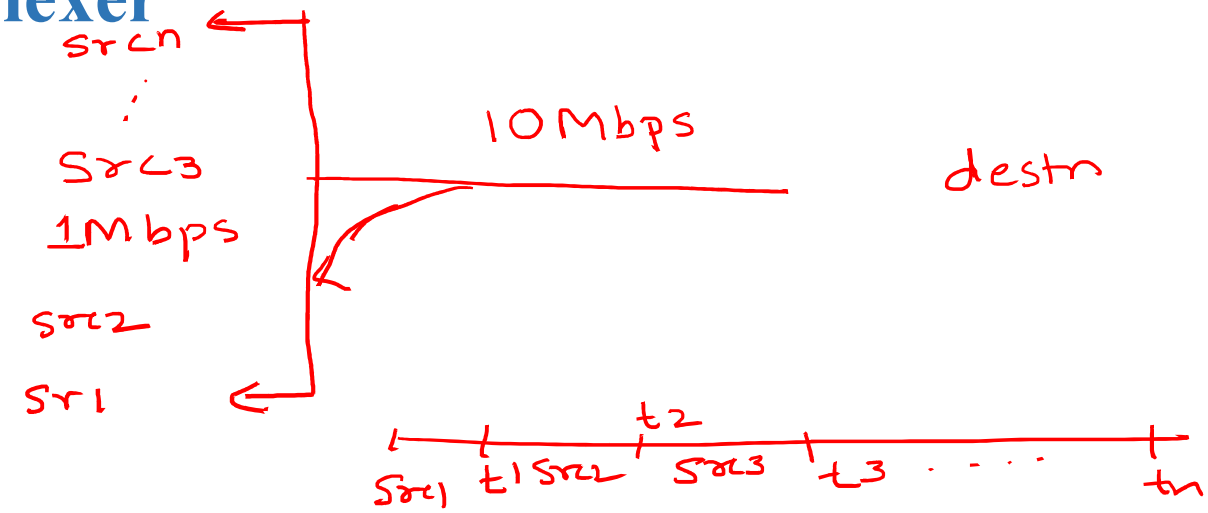
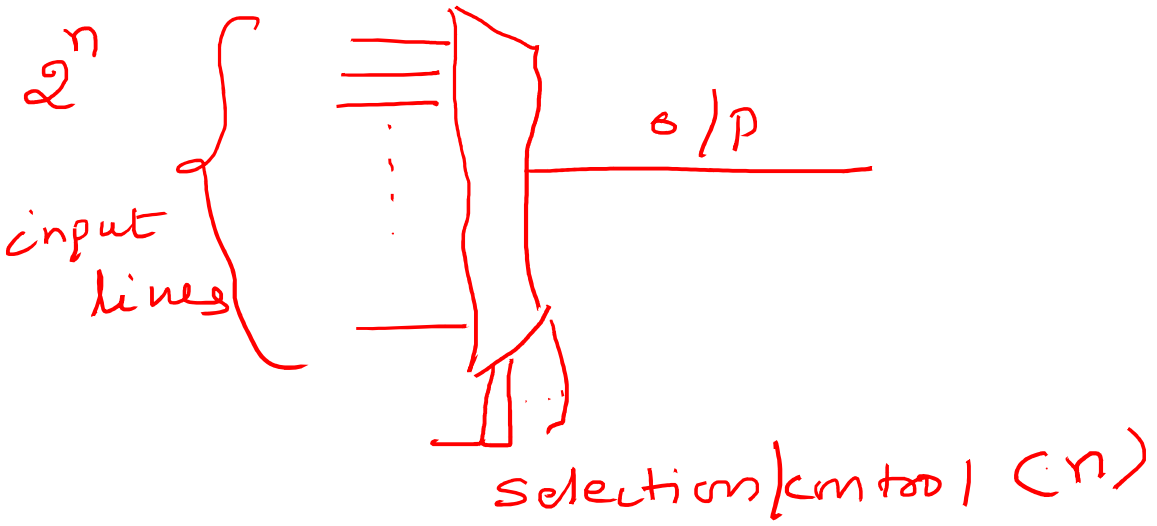
Multiplexers

Students are advised to write down the notes for every lecture

Multiplexer





Multiplexer

- Multiplexer is an useful MSI device and are also called as data selectors.
- Multiplexer selects one of its 2^n input line and directs it to a single output line .
- n-bit select lines decide which input line is to be selected.
- Examples: 2-to-1 line MUX, 4-to-1 line MUX, 8-to-1 line MUX, 16-to-line MUX.

