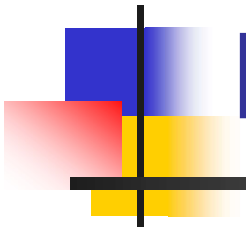


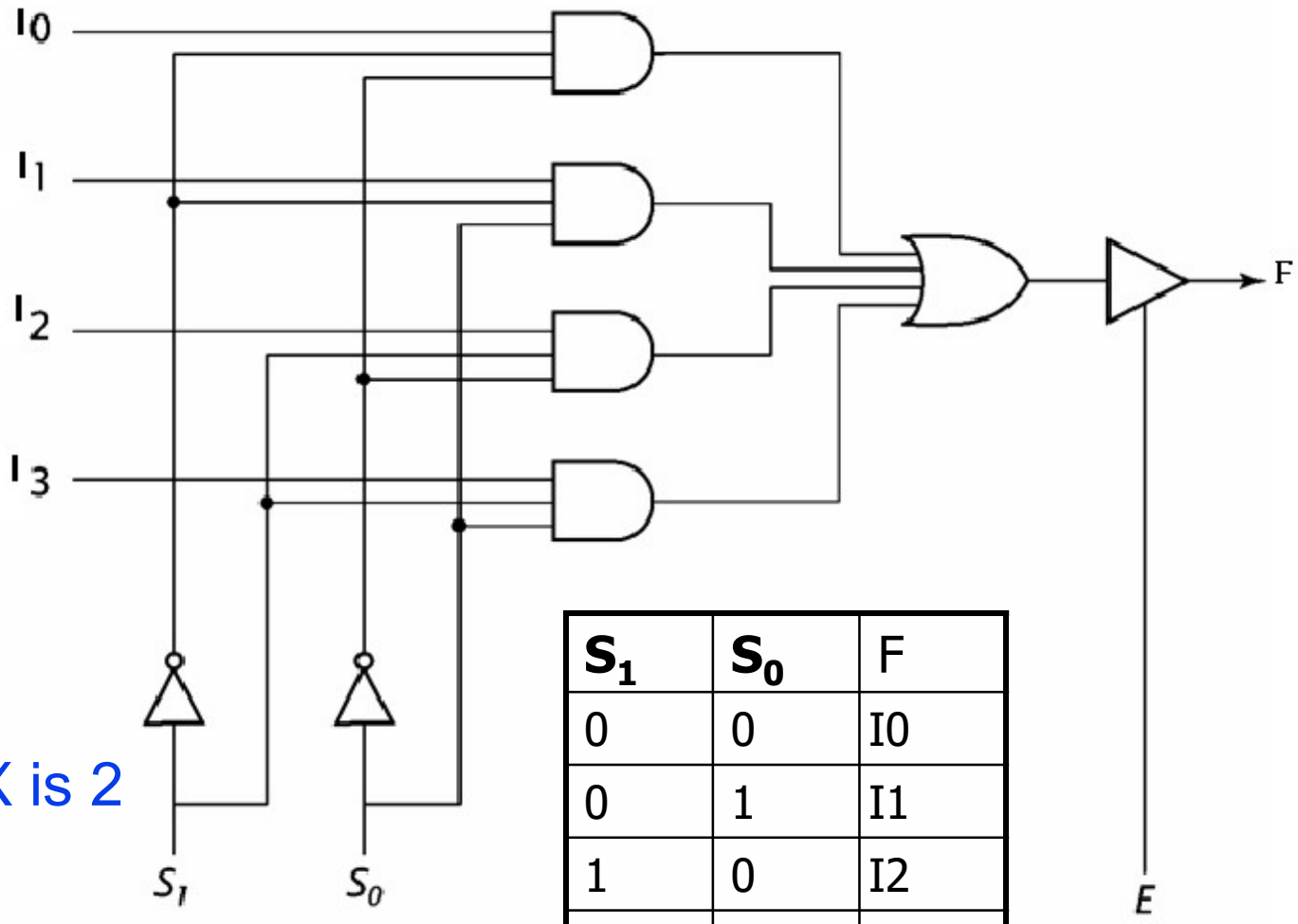
Unit 2 Part II
Digital Components

Multiplexer (MUX)

A multiplexer can use addressing bits to select one of several input bits to be the output.

