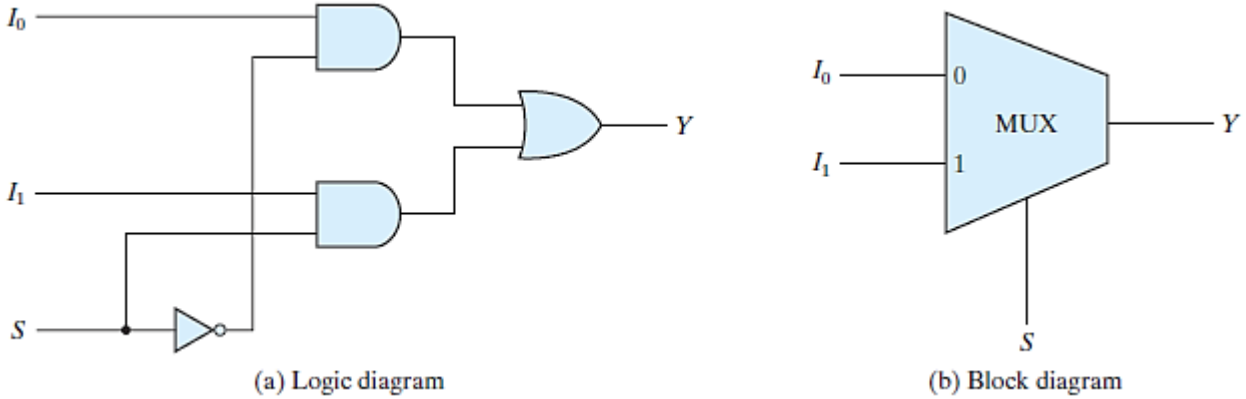
Exp. No.8 Multiplexer (MUX) and Demultiplexer(DEMUX)

By: Assistant Professor Maha George Zia

Multiplexer

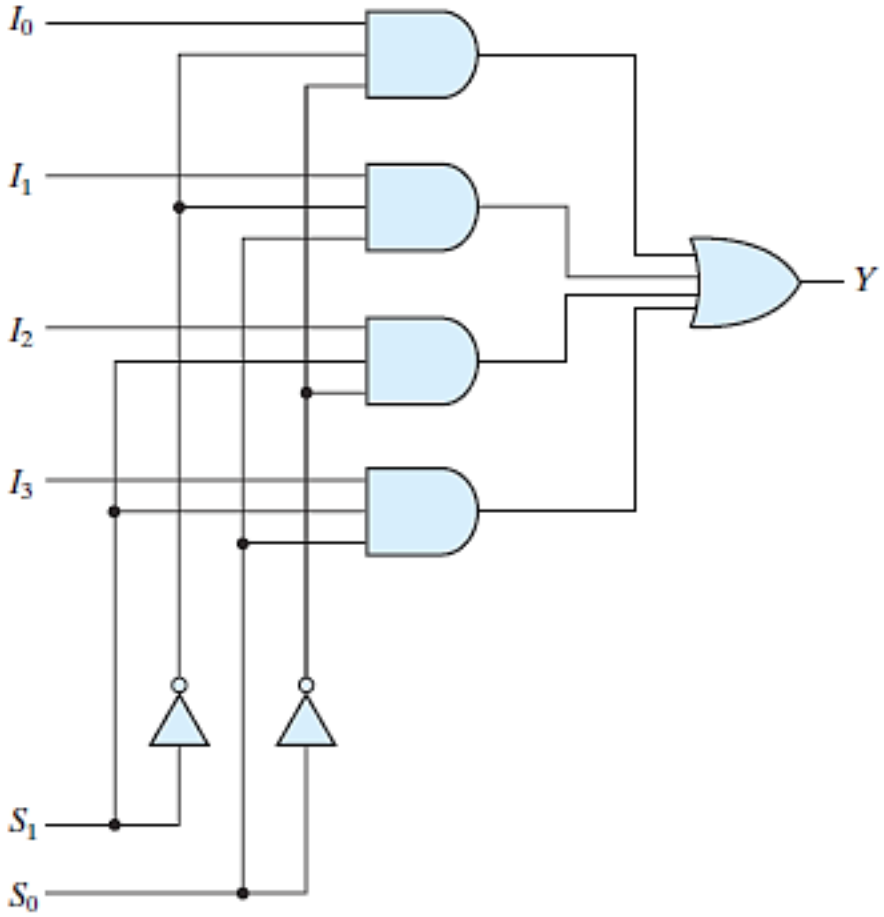
- A multiplexer is a combinational circuit that selects binary information from one of many input lines and directs it to a single output line.
- The selection of a particular input line is controlled by a set of selection lines. Normally, there are 2^n input lines and n selection lines whose bit combinations determine which input is selected.



