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Assignment 4:

Implement a 4-to-1 multiplexer using two input NAND logic gates.

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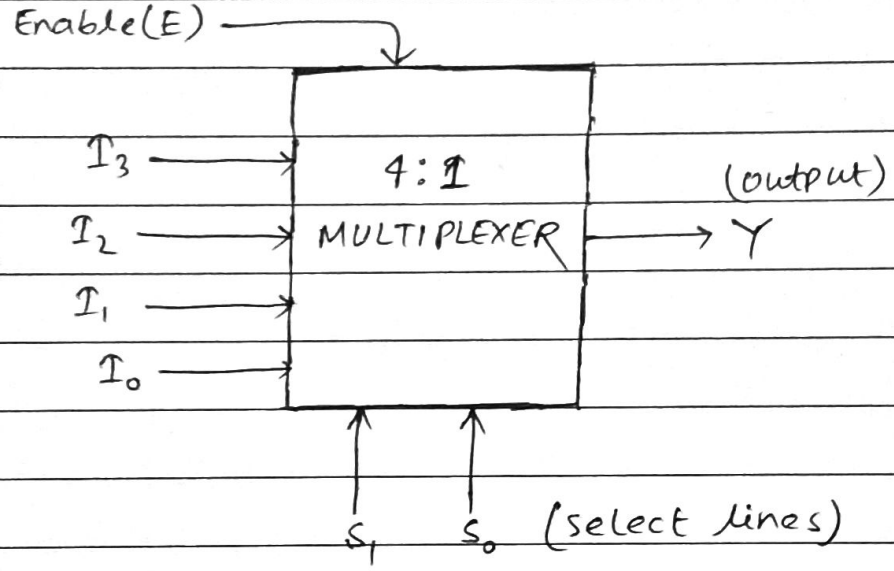
4 to 1 Multiplexer :

This consists four data input lines I_0, I_1, I_2, I_3, and two select lines S_0, S_1 and one output Y that will give one of the four Input lines. There will be an Enable (E) to actually enable the circuitry.



Truth Table :

S_0	S_1	Y (E==1)
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

[Here the output line selects one of the inputs on the basis of select lines value]

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So, the expression for Y will be :→

$$Y = \overline{S}_0 \overline{S}_1 I_0 + \overline{S}_0 S_1 I_1 + S_0 \overline{S}_1 I_2 + S_0 S_1 I_3$$

Now we will implement the circuit using two input NAND gates.

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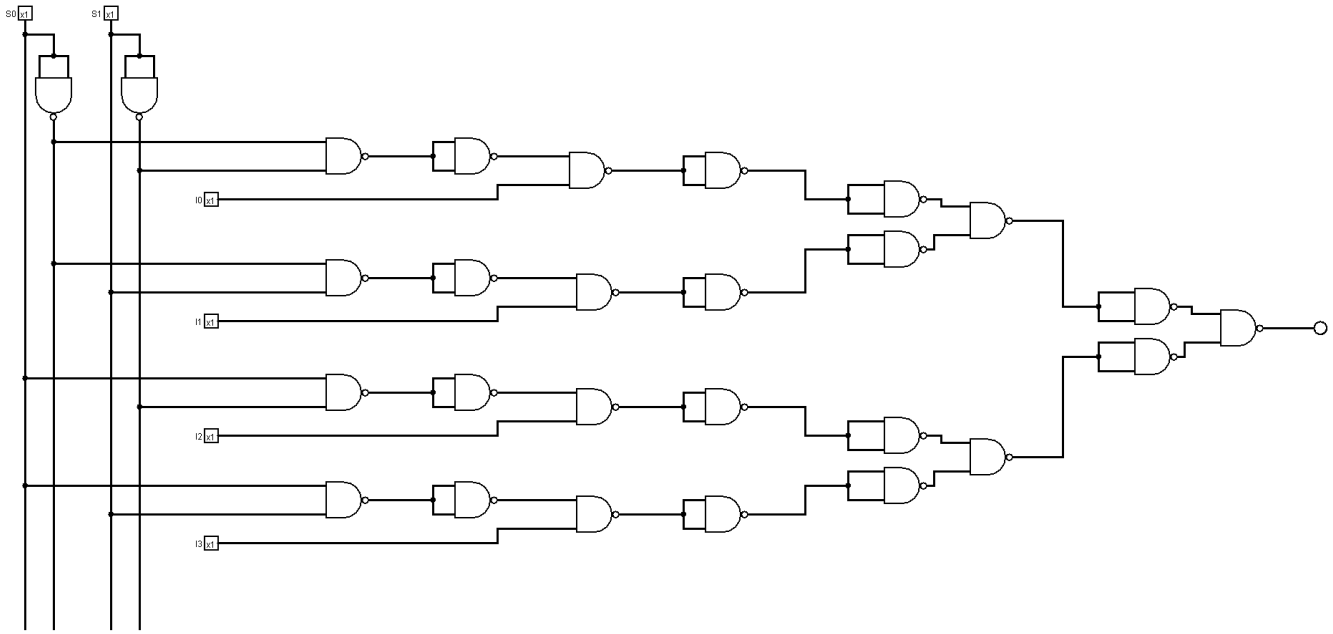

