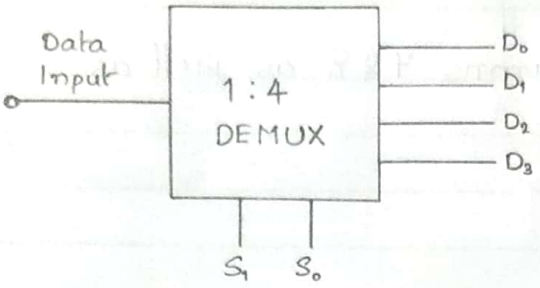
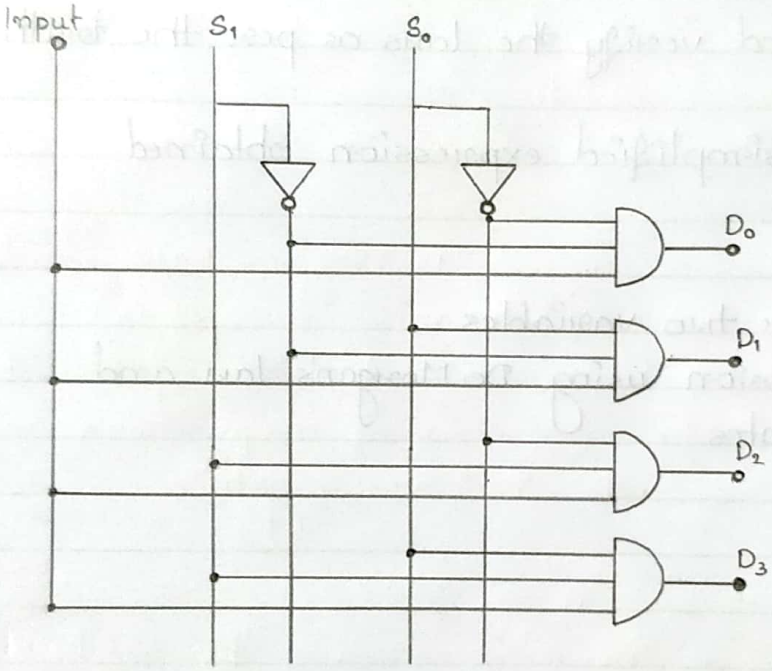
Demultiplexer



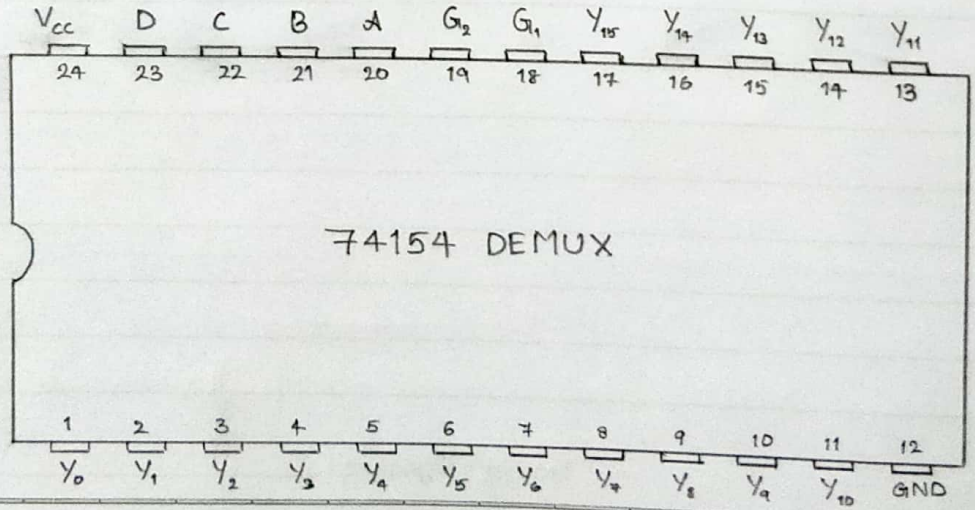
Truth Table

S_1	S_0	D_0	D_1	D_2	D_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

Logic Diagram



Pin Diagram



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Expt. No. 3 MULTIPLEXER AND DEMULTIPLEXER Page No. 17

Aim

1. To realize 4:1 and 1:4 multiplexer and demultiplexer using logic gates
2. To familiarize various multiplexer and demultiplexer ICs (IC 74150, IC 74151, IC 74154)
3. To realize the function using multiplexer IC
   $F(A,B,C,D) = \Sigma m(1,5,7,9,10,11,12)$

Components Required

IC 7404, IC 7411, IC 7432, IC 74150, IC 74151, IC 74154 and connecting wires

Theory

Multiplexers (MUX) and demultiplexers (DEMUX) are a special type of combinational circuits which are one of the most widely used standard circuits in digital design.

