Basic Electronics Engineering (Spring 2024)

Resources of PPT:

- www.google.com

- Digital Design, 4th Edition
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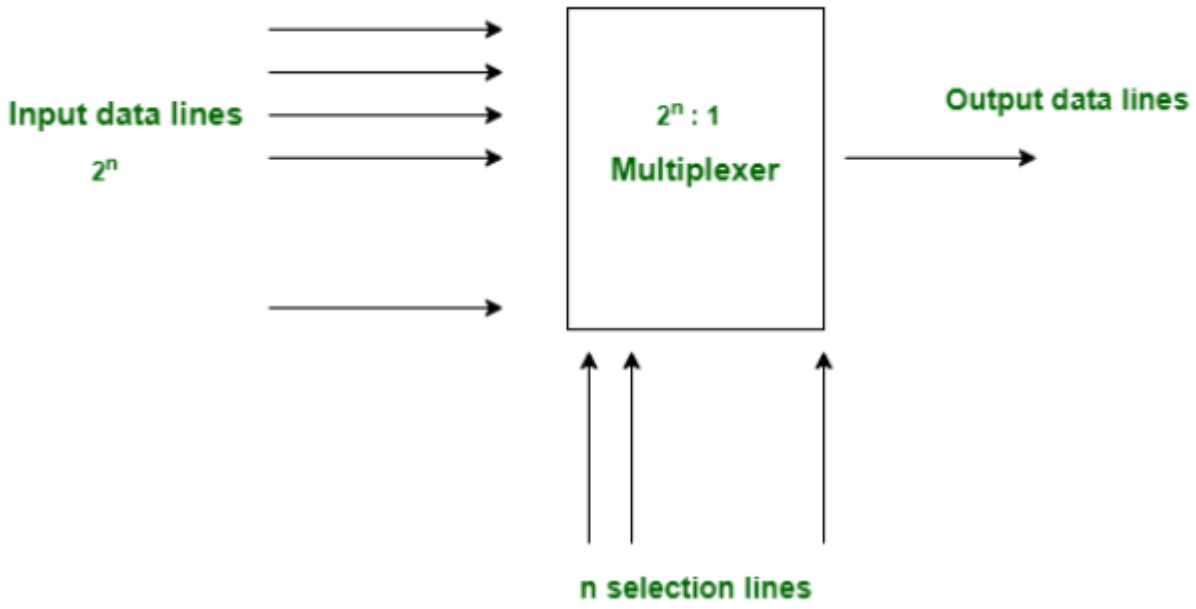
Combinatorial Circuit

MULTIPLEXER /DATA SELECTOR:

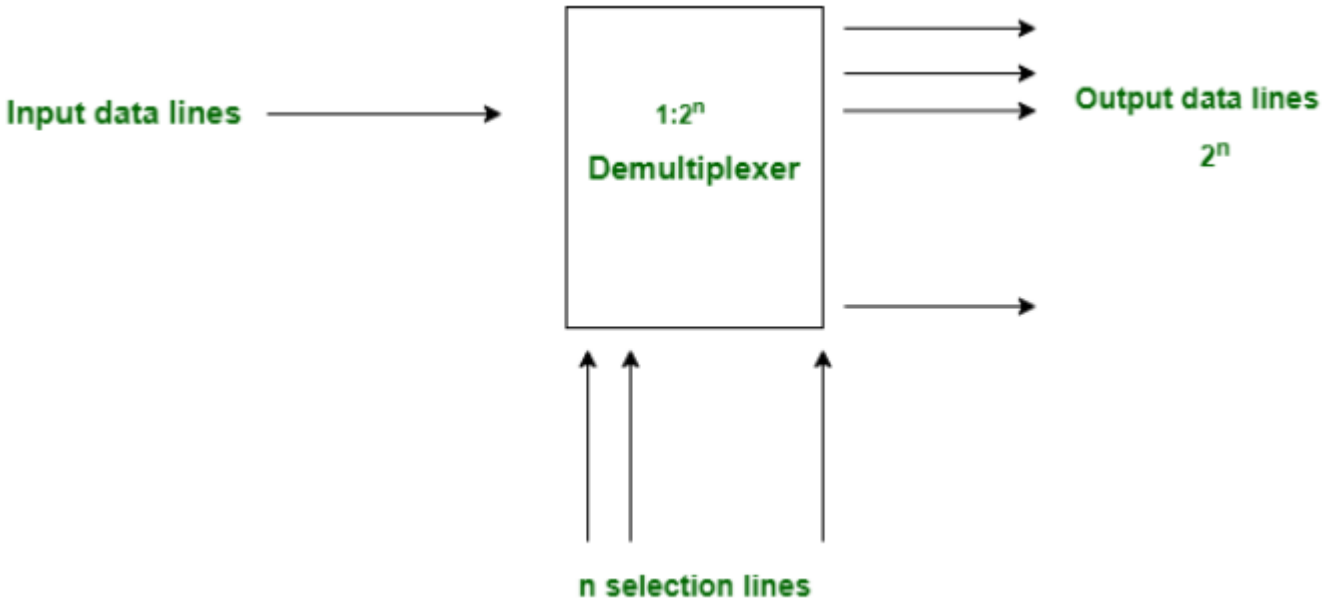
Multiplexer is a data selector which takes several inputs and gives a single output.In multiplexer we have 2^n input lines and 1 output lines where n is the number of selection lines.



