Assignment 3

Title: Multiplexer

Problem Statement: Realization of Boolean Expression for suitable combonation logic using MUX 74151

Hardware and Software Requirements:

Theory:

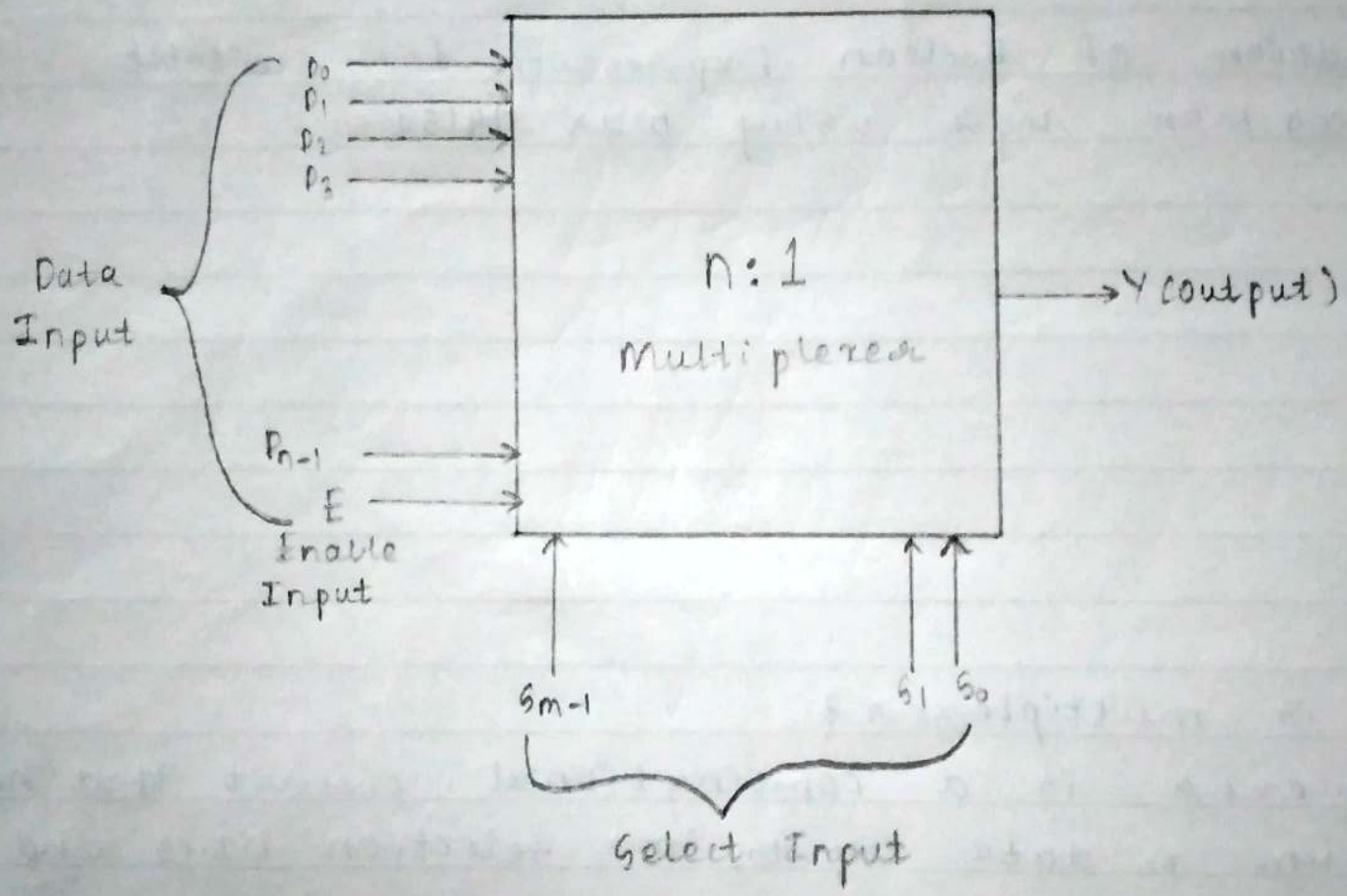
1) What is multiplexer?

- Multiplexer is a combinational circuit that has maximum n data inputs, 'm' selection lines and single output line.
- One of these data inputs will be connected to the output based on the values of selection lines.
- Relation between Data inputs (n) and select inputs (m) is $2^m = n$.

2) 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 individually but to a group of rows

→ Block diagram



and columns at a time.