The multiplexer is a logic circuit that gates one out of several inputs to a single output. The input selected is controlled by a set of select inputs. For selecting one out of N inputs & connection to the output, a set of M select inputs is required where $2^M = N$

The demultiplexer performs the reverse operation of a multiplexer. It accepts a single input & distributes it over several outputs. The select input code determines to which output the data input will be transmitted. The number of output lines is N and the select lines is M, where $N = 2^M$

Standard MUX ICs are

4:1 - IC 74153

8:1 - IC 74151

DEMUX IC for 1:16 is IC 74154

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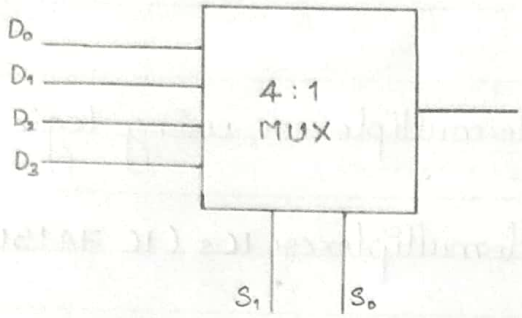
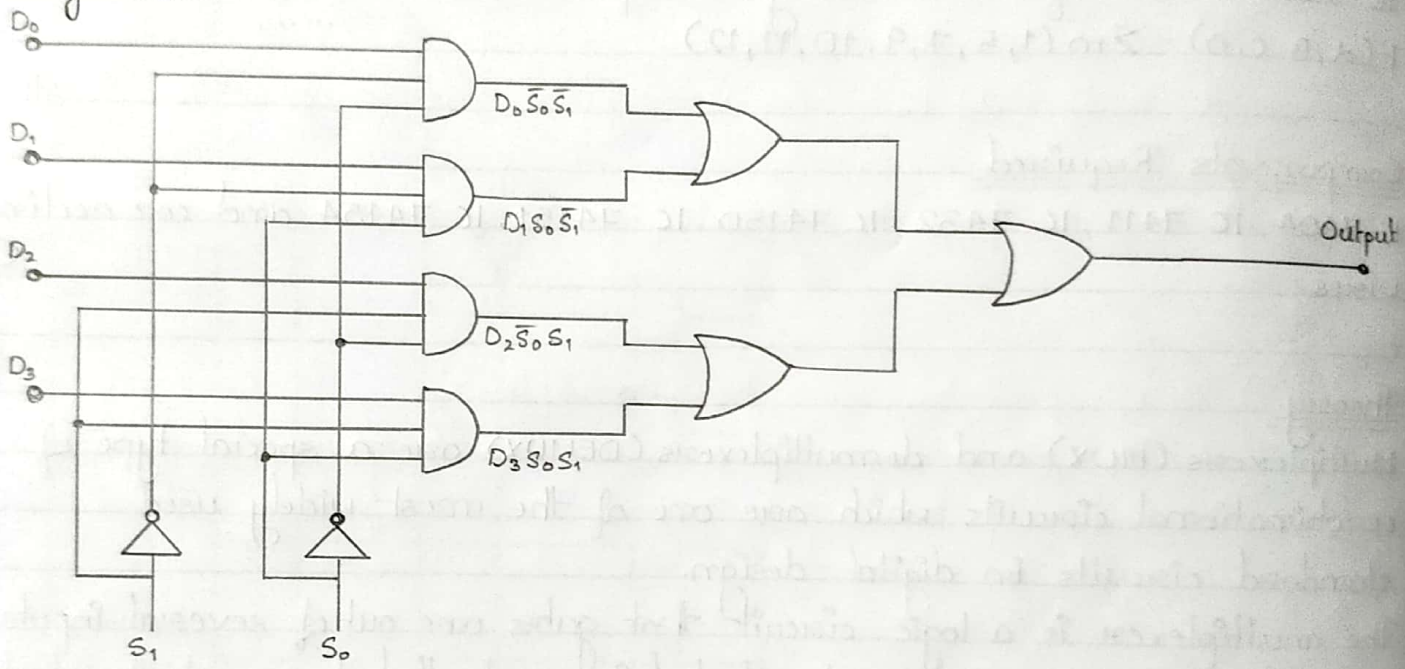
Multiplexer