Two-to-one-line multiplexer

- $Y = I_o . \bar{S} + I_1 . S$

- When the select line, S=0, the output of the lower AND gate is zero, but the upper AND gate is I_0. Thus, the output generated by the OR gate is equal to I_0.
- Similarly, when S=1, the output of the upper AND gate is zero, but the output of lower AND gate is I_1. Therefore, the output of the OR gate is I_1.
- Thus, the Boolean expression for the output becomes I_0 when S=0 and output is I_1 when S=1.



(a) Logic diagram

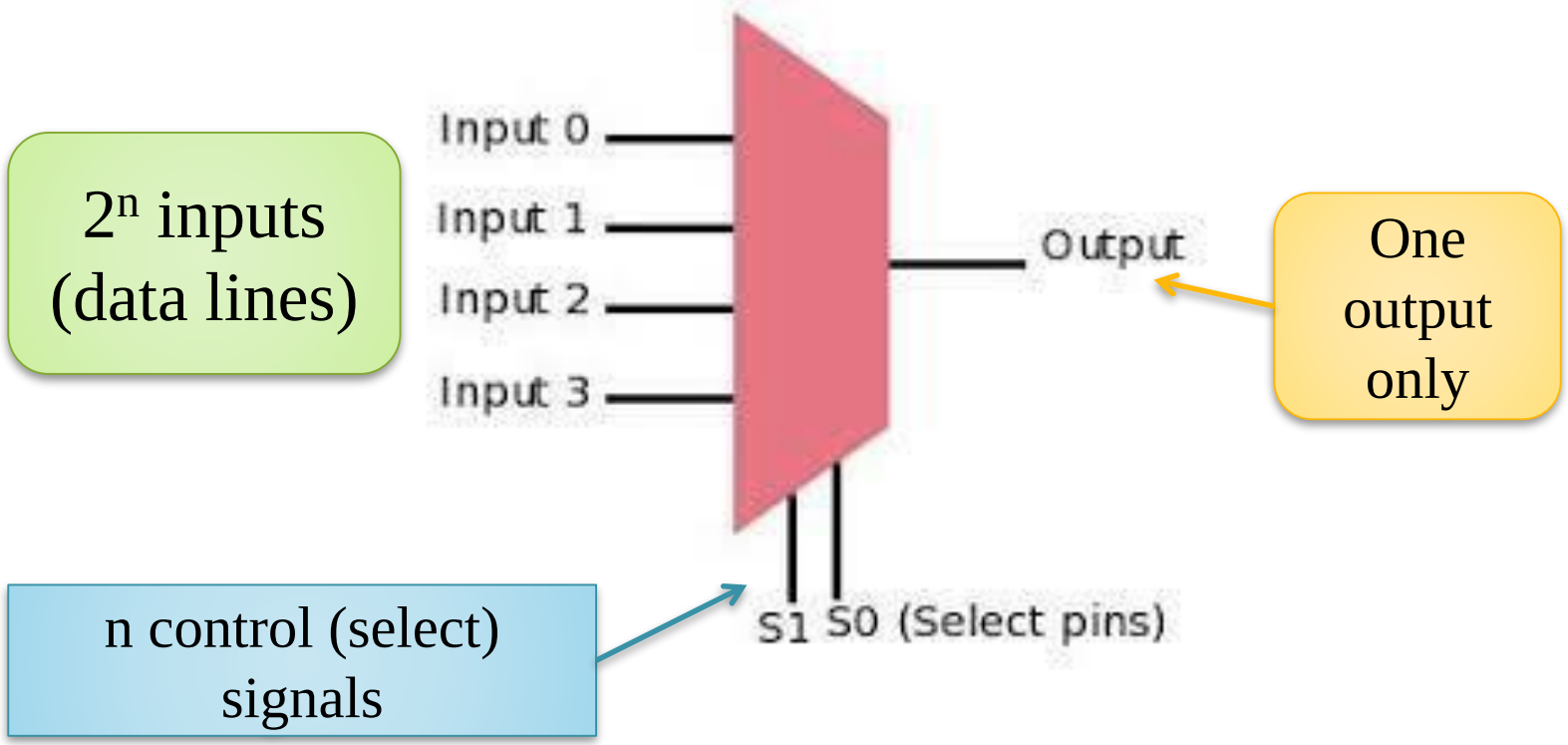
H.W Find the equation of Y of 4-to-1 line MUX