- A selector chooses a single data input and passes it to the MUX output
- It has one output selected at a time.

4 to 1 line multiplexer



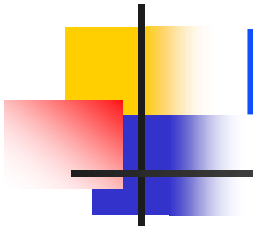
4 to 1 line multiplexer

2^n MUX to 1

n for this MUX is 2

This means 2 selection lines s_0 and s_1

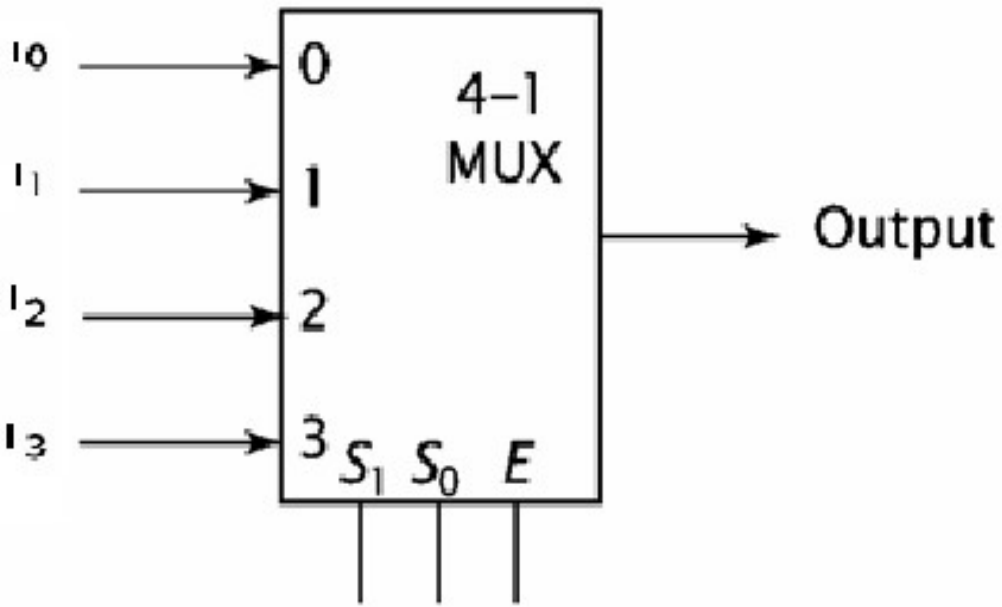
S_1	S_0	F
0	0	I0
0	1	I1
1	0	I2
1	1	I3



Multiplexer (MUX)

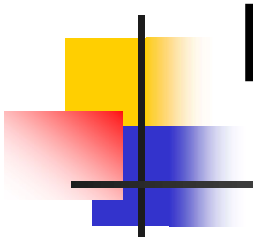
- Consists of:
  - Inputs (multiple) = 2^n
  - Output (single)
  - Selectors (# depends on # of inputs) = n
  - Enable (active high or active low)

