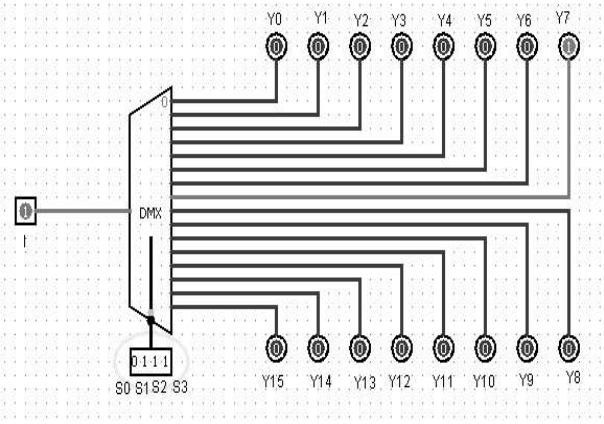
S0 S1 S2 S3
Y15 Y14 Y13 Y12 Y11 Y10 Y9 Y8


Y0 Y1 Y2 Y3 Y4 Y5 Y6 Y7
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