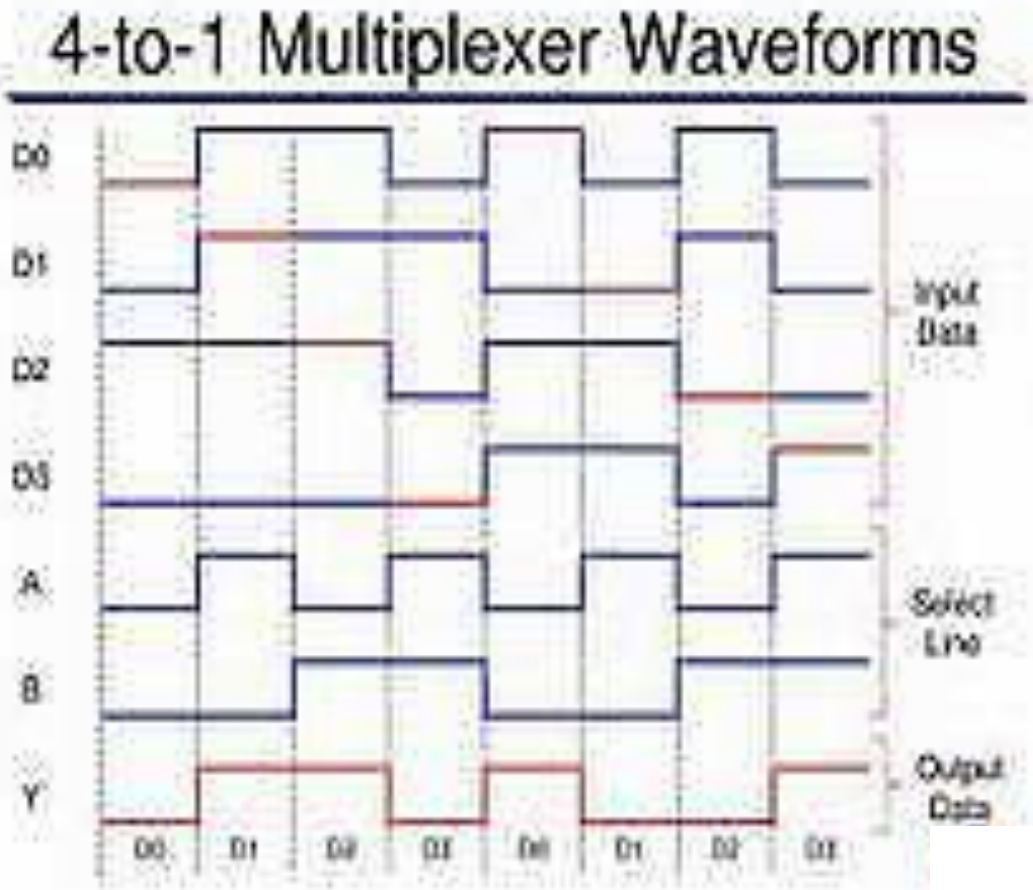
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

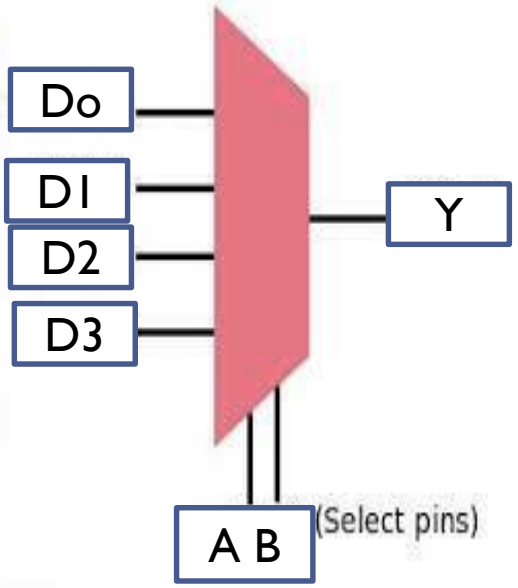
(b) Function table

Four-to-one-line multiplexer

- The size of a multiplexer is specified by the number 2^n of its data input lines and the single output line. The n selection lines are implied from the 2^n data lines.