2^n : 1, n => select lines

2 : 1

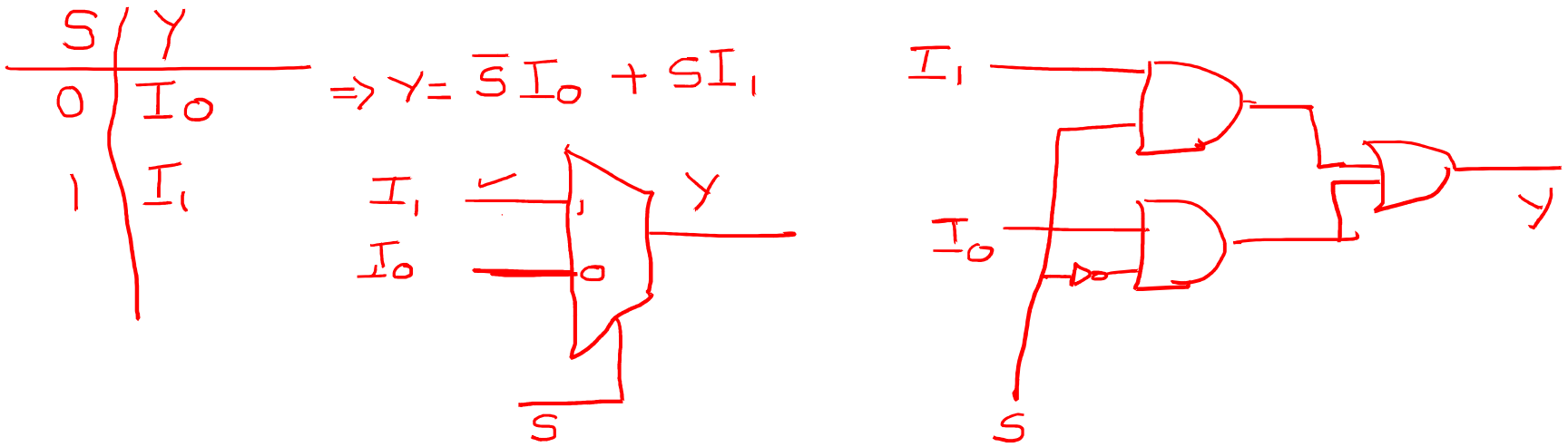
4 : 1

8 : 1

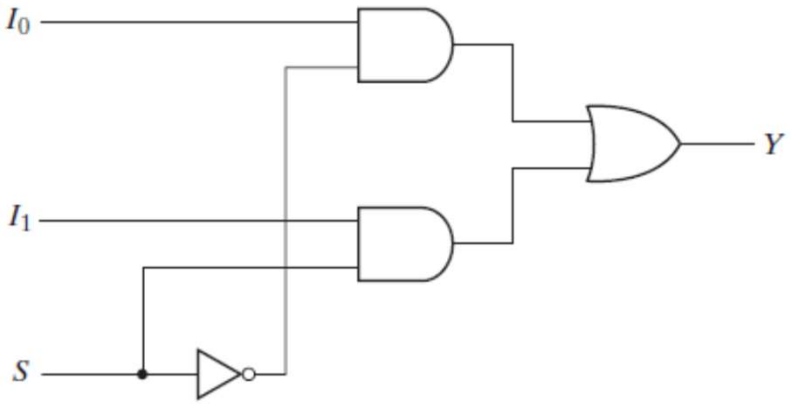
16 : 1

2-to-1 line MUX

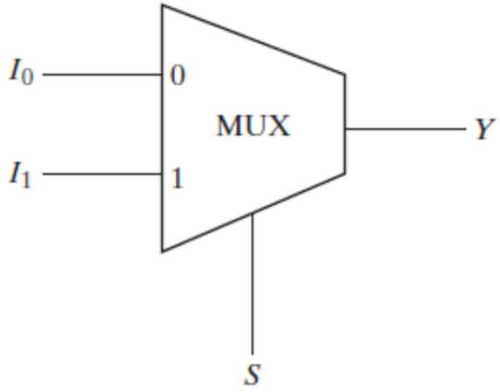
- S- selection input, y is the output, I1 and I0 are inputs
- Symbol/block diagram, function table, output expressions and circuit is given :



