# 4:1 MUX or 4x1 MUX

$n = 4$

$n = 2^m$

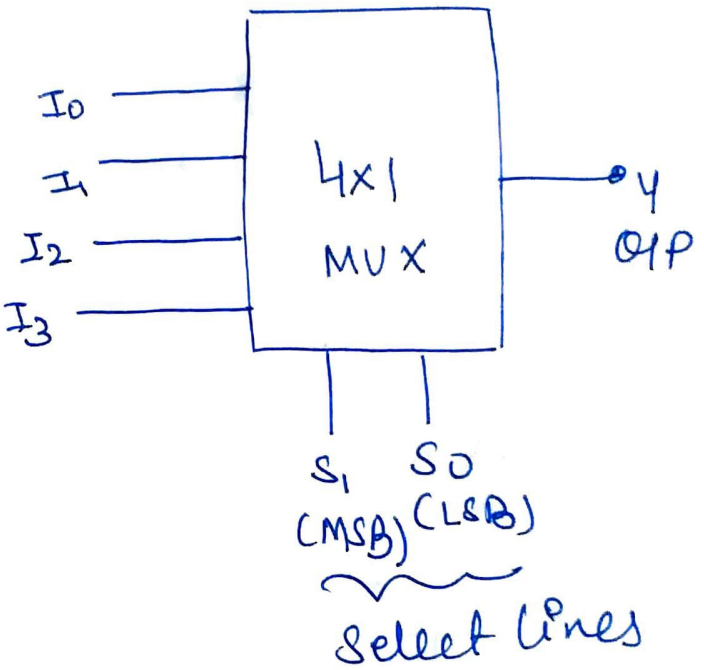
$m = \log_2(n)$

↓

select lines $= \log_2(4)$

$= 2 \log_2(2)$

$= 2$

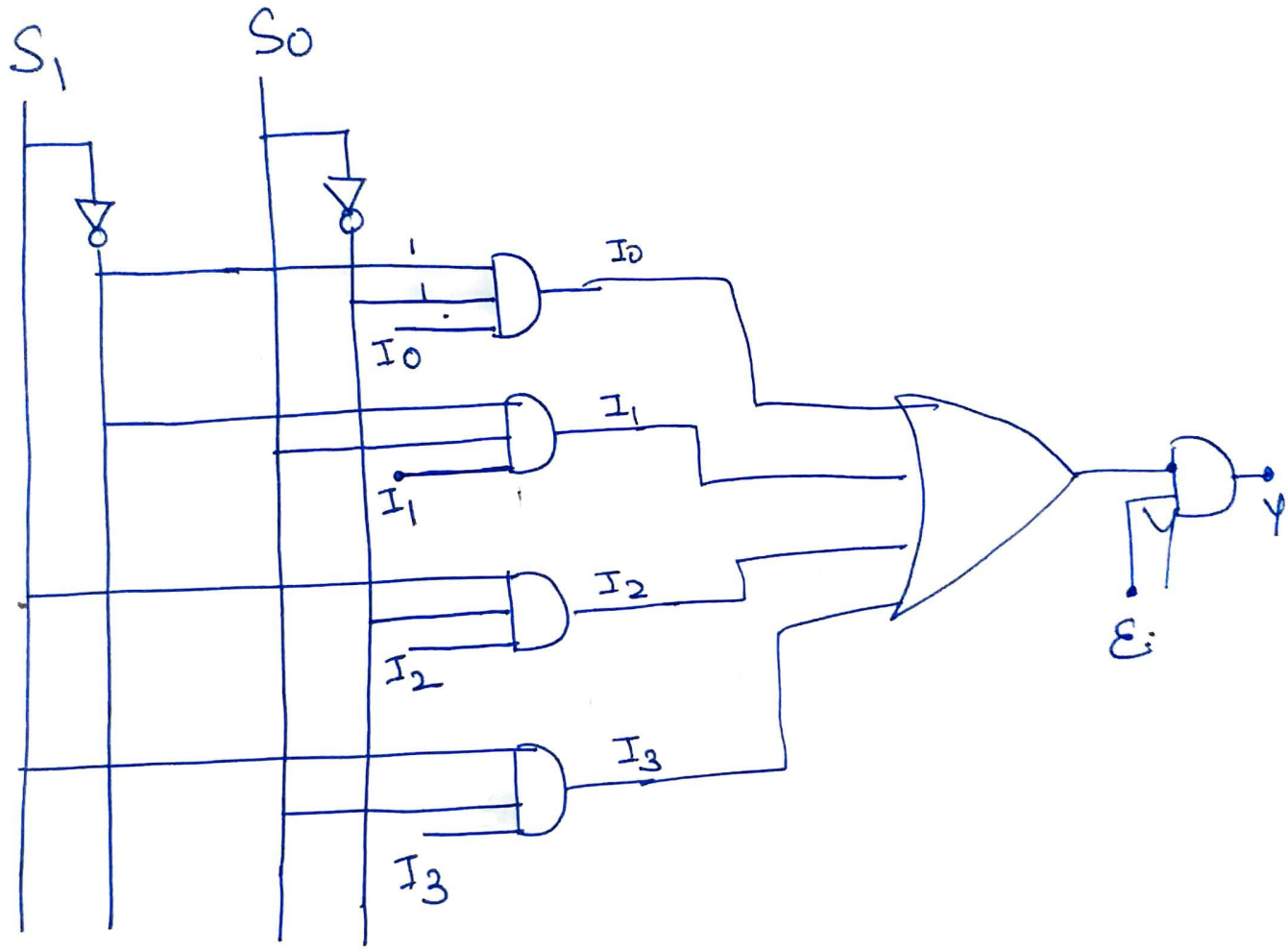



↳ Make Truth Table for the circuit. E is high.
(You can use it and attach to each ckt)