Function table with enable



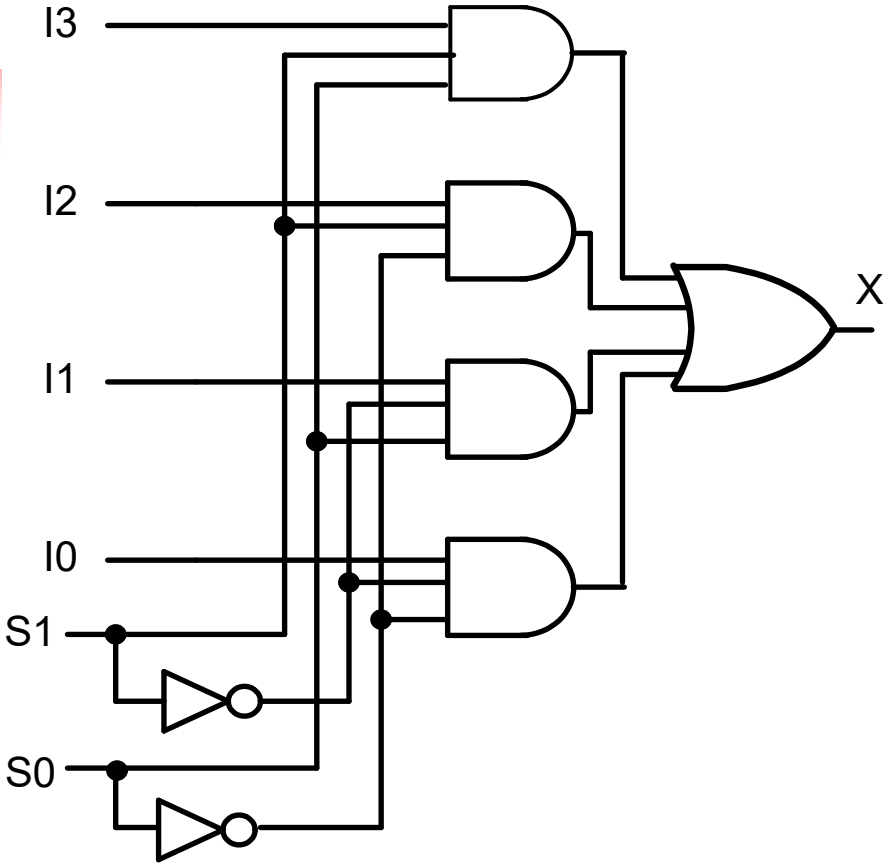
S_1	S_0	E	Output
X	X	0	X
0	0	1	I_0
0	1	1	I_1
1	0	1	I_2
1	1	1	I_3

Multiplexers versus decoders

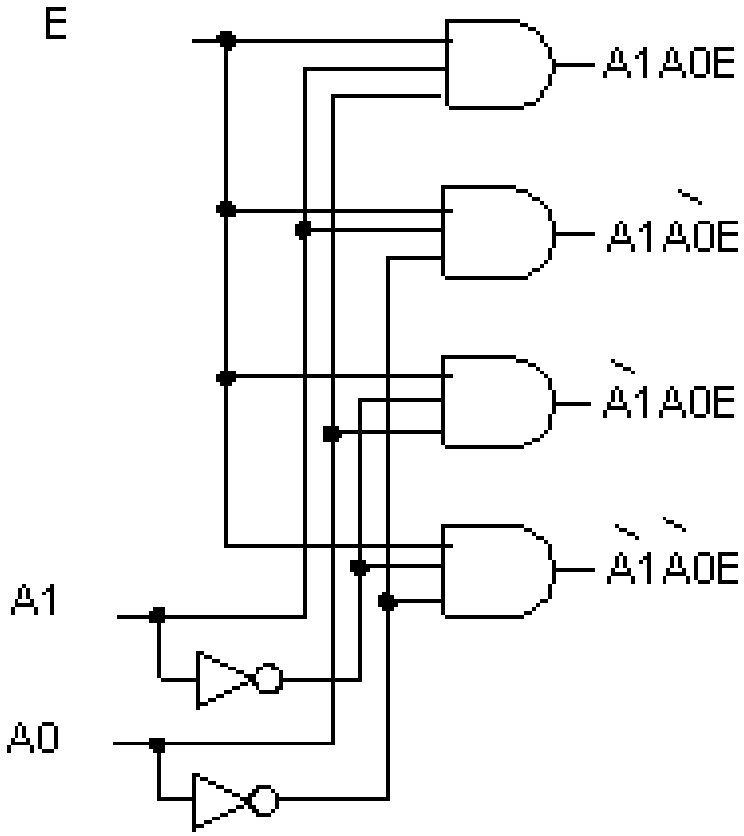


- A Multiplexer uses *n* binary select bits to choose from a maximum of 2^n unique input lines.
- Multiplexers and decoders both can decode minterms.
- Decoders have n number of output lines while multiplexers have only one output line.
- The decoded minterms are used to select data from one of up to 2*n* unique data input lines.
- The output of the multiplexer is the data input whose index is specified by the *n* bit code.