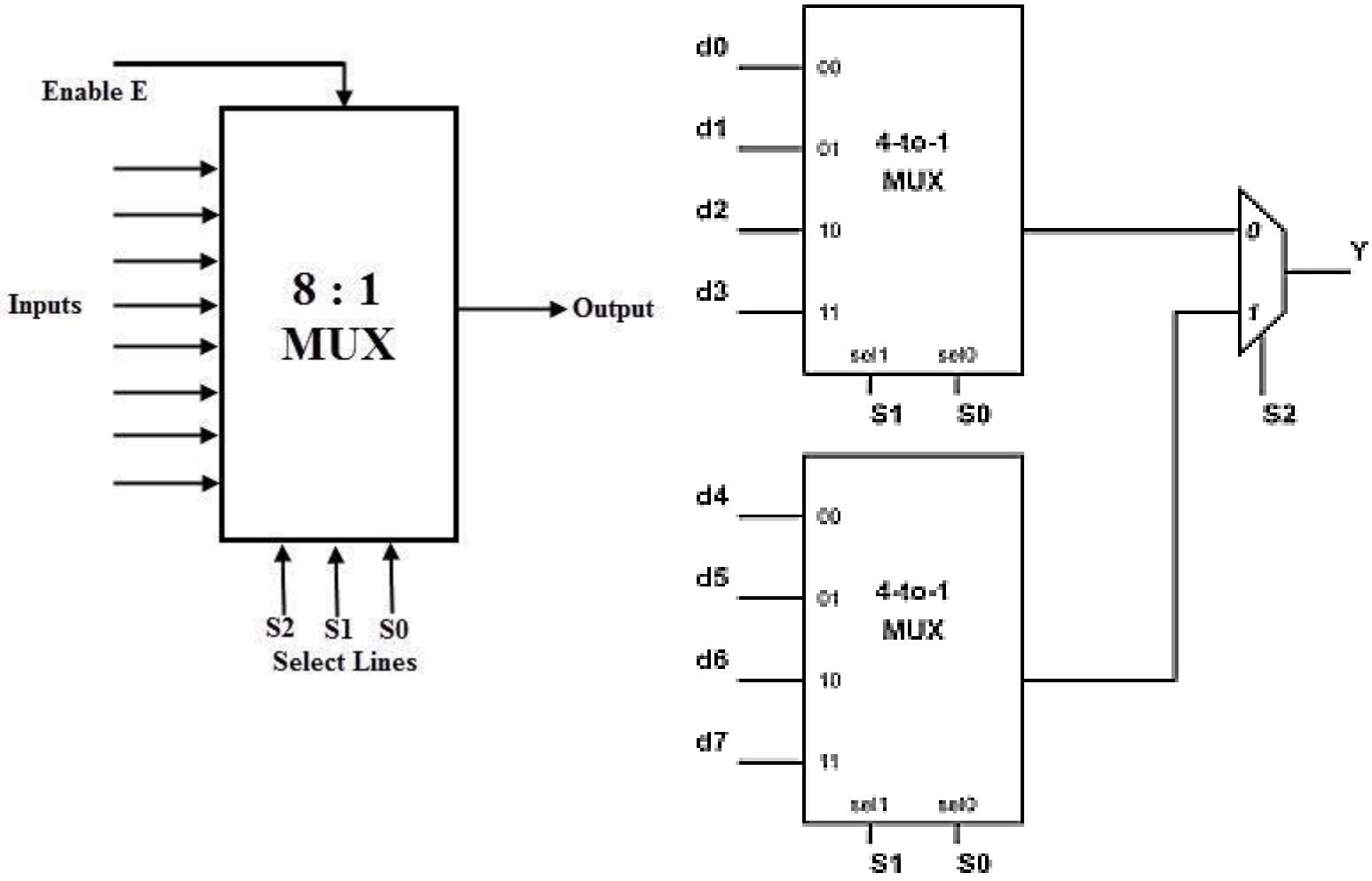




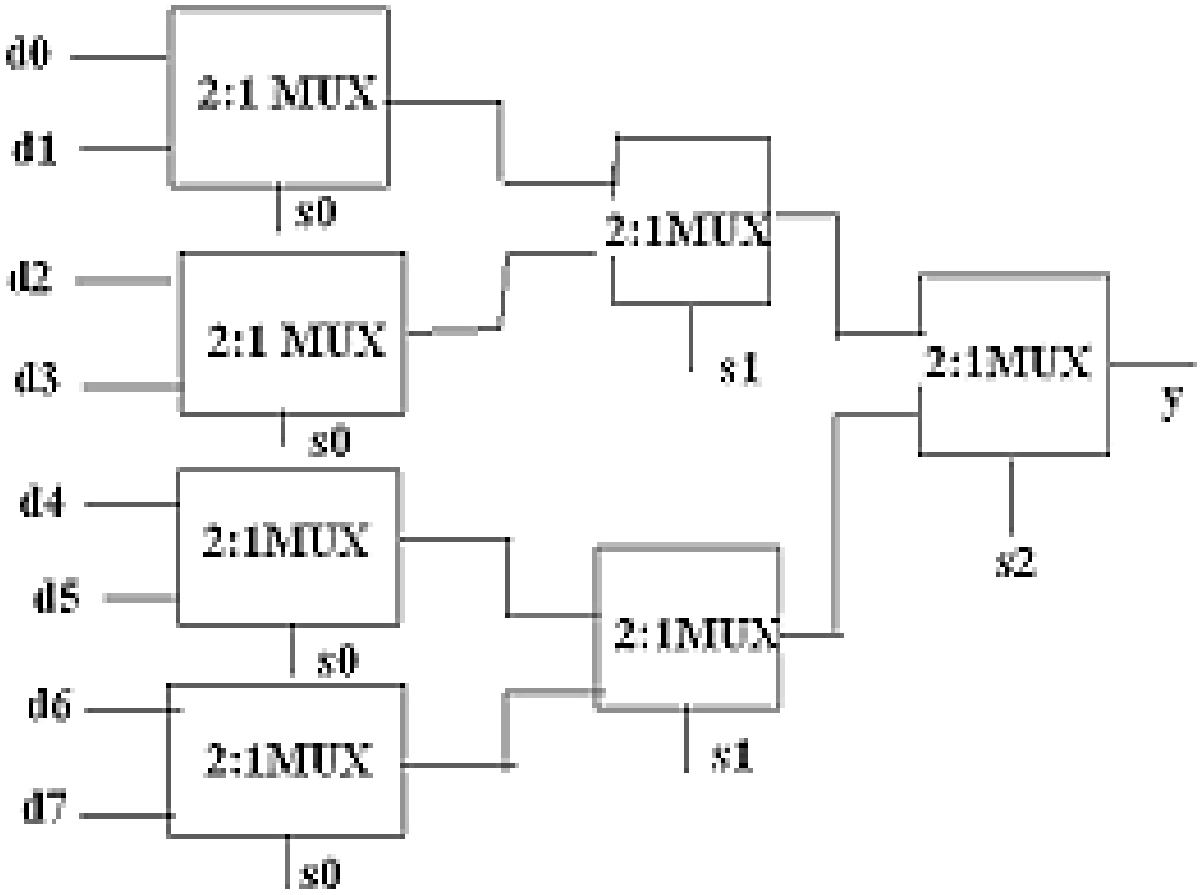


A	B	Y