- Besides reducing the number of individually independent inter connections, multiplexing also simplifies the drive electronics, reduces the cost and provides direct interface with the microprocessors.

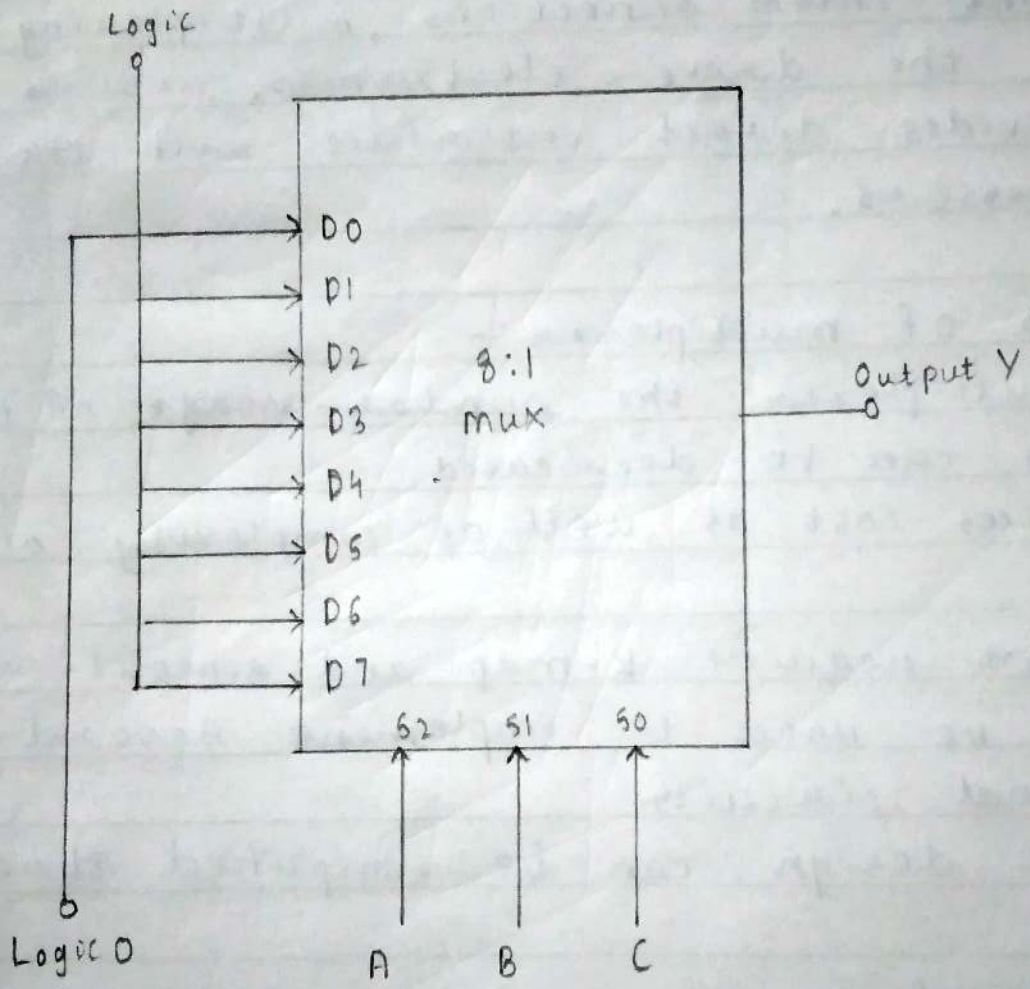
3) Advantages of multiplexer :-

- In a multiplexer the ~~number~~ usage of number of wires can be decreased.
- It reduces cost as well as complexity of the circuit.
- MUX doesn't require K-map and simplification.
- MUX can be used to implement several combinational circuits.
- The logic design can be simplified through mux.

4) Applications of MUX :-

- Multiplexer is used as a data selector device
- Multiplexers are used in communication systems to increase efficiency of the system.
- To maintain large amount of data, multiplexers are used in computer memory systems.
- Multiplexers are also used in PLC (Programmable Logic Control) systems.
- Multiplexers are used in communication systems to increase the efficiency of the system.