Multiplexer Versus Decoder



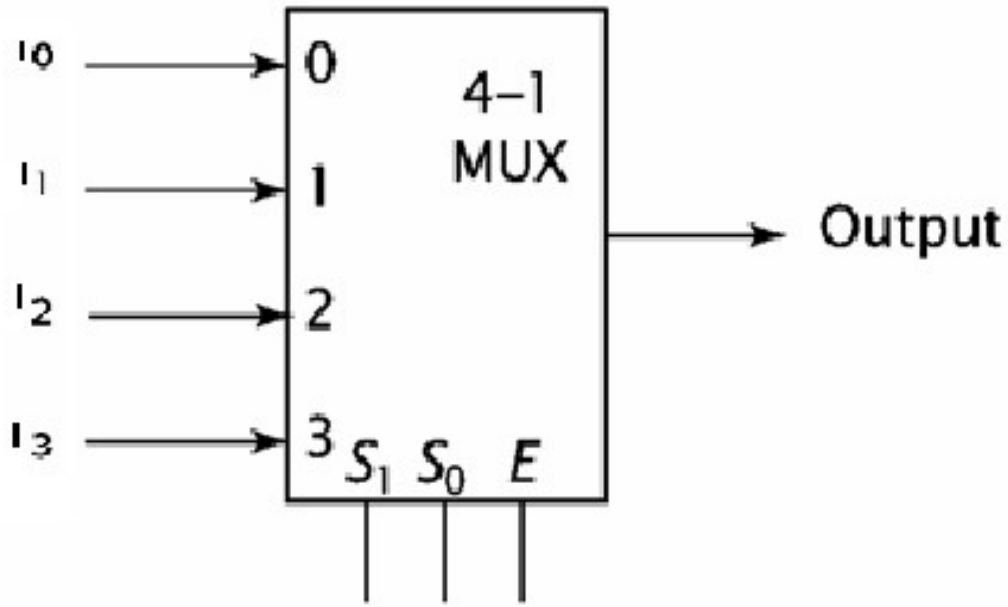
4-to-1 Multiplexer



2-t0-4 Decoder

Note that the multiplexer has an extra OR gate. A1 and A0 are the two inputs in decoder. There are four inputs in multiplexer.