2-to-1 line MUX



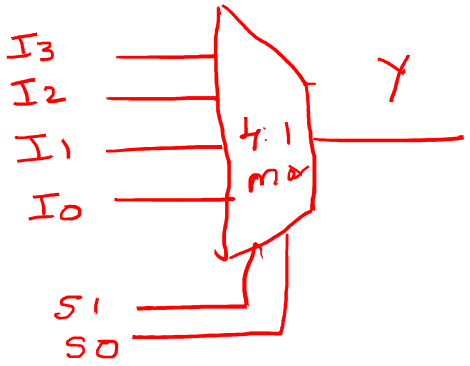
(a) Logic diagram



(b) Block diagram

4-to-1 line multiplexer

- Write the Symbol/block diagram, Function table, output expressions and circuit .



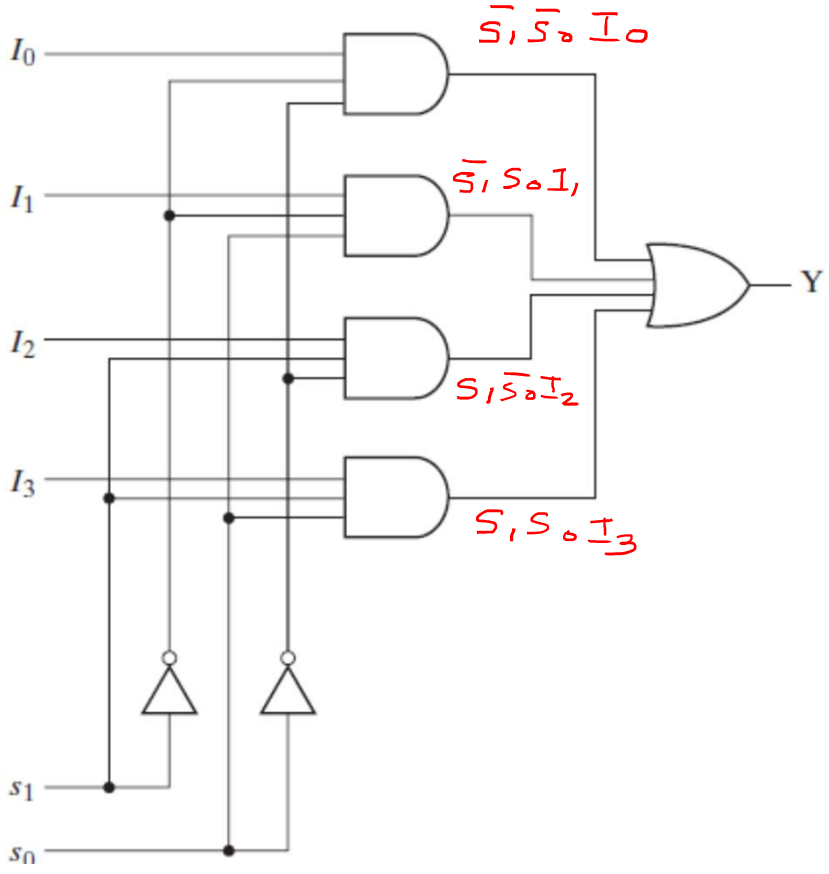
S1	S0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

Assume $I_3 = 1$ $I_2 = 1$ $I_1 = 0$ $I_0 = 0$

$S_1 S_0 = 10$, $Y = ?_0 1$

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

4-to-1 line multiplexer



8-to-1 line multiplexer

- Write the Symbol/block diagram, function table, output expressions and circuit

Select lines: $S_2 S_1 S_0$

$$Y = \bar{S}_2 \bar{S}_1 \bar{S}_0 I_0 + \bar{S}_2 \bar{S}_1 S_0 I_1 + \bar{S}_2 S_1 \bar{S}_0 I_2 + \bar{S}_2 S_1 S_0 I_3$$
$$S_2 \bar{S}_1 \bar{S}_0 I_4 + S_2 \bar{S}_1 S_0 I_5 + S_2 S_1 \bar{S}_0 I_6 + S_2 S_1 S_0 I_7$$

