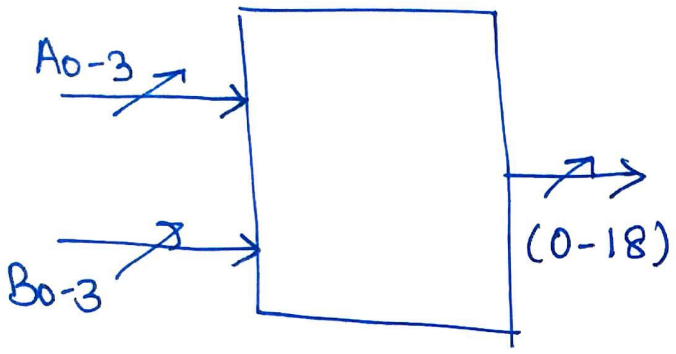
BCD Adder

(Binary Coded Decimal Adder



Both A & B are from (0 to 9)

0000 to 1001

Why (0-18)

0+0 → 0 , 9+9 → 18

* No Carry is Considered in this lecture, but if Carry is Included then 0 to 19.

↳ Addition gives binary sum

~~Decimal~~

↳ Appln

* Digital watches.

15 → 1111 → Binary

↓

0001 0101

BCD

↳ "0110" → add 6, when i) $C^* = 1$

2) $S_3^* = 1$ or S_2^* or $S_1^* = 1$

$S_3^* (S_2^* + S_1^*) = 1$

3) $S_3^* \cdot S_1^* = 1$

Decimal	Binary form					BCD form				
	C*	S_3^*	S_2^*	S_1^*	S_0^*	C	S_3	S_2	S_1	S_0
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	1
2	0	0	0	1	0	0	0	0	1	0
3	0	0	0	1	1	0	0	0	1	1
4	0	0	1	0	0	0	0	1	0	0
5	0	0	1	0	1	0	0	1	0	1
6	0	0	1	1	0	0	0	1	1	0
7	0	0	1	1	1	0	0	1	1	1
8	0	1	0	0	0	0	1	0	0	0
9	0	1	0	0	1	0	1	0	0	1
10	0	1	0	1	0	1	0	0	0	0
11	0	1	0	1	1	1	0	0	0	1
12	0	1	1	0	0	1	0	0	1	0
13	0	1	1	0	1	1	0	0	1	1
14	0	1	1	1	0	1	0	1	0	0
15	0	1	1	1	1	1	0	1	0	1
16	1	0	0	0	0	1	0	1	1	0
17	1	0	0	0	1	1	0	1	1	1
18	1	0	0	1	0	1	1	0	0	0
19	1	0	0	1	1	1	1	0	0	1