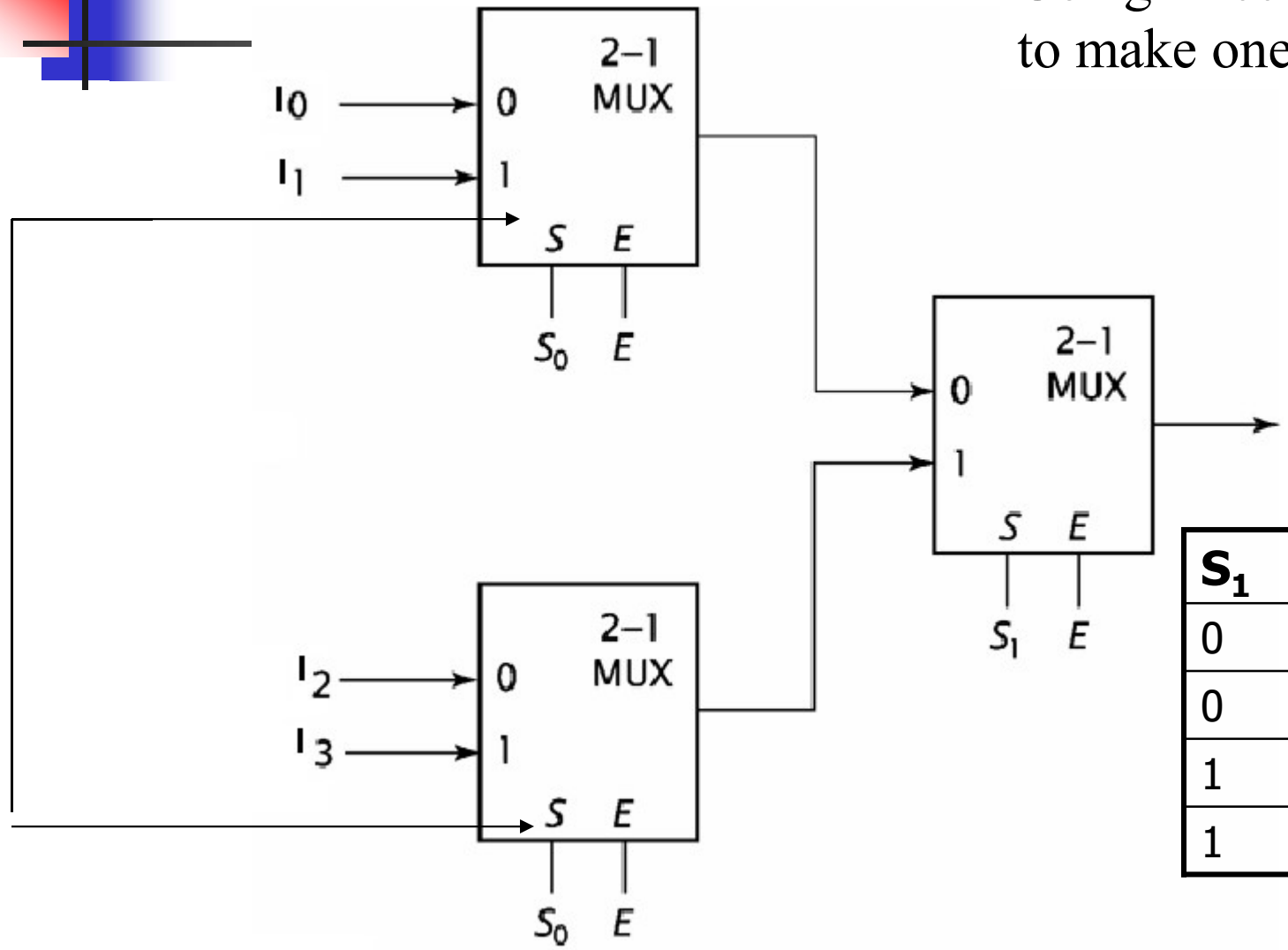
Function table with enable



S_1	S_0	E	Output
X	X	0	X
0	0	1	I_0
0	1	1	I_1
1	0	1	I_2
1	1	1	I_3

Cascading multiplexers

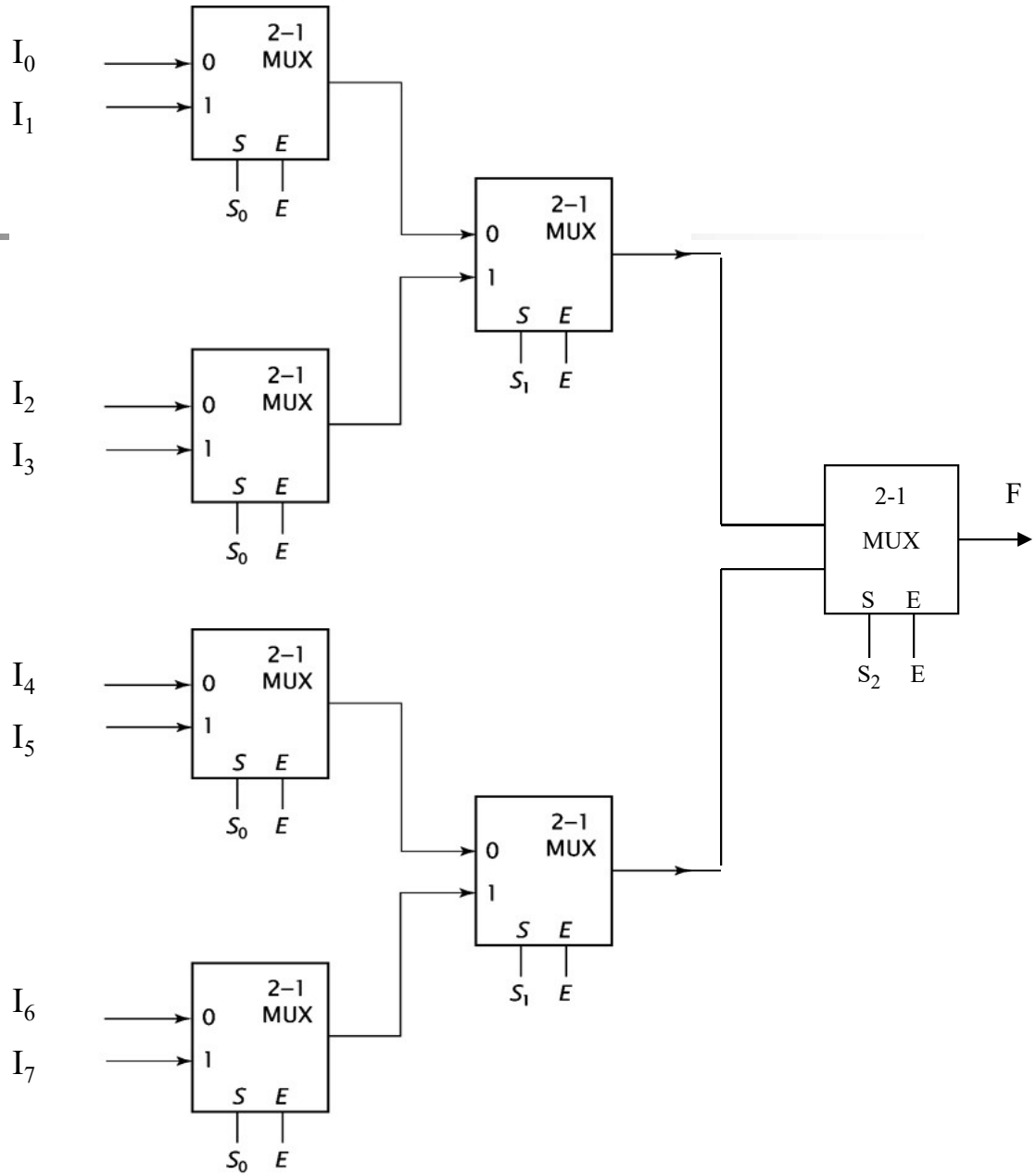