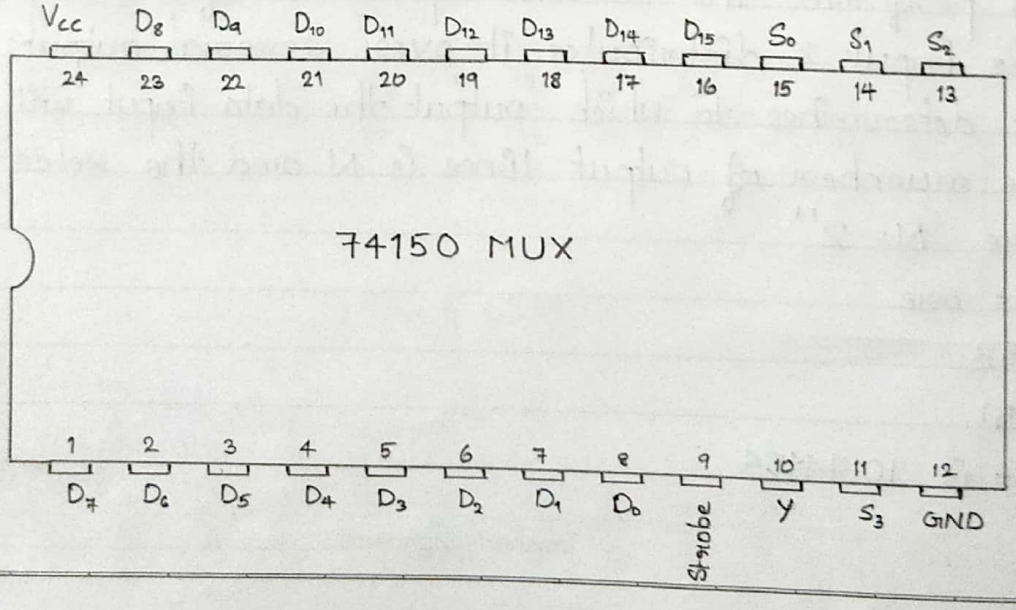
Truth Table

S_1	S_0	Y
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3

Logic Circuit



Pin Diagram



Binary/BCD conversions are most often encountered in connection with computer applications. Numerical data transmitted in BCD form from input devices must be converted to binary form so that arithmetic operations can be performed on it. The binary results of the arithmetic operations must then be converted to BCD for transmission to output devices. Conversion tables may be stored in the ROM.

IC 74150

The data selector contains full on chip decoding to select the desired data source. IC 74150 selects one of the 16 data sources to enable the device. A higher level at the strobe forces the output to be high & at a lower level it's output is low.

IC 74151

It is a popular 16 pin dual input IC that implements an 8:1 MUX. V_{cc} is on pin 15 & GND is on pin 8. Pins 5 & 6 are the outputs. On pin 6 is the inverted version of the output. The enable is on pin 7.

IC 74154

It is a 1-to-16 demultiplexer. To activate the IC, strobe must be active low. When the strobe is low, the control input determines which output lines are low when the data is low. When the data input is high, all output lines are high.