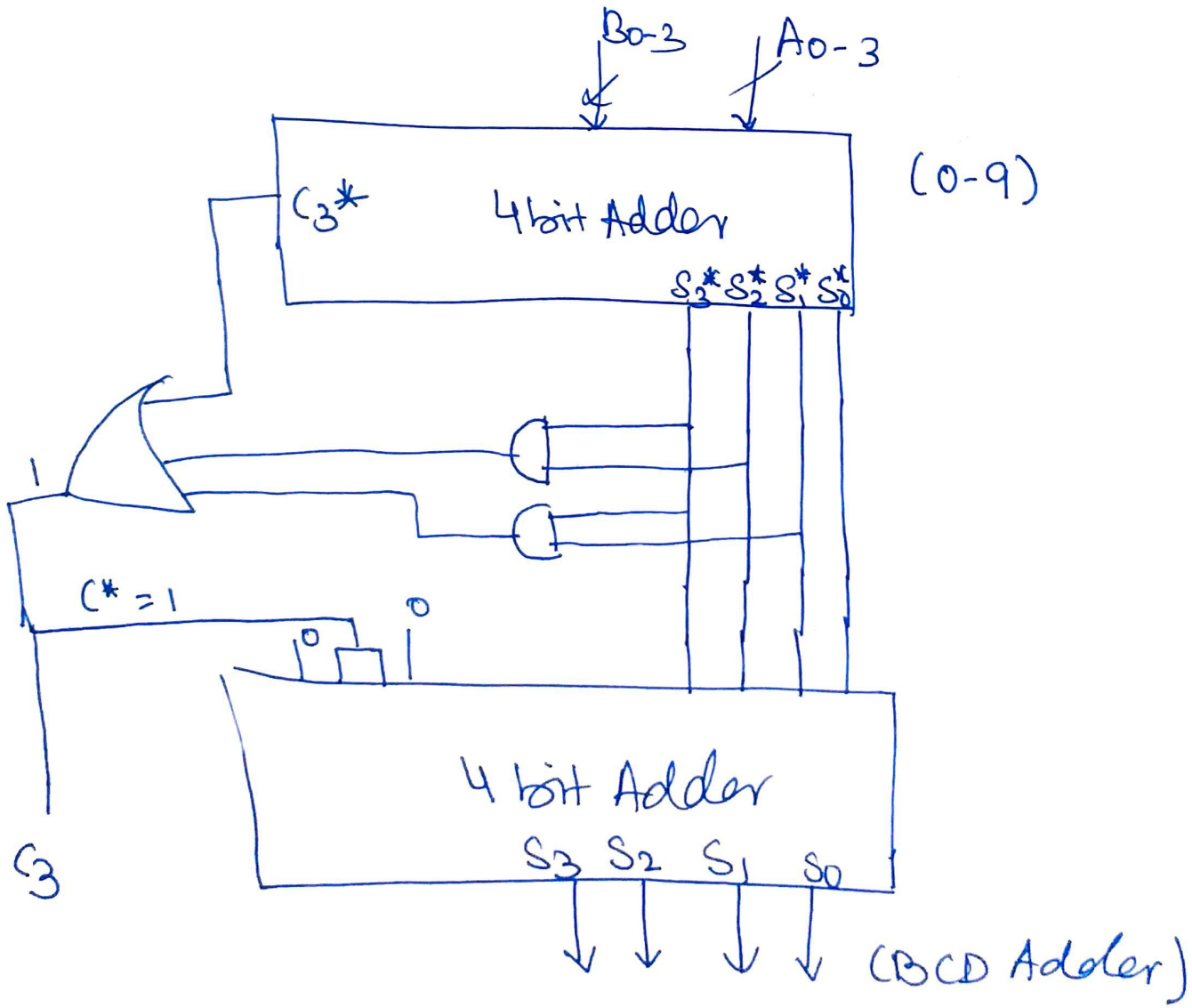
($C^* = 1$ for 16 to 19)

$$C^* + S_3^* (S_2^* + S_1^*) + S_3^* S_1^*$$

$$C^* + S_3^* S_2^* + S_3^* S_1^* + S_3^* S_1^*$$

$$= C^* + S_3^* S_2^* + S_3^* S_1^*$$

Convert binary sum to BCD sum.