Using three 2-1 MUX
to make one 4-1 MUX



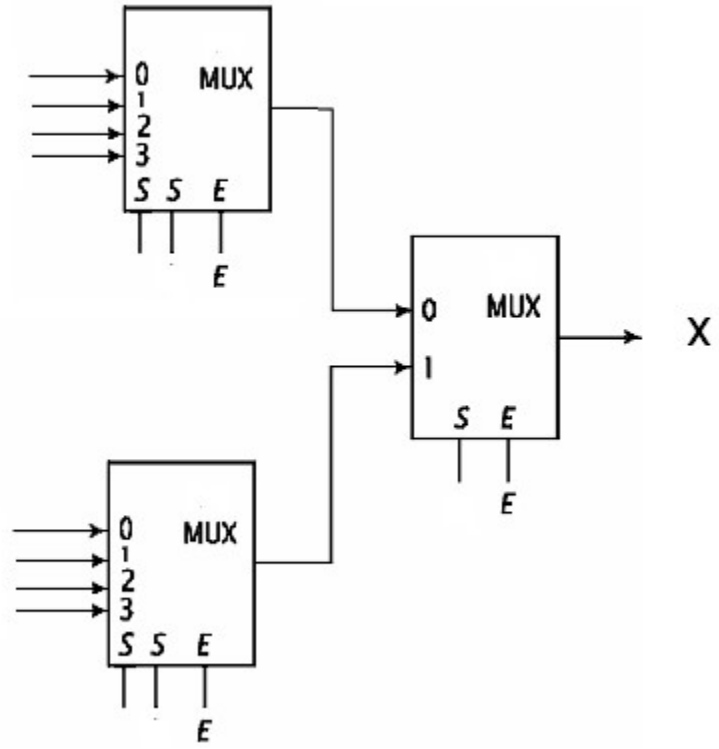
S_1	S_0	F
0	0	I0
0	1	I1
1	0	I2
1	1	I3

Example: Construct an 8-to-1 multiplexer using 2-to-1 multiplexers.