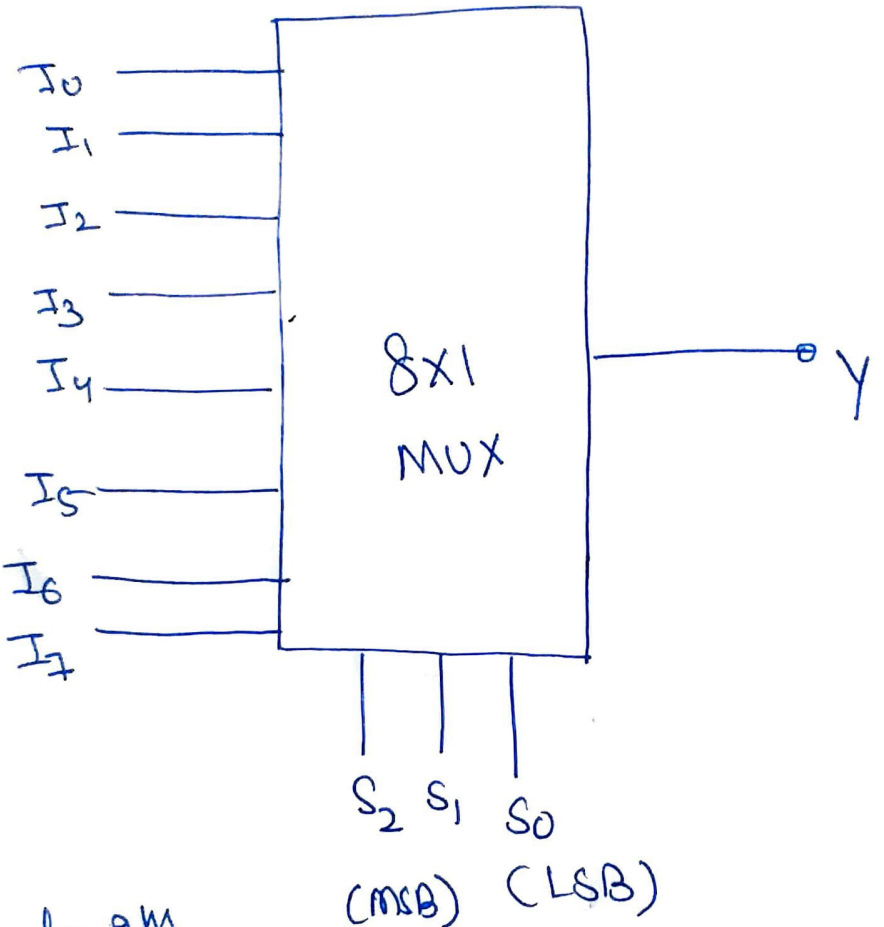
↳

| $S_1$ | $S_0$ | Y |
|---|---|---|
| 0 | 0 | $I_0$ |
| 0 | 1 | $I_1$ |
| 1 | 0 | $I_2$ |
| 1 | 1 | $I_3$ |

$$Y = \overline{S_1}\,\overline{S_0} I_0 + \overline{S_1} S_0 I_1 + S_1 \overline{S_0} I_2 + S_1 S_0 I_3$$