Combinatorial Circuit

DEMULTIPLEXER /DATA DISTRIBUTOR:

Demultiplexer is a data distributor which takes a single input and gives several outputs.In demultiplexer we have 1 input and 2^n output lines where n is the selection line.



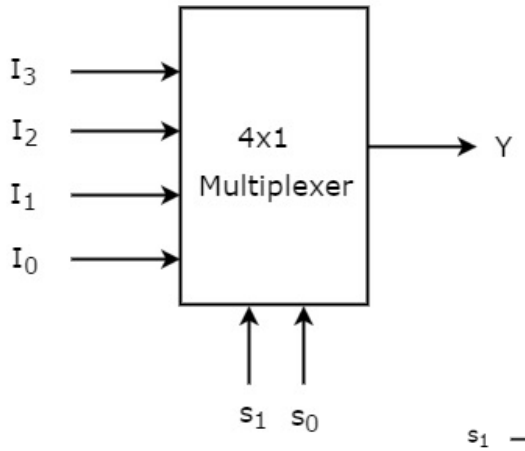
Combinatorial Circuit

Difference between of Multiplexer and Demultiplexer :

Multiplexer	Demultiplexer
Multiplexer processes the digital information from various sources into a single source.	Demultiplexer receives digital information from a single source and converts it into several sources
It is known as Data Selector	It is known as Data Distributor
Multiplexer is a digital switch	Demultiplexer is a digital circuit
It follows combinational logic type	It also follows combinational logic type
It has 2^n input data lines	It has single input line
It has a single output data line	It has 2^n output data lines
It works on many to one operational principle	It works on one to many operational principle
In time division Multiplexing, multiplexer is used at the transmitter end	In time division Multiplexing, demultiplexer is used at the receiver end

Combinatorial Circuit

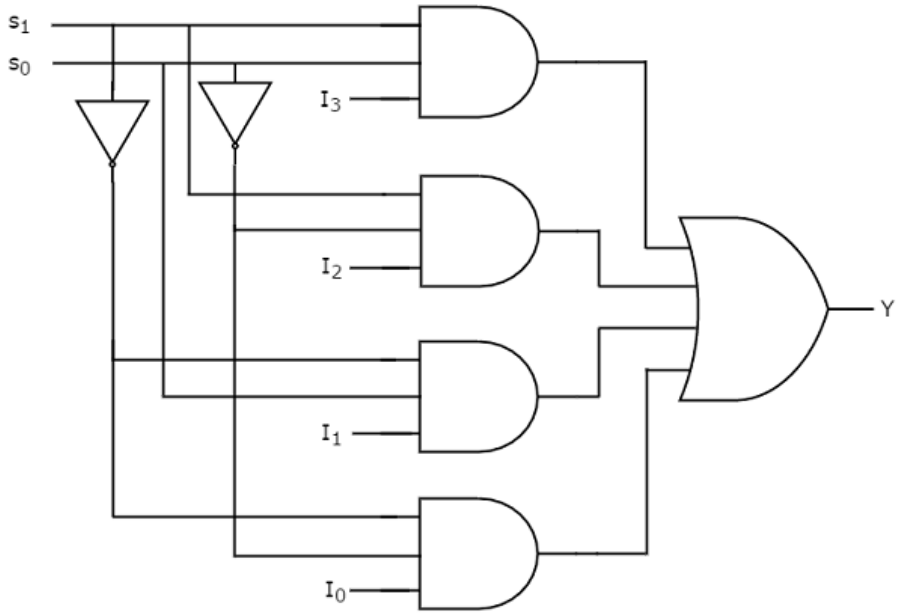
4x1 Multiplexer



Selection Lines		Output
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

From Truth table, we can directly write the **Boolean function** for output, Y as