0	0	D0
0	I	DI
I	0	D2
I	I	D3

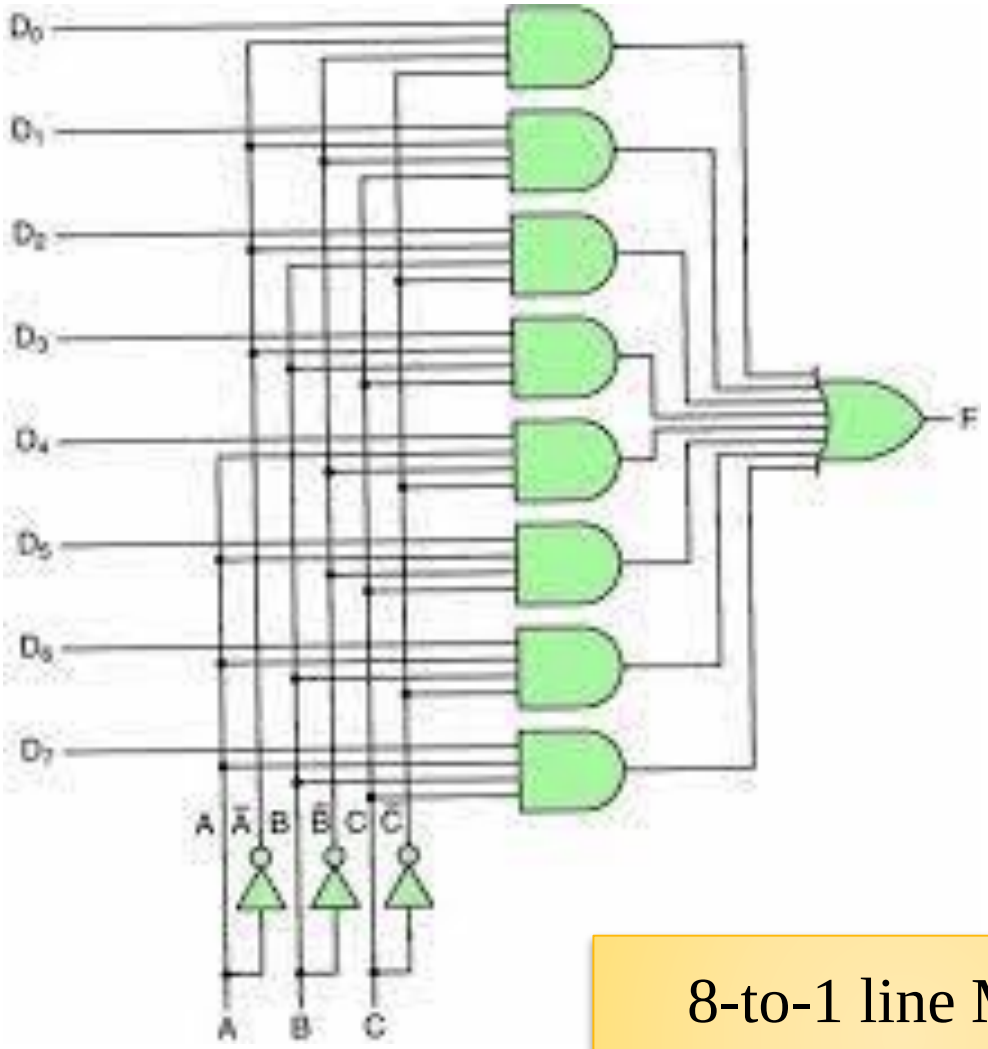
8-to-1 line MUX



