

ASSIGNMENT NO: 03

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AIM: Application like Realization of Boolean expression using MUX / DEMUX.

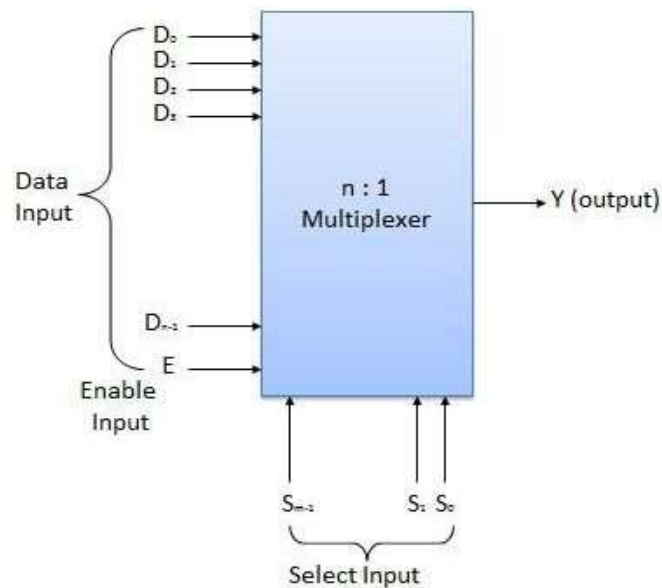
PROBLEM STATEMENT: Realization of Boolean expression for suitable combination logic using MUX 74151.

PRE-REQUISITE:

Digital trainer kit, ICs- 74151, 74LS08, 7404 Probs

THEORY:**Multiplexer (MUX)**

Multiplexer means transmitting a large number of information units over a smaller number of channels or lines. A digital multiplexer is a combinational circuit that selects binary information from one of many input lines and directs it to a single output line. The selection of a particular input line is controlled by a set of selection lines. Normally, there are 2^n input line and n selection lines whose bit combination determine which input is selected.

**Necessity of Multiplexer:**

Multiplexing technique is designed to reduce the number of electrical connections or leads in the display matrix. Whereas driving signals are applied not to each pixel (picture element) individually but to a group of rows and columns at a time. Besides reducing the number of individually independent interconnections, multiplexing also simplifies the drive electronics,

reduces the cost and provides direct interface with the microprocessors. There are limitations in multiplexing due to complex electro-optical response of the liquid crystal cell. However, fairly reasonable level of multiplexing can be achieved by properly choosing the multiplexing scheme, liquid crystal mixture and cell designing.

Types of Multiplexer:

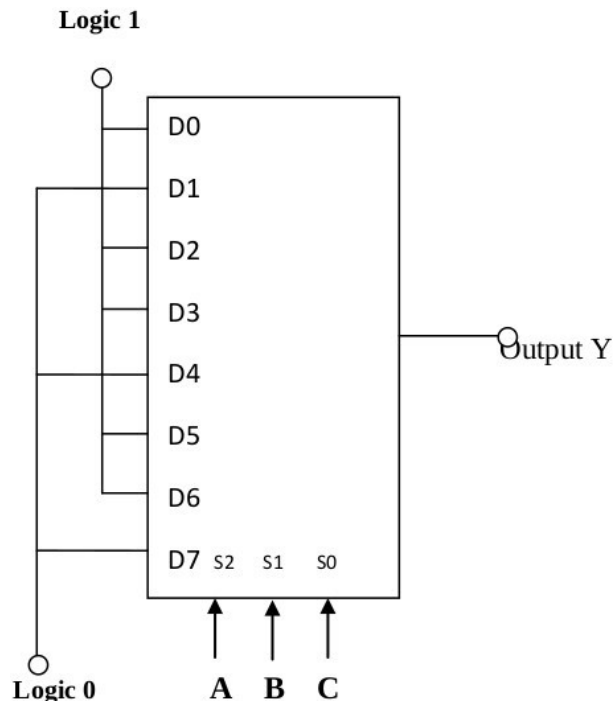
- 2-1 multiplexer (1select line)
- 4-1 multiplexer (2 select lines)
- 8-1 multiplexer(3 select lines)
- 16-1 multiplexer (4 select lines)

1. Implement the following expression using a MUX $F(A,B,C) = \sum m(0,2,3,5,6)$

Solution:

As there are three variables A,B and C, the MUX is having 3 select inputs. The function $\sum m$ gives numbers corresponding to each minterm as (0,2,3,5,6).

Thus, implementation of logic expression using a MUX is as shown below:



2. Implement the following Boolean function using 8:1

$$\text{MUX } F(A,B,C,D) = \sum m(2,5,7,8,9,10,13,15)$$

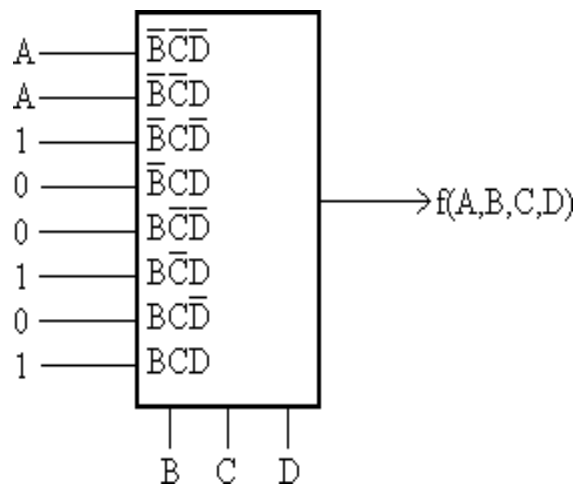
Solution:

The variables B,C,D are connected to the select lines S2, S1 & S0 respectively & A take as extra select input.

If the minterms are then listed together with the data variable set as true and false in order to find the data input values.

4	2	1	0	8	
B	C	D	\bar{A}	A	Data Value
0	0	0	0	⑧	A
0	0	1	1	⑨	A
0	1	0	②	⑩	1
0	1	1	3	11	0
1	0	0	4	12	0
1	0	1	⑤	⑬	1
1	1	0	6	14	0
1	1	1	⑦	⑮	1

Thus, implementation of logic expression using a MUX is as shown below:

**Applications of Multiplexers:**

1. Communication System
2. Computer Memory
3. Telephone Network

4. Transmission from the Computer System of a Satellite

QUESTIONS:

1. **What** is multiplexer?
2. Why MUX called data distributor?
3. What is difference between MUX and DEMUX?
4. What is Enable(E)?
5. What are applications of MUX?