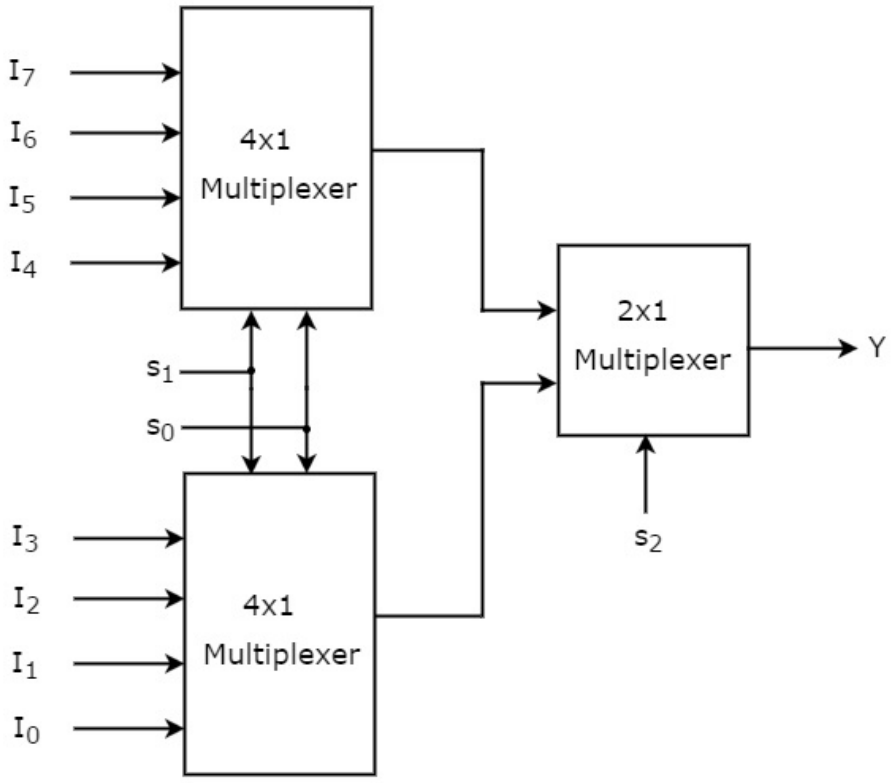
$$Y = S_1'S_0'I_0 + S_1'S_0I_1 + S_1S_0'I_2 + S_1S_0I_3$$



Combinatorial Circuit

8x1 Multiplexer

Selection Inputs			Output
S_2	S_1	S_0	Y
0	0	0	I_0
0	0	1	I_1
0	1	0	I_2
0	1	1	I_3
1	0	0	I_4
1	0	1	I_5
1	1	0	I_6
1	1	1	I_7



For further resource: https://www.tutorialspoint.com/digital_circuits/digital_circuits_multiplexers.htm
https://www.youtube.com/watch?v=4Ouy2NKtfVA

Combinatorial Circuit

Implementation of Combinational Logic using MUX

Problem 1: Implement the given function using multiplexer F (X,Y,Z) =∑m (0, 2, 6, 7)

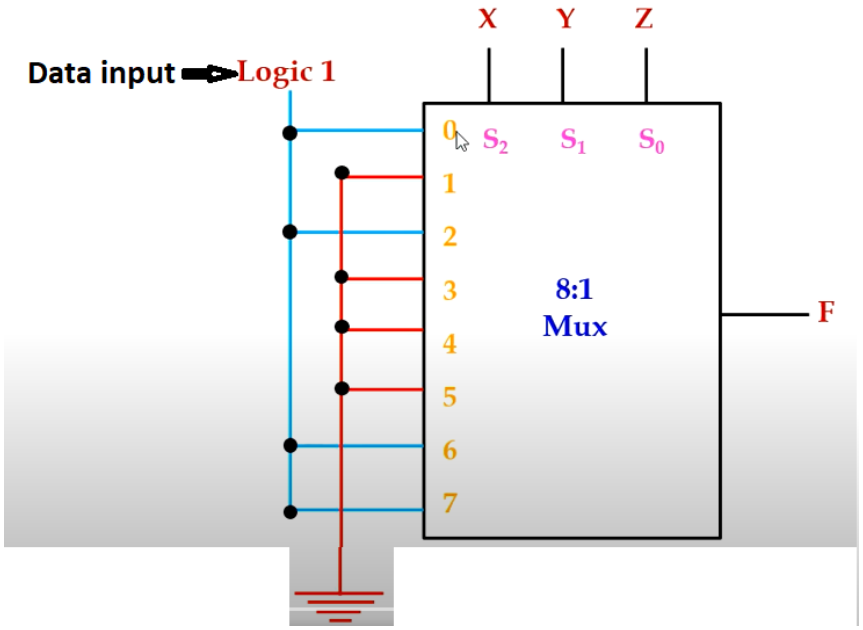
Since maximum minterm is 7, it needs to consider at least 3 control/selection variables.

Step 1: Select the multiplexer

Step 2: Connect inputs corresponds to the present minterms to logic 1

Step 3: Connect remaining inputs to logic 0

Step 4: Connect input variables to select lines of MUX



For further resource: https://www.youtube.com/watch?v=jUNHFvdBdYs

Combinatorial Circuit

DEMULTIPLEXER

Control Signal		Data	Output
A	**B**	**D**	**Y**
0	0	D	Y0 = AND(0,0,D)
0	1	D	Y1 = AND(0,1,D)
1	0	D	Y2 = AND(1,0,D)
1	1	D	Y3 = AND(1,1,D)