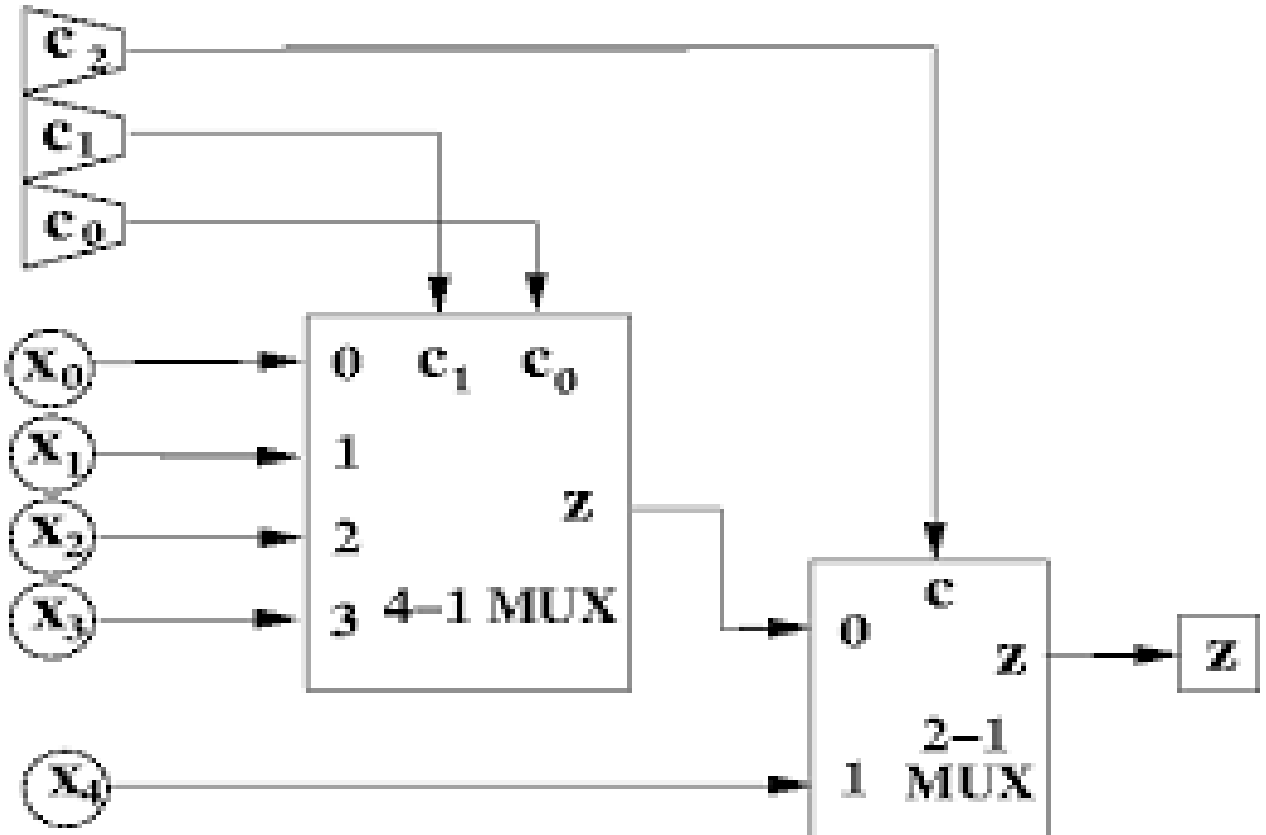
8-to-1 line MUX using 4-to-1 MUX and 2-to-1 MUX