- Diagram



Design:

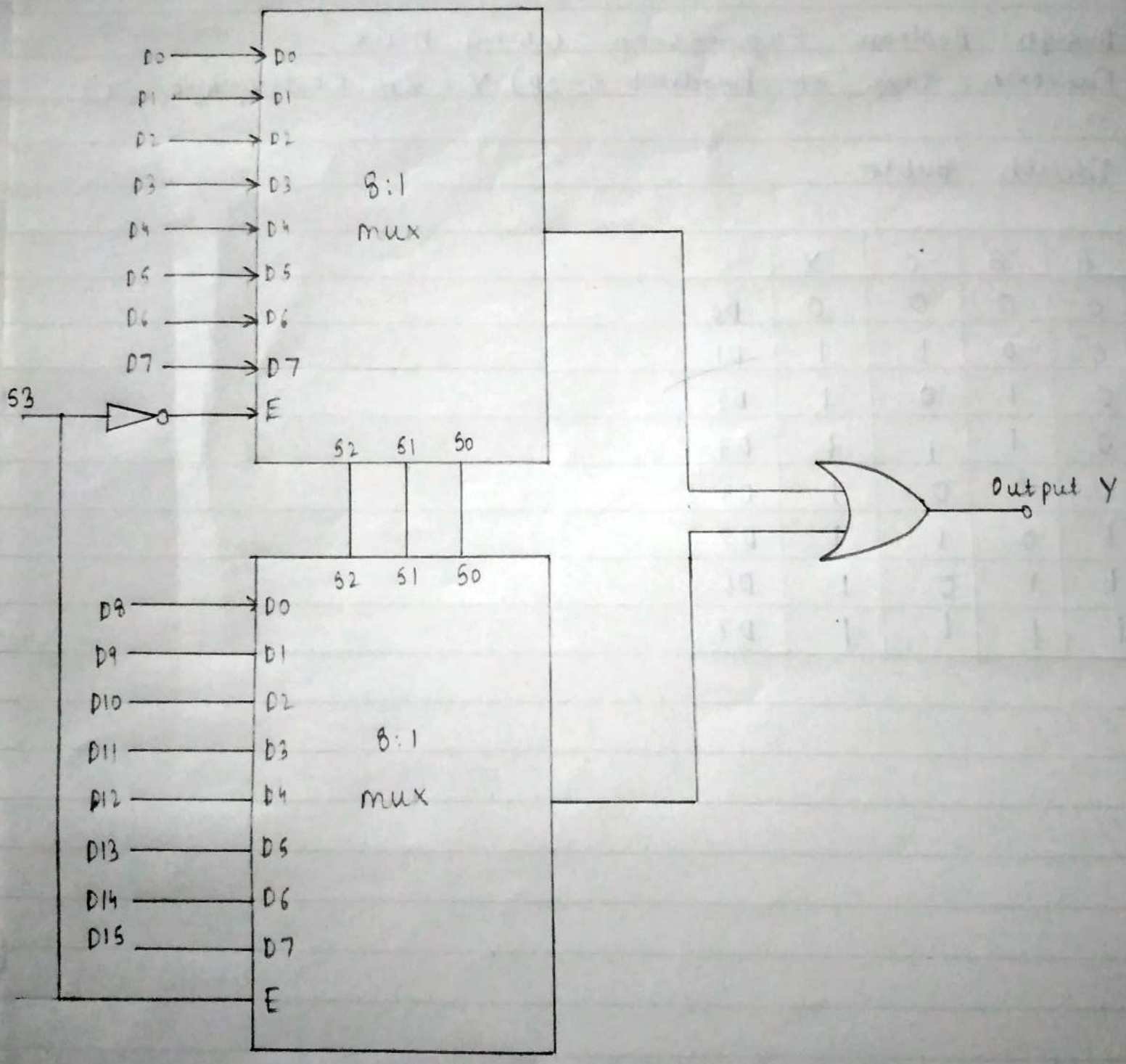
1. Design Boolean Expression using mux

Function = Sum of Product (SOP) $Y = \Sigma m (1,2,3,4,5,6,7)$

- Truth table

A	B	C	Y	
0	0	0	0	D0
0	0	1	1	D1
0	1	0	1	D2
0	1	1	1	D3
1	0	0	1	D4
1	0	1	1	D5
1	1	0	1	D6
1	1	1	1	D7

2. Implementation of 16:1 mux using 8:1 mux



→ $F(A,B,C,D) = \Sigma m(2,4,5,7,10,\&14)$

• Use hardware reduction method and implement the given Boolean expression with the help of neat logic diagram. (N-Cicele Method).

→ Simplification

• Truth table

	D0	D1	D2	D3	D4	D5	D6	D7
$\bar{A}$	0	1	2	3	4	5	6	7
A	8	9	10	11	12	13	14	15
I/P to mux	0	0	1	0	$\bar{A}$	$\bar{A}$	A	$\bar{A}$

Conclusion: Realized Boolean Expression for a suitable combination logic using MUX 74151

• Diagram