→ Draw 8:1 mux circuit

Realize 4:1 using only 2:1 MUXs (Multiplexer tree)

For 4:1 MUX

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

For 2:1 MUX

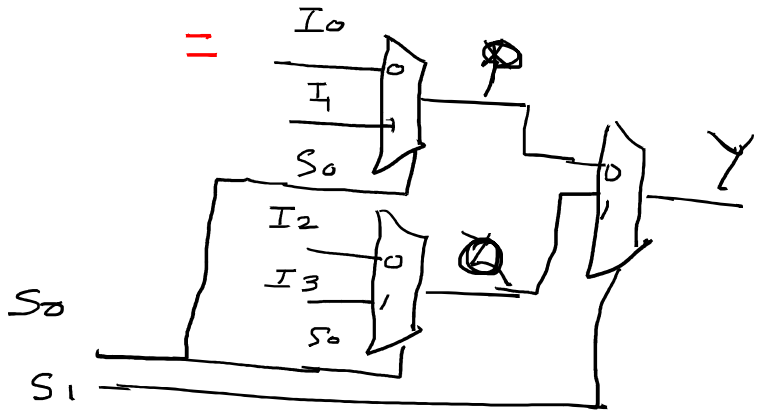
$$Y = \bar{S} I_0 + S I_1$$

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

$(\bar{S}_0 I_0 + S_0 I_1)$: 2:1 mux

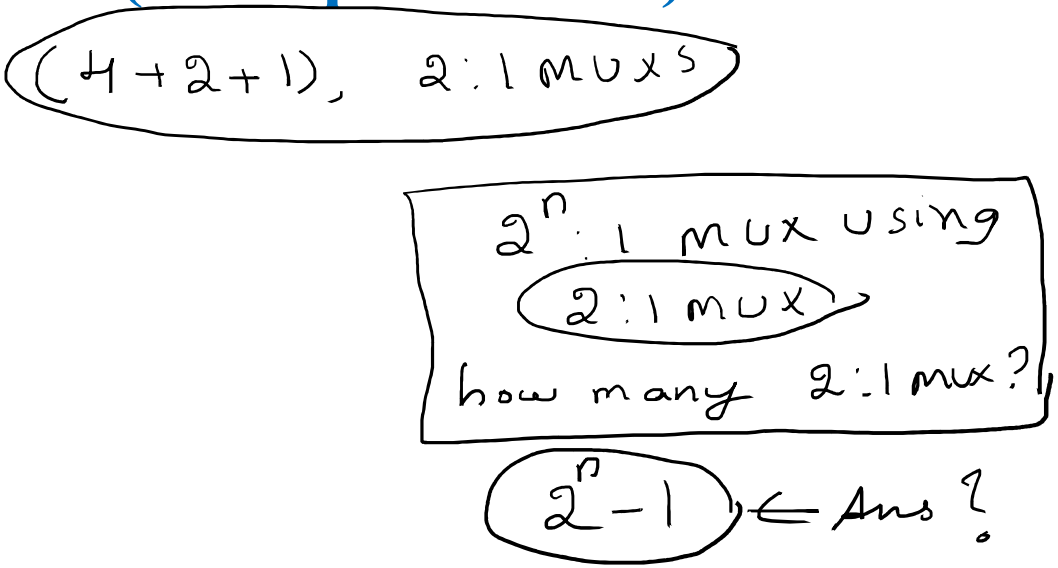
$(\bar{S}_0 I_2 + S_0 I_3)$: 2:1 mux

$= \bar{S}_1 \cdot P + S_1 \cdot Q$: 2:1 mux



3, 2:1 MUXs

Realize 8:1 using only 2:1 MUXs (Multiplexer tree)



Realize 8:1 using only 4:1 MUXs and 2:1 MUX

Question?