8-to-1 line MUX using 2-to-1 MUX



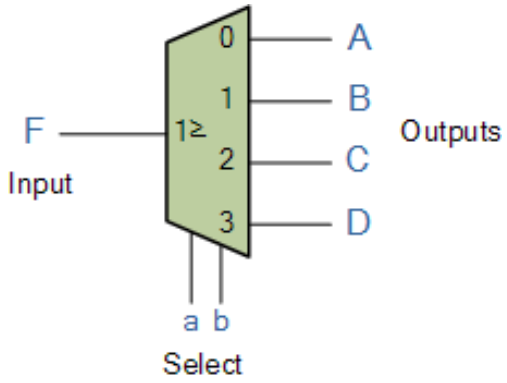
8-to-1 line MUX using logic gates



5-to-1 line MUX using 4-to-1 MUX and 2-to-1 MUX

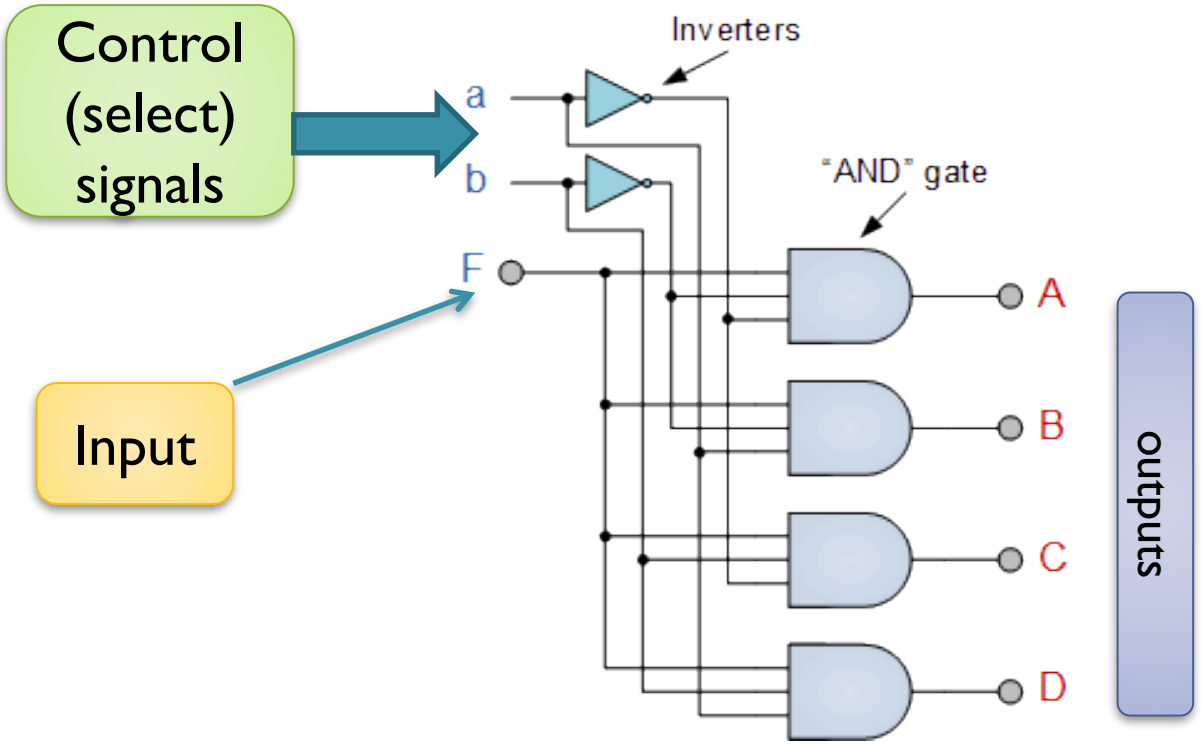
Demultiplexer

- The demultiplexer takes one single input data line and then switches it to any one of a number of individual output lines one at a time.
- The demultiplexer converts a serial data signal at the input to a parallel data at its output lines.