# 8x1 MUX




$n = 2^m$

$m = \log_2(n)$

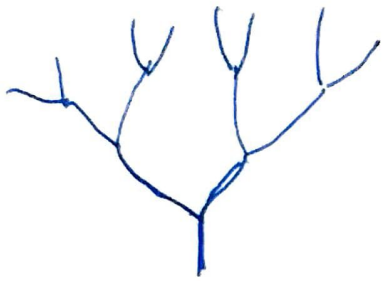
$m = \log_2(8)$

$= 3\log_2(2)$

Complete 8x1 MUX circuit

# MUX Tree

↳ Obtaining higher order MUX by lower order MUX



↳ Implement 4x1 MUX using 2x1 MUX

Soln:- required data lines $^{n}$ = 4

divide by available MUX

$^{t}$ = $\frac{4}{2}$ = (2)

= $\frac{2}{2}$ = (1)

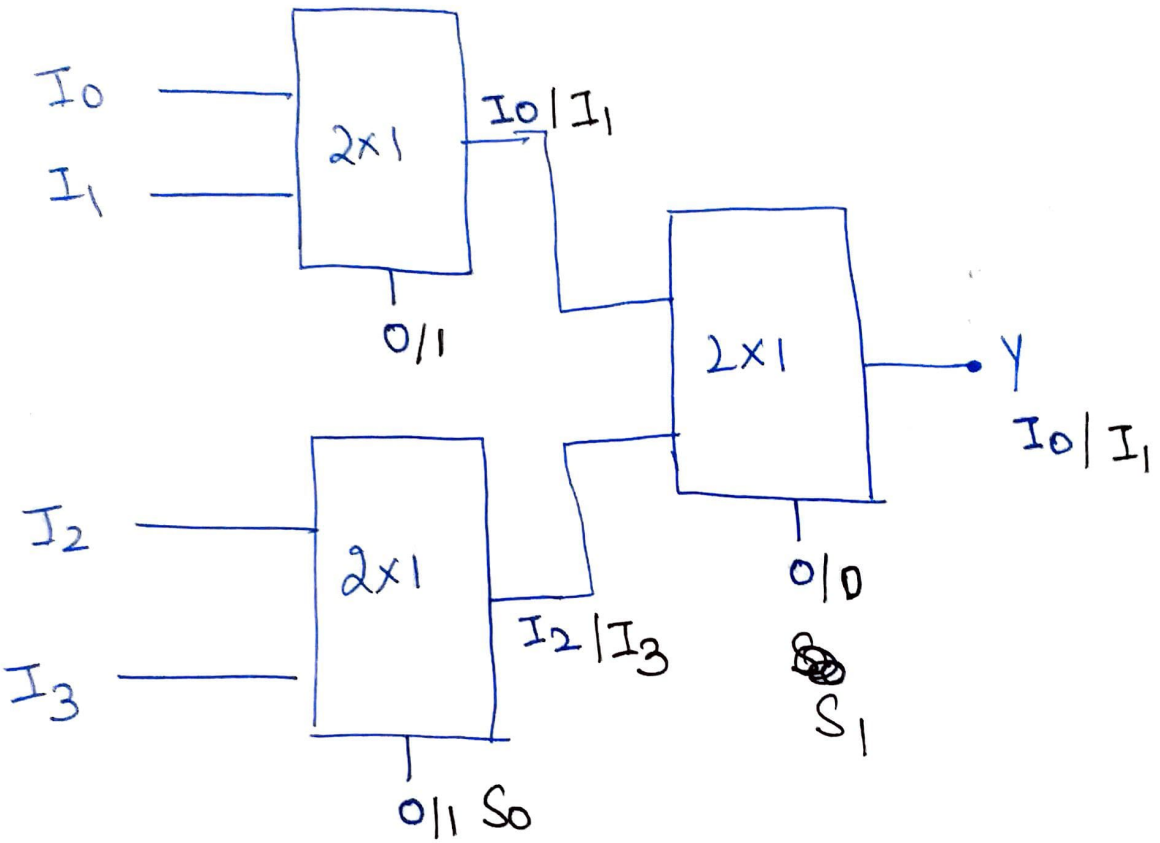
t = 3

↳ Stop after getting 1 to

↳ Add them 2 + 1 = 3

↳ 3 (2x1 MUX is required) to implement 4x1 MUX

↳ Sequence 1st 2 (2x1 MUX) then 1 (2x1) MUX.




↳ TT of 4x1 MUX

| $S_1$ | $S_0$ | Y |
|---|---|---|
| 0 | 0 | $I_0$ |
| 0 | 1 | $I_1$ |
| 1 | 0 | $I_2$ |
| 1 | 1 | $I_3$ |

Y = $I_0$, Both need to be same (for two 2x1 MUX)

# Implementing 8x1 MUX using 2x1 MUX