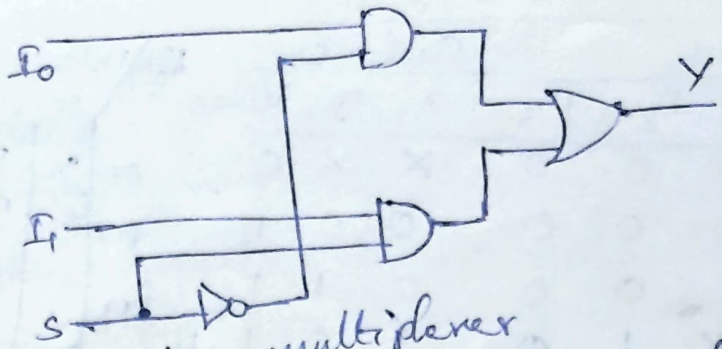
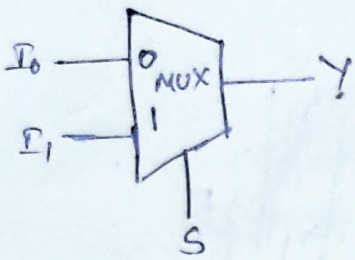


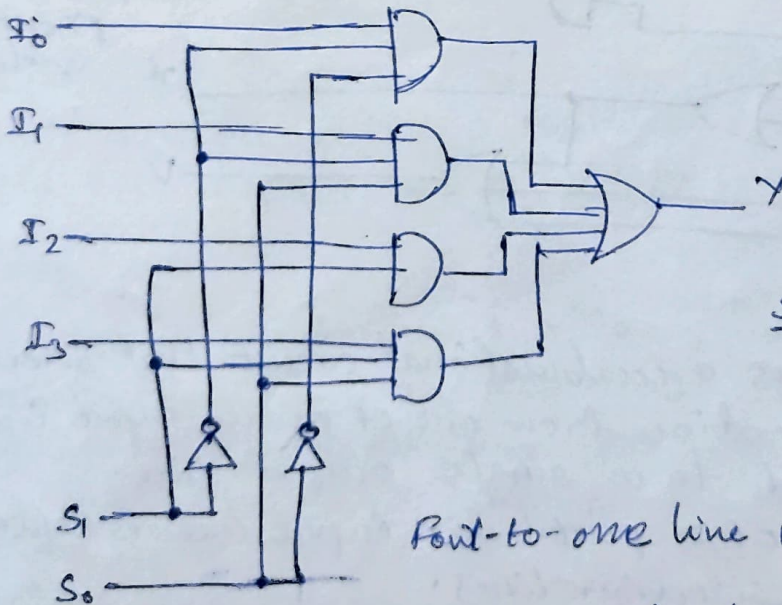
• Multiplexers

- 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.
- A two-to-one line multiplexer has two data input lines, one output line and one selection line.



Two-to-one line multiplexer

- When $S=0$, the upper AND gate is enabled and I_0 has the path to the output.
- When $S=1$, the lower AND gate is enabled and I_1 has a path to the output.
- The multiplexer acts like an electronic switch that selects one of two sources.
- A four-to-one line multiplexer has four inputs I_0 through I_3 , applied to one input of an AND gate.
- Selection lines S_1 and S_0 are decoded to select a particular AND gate.
- The outputs of the AND gates are applied to a single OR gate that produces the one line output.



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

Four-to-one line multiplexer

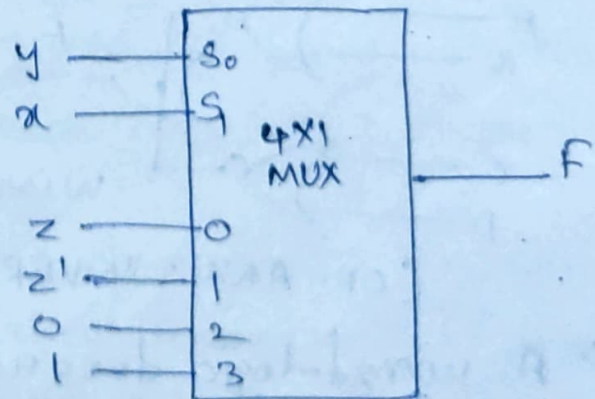
→ A multiplexer is also called a data selector, since it selects one of many inputs and sends the binary information to the output line.

Boolean Function Implementation

→ The method for implementing a Boolean function of n variables with a multiplexer that has $n-1$ selection inputs.

- The first $(n-1)$ variables of the function are connected to the selection inputs of the multiplexer.
- The remaining single variable of the function is used for the data inputs.
- Consider the Boolean function $F(x, y, z) = \sum(1, 2, 6, 7)$
 - ↳ This Boolean function of three variables can be implemented with a four-to-one line multiplexer.
 - The two variables x and y are applied to the selection lines.
 - The other ~~single~~ variable is z , so each data input of the multiplexer will be $z, z', 1$ or 0 .

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



- Any Boolean function of n variables can be implemented with a multiplexer with $n-1$ selection inputs and 2^{n-1} data inputs.