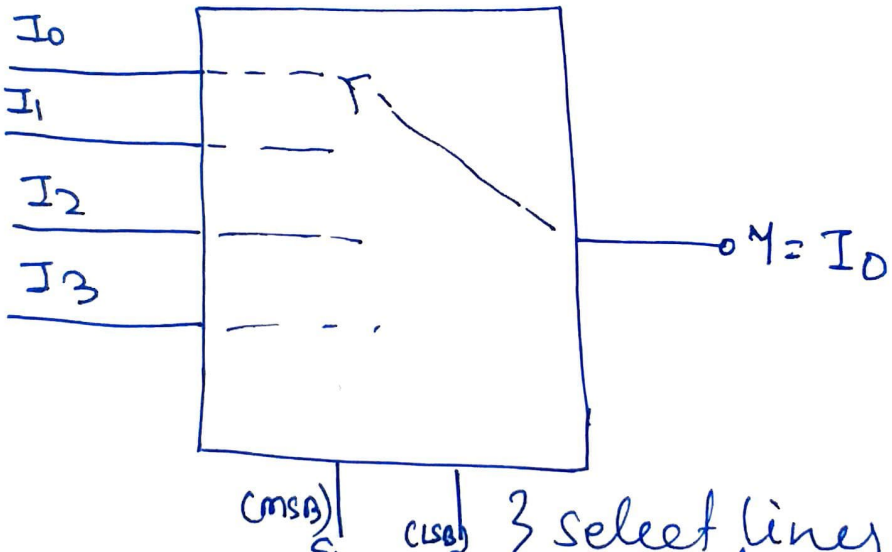
Introduction to MUX

↓

Multiplexer

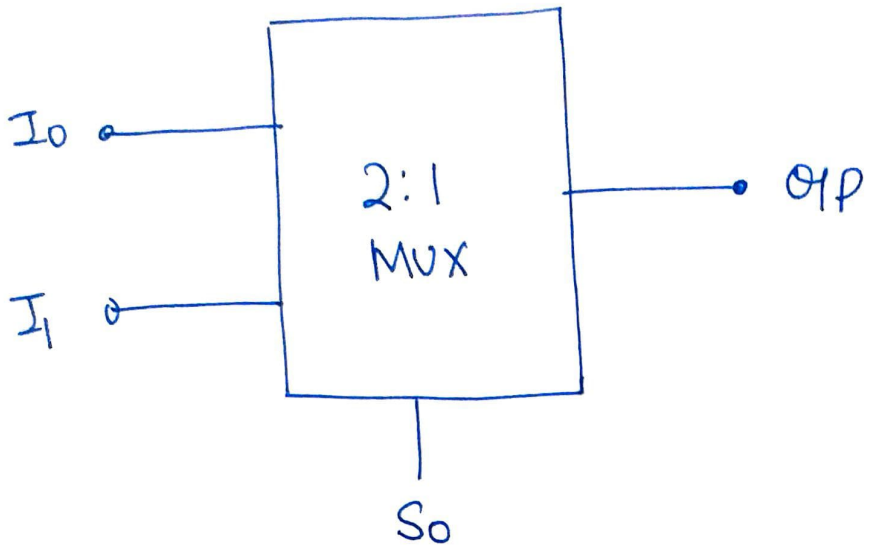
↳ It is a Combinational Circuit that selects binary information from one of many I/P lines and directs it to 1 O/P line.

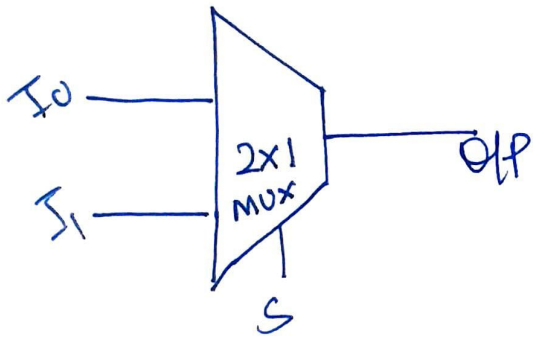
↳ It is simply a DATA SELECTOR.



↳ A particular I/P is selected & how the data is selected, it's done by a select line

S_1	S_0	Input selected.
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3





↳ n = no. of I/Ps.

$2^{(m)} = n$ → no. of select lines.

$$m = \log_2 n$$

↳ n = 4

$m = \log_2 4$

$m = 2 \log_2 2^1$

↳ It is MSI (Medium Scale Integration)

↳ It can be used to design Combinational Circuit like adder, sub etc.

↳ Adv

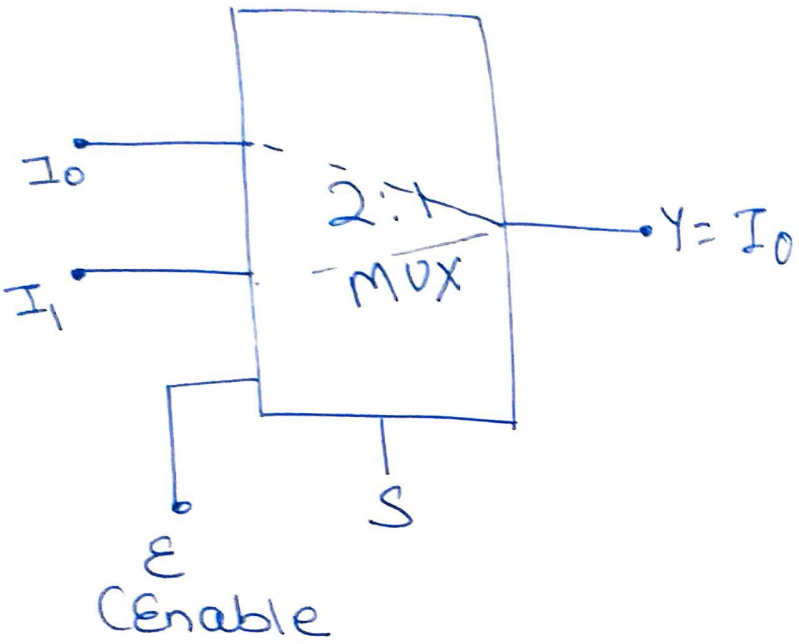
i) Reduces the no. of wires.
2) Reduces circuit Compleexity & Cost
3) Implementation of various circuit using MUX.

↳ TYPES

2:1 MUX, 4:1 MUX, 8:1 MUX, 16:1 MUX, and 32:1 MUX.

2:1 MUX → 1 Select Variables.
4:1 MUX → 2
8:1 MUX → 3
16:1 MUX → 4
32:1 MUX → 5

2:1 MUX



$\mathcal{E}$	S	Y
0	X	0
1	0	I_0
1	1	I_1

$$Y = \mathcal{E}\bar{S}I_0 + \mathcal{E}SI_1$$

$$Y = \mathcal{E}[\bar{S}I_0 + SI_1]$$