Procedure

Realization of MUX & DEMUX using ICs

1. Place ICs on the bread board.
2. Connect the V_{cc} & GND to respective pins.

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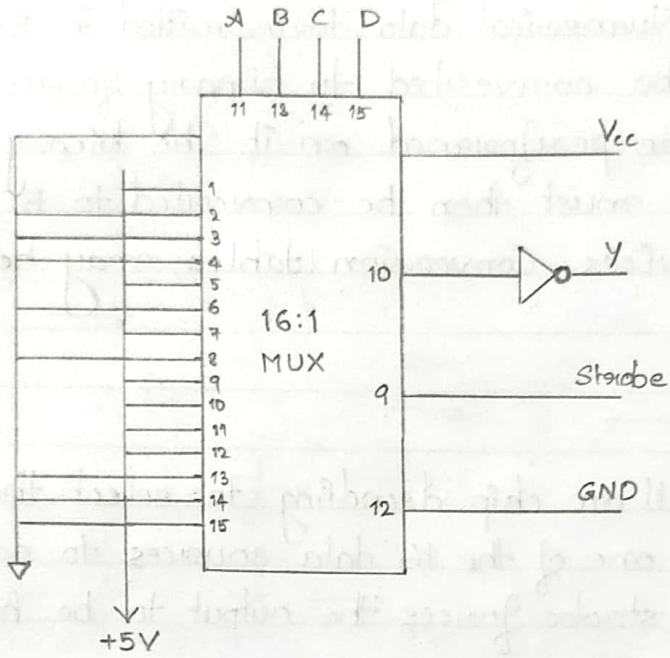
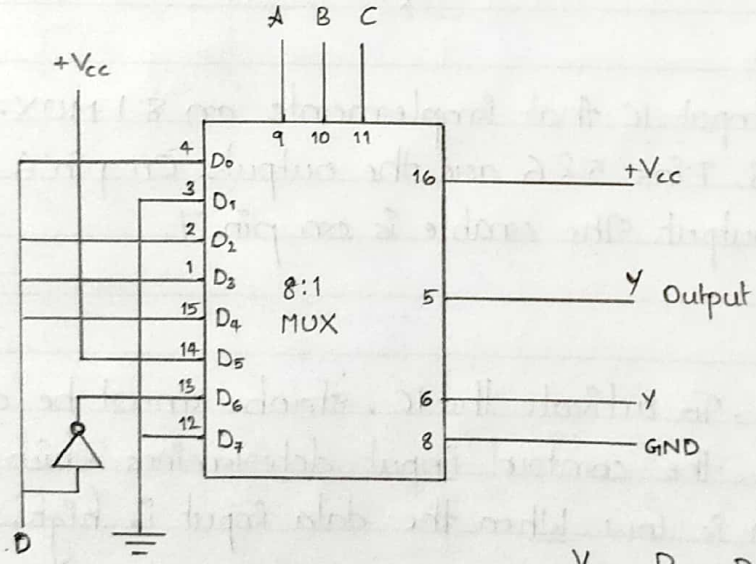
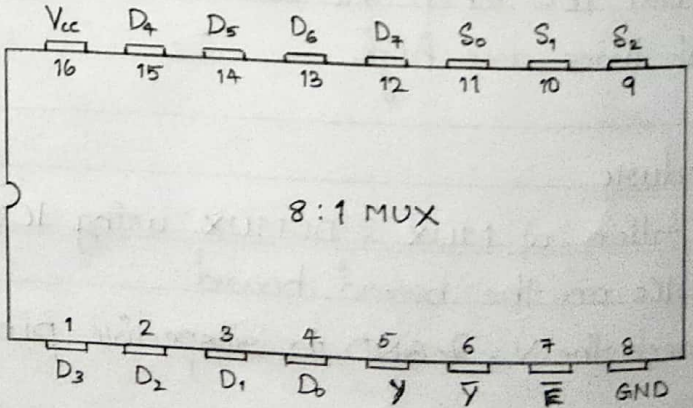
Realization of Function using Multiplexer IC

Given function is $Y = \Sigma m(1,5,7,9,10,11,12)$







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Expt. No. 3 Page No. 21

3. Provide input from the toggle switch.
4. Connect the output to the LED & verify the operation as per truth table.

Realization of Function using MUX IC

1. Check the ICs & place the ICs on bread board.
2. Connect Vcc & ground & set up the circuit as per the given diagram.
3. Simplify the given function & complement the 16:1 MUX & 8:1 MUX using ICs 74150 & 74151.
4. Verify the function table.

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