4 to 1 MULTIPLEXER

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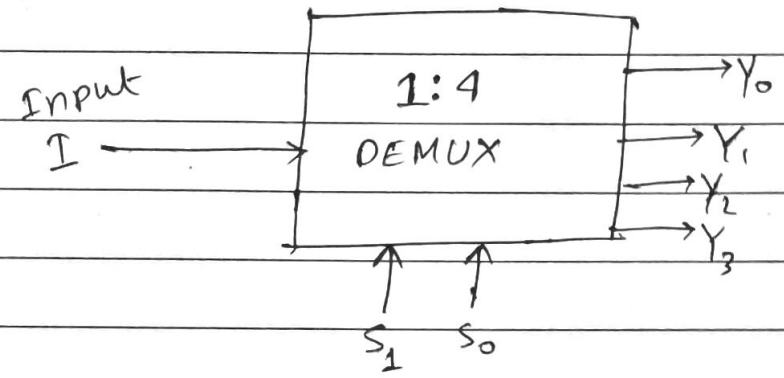
1 to 4 demultiplexer using two input NAND logic gates.

1-to-4 demultiplexer :

It consists of a single Input I two select lines S_0, S_1 and four outputs Y_0, Y_1, Y_2, Y_3 The input data goes to any of the four outputs for a particular combination of select lines.



Truth Table

S_0	S_1	Y_0	Y_1	Y_2	Y_3
0	0	I	0	0	0
0	1	0	I	0	0
1	0	0	0	I	0
1	1	0	0	0	I

[Here the input comes to any of four outputs]

So, $Y_0 = \overline{S_0}\,\overline{S_1}\,I$

$Y_1 = \overline{S_0}\,S_1\,I$

$Y_2 = S_0\,\overline{S_1}\,I$

$Y_3 = S_0\,S_1\,I$

Now, we will implement the circuit using two-input NAND gates.

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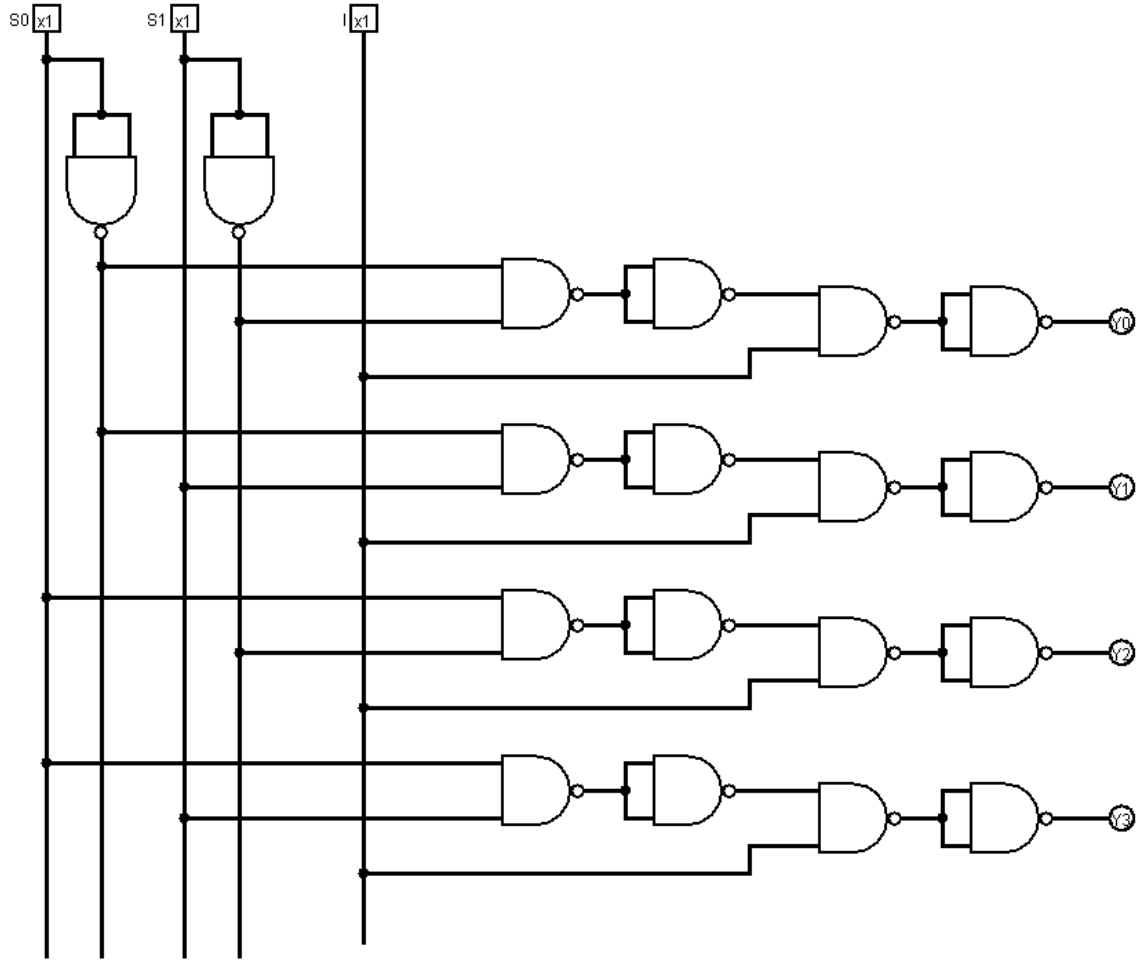

1 TO 4 DEMULTIPLEXER