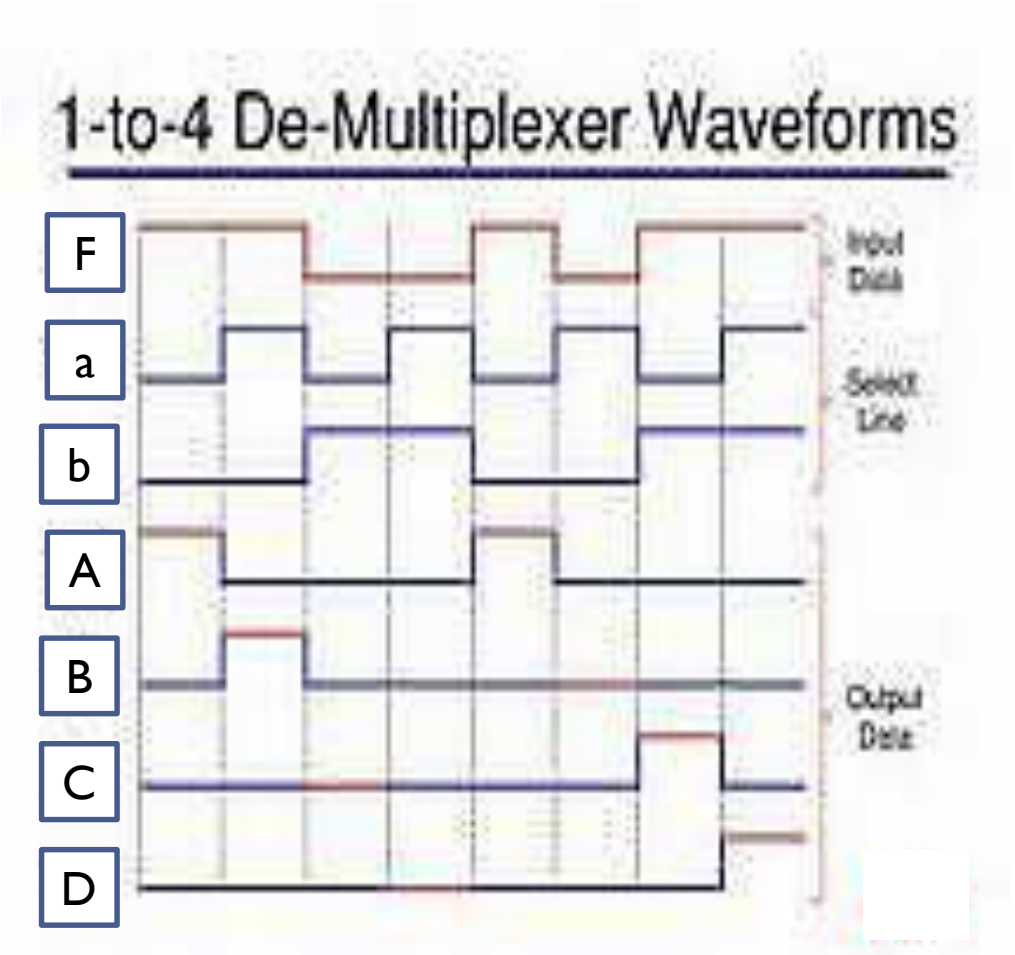


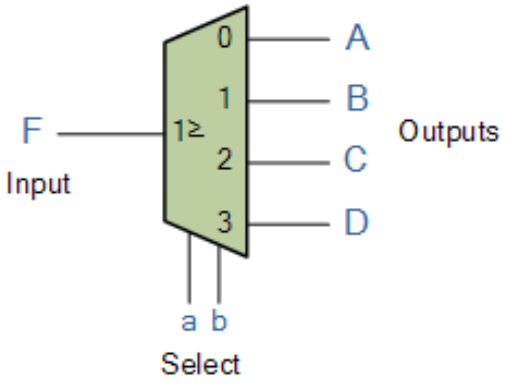
a	b	o/p
0	0	A
0	I	B
I	0	C
I	I	D

I – to- 4 line Demultiplexer



1 – to- 4 line Demultiplexer logic diagram


1-to-4 De-Multiplexer Waveforms
F
a
b
A
B
C
D
Input Data
Select Line
Output Data


F
Input
1≥
0
1
2
3
A
B
C
D
Outputs
a b
Select