S_2	S_1	S_0	F
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

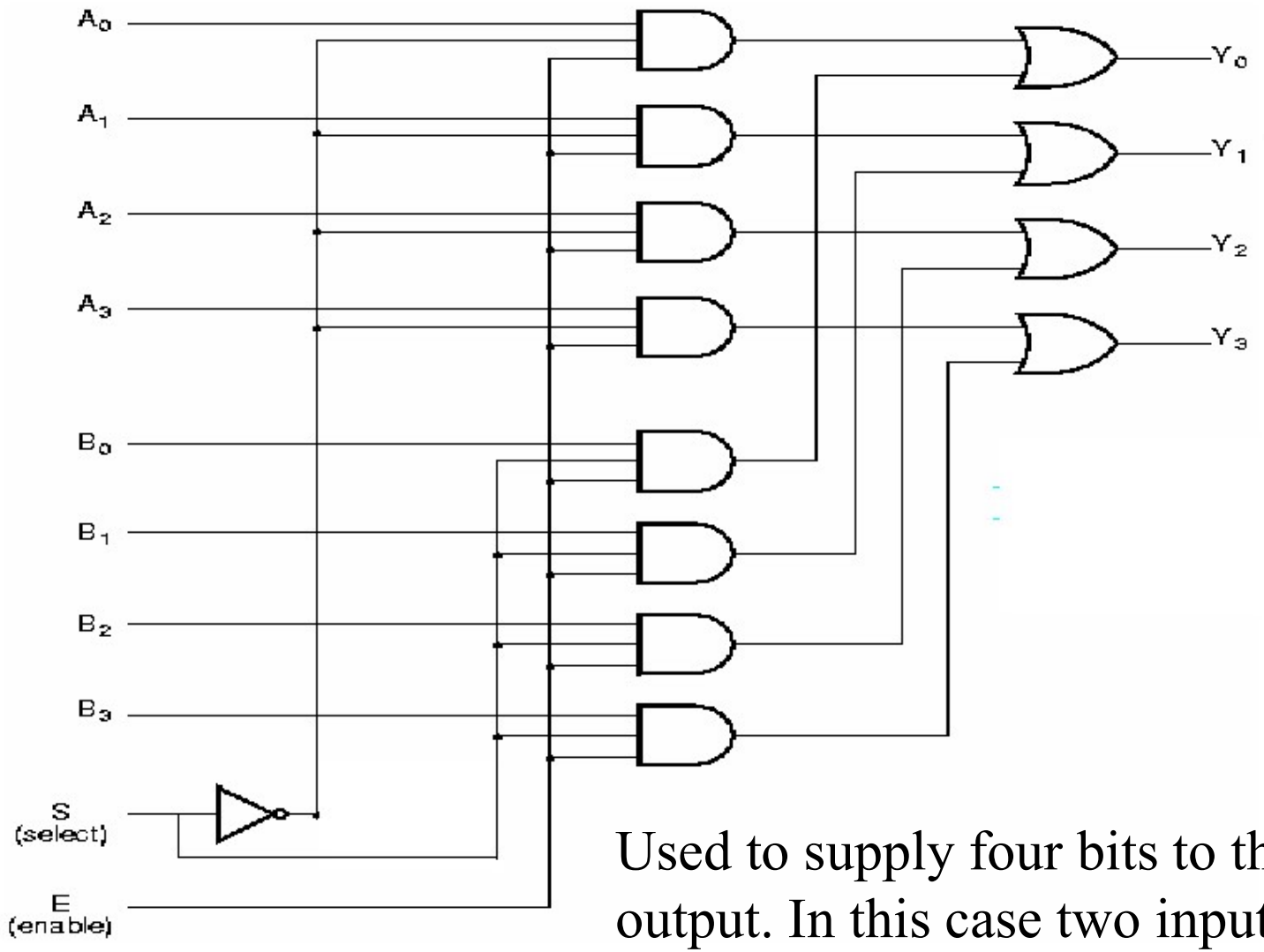


Example ( ) Construct 8-to-1 multiplexer using one 2-to-1 multiplexer and two 4-to-1 multiplexers



S_2	S_1	S_0	X

Quadruple 2-to-1 Line Multiplexer



Used to supply four bits to the output. In this case two inputs four bits each.

Quadruple 2-to-1 Line Multiplexer

E (Enable)	S (Select)	Y (Output)
0	X	All 0's
1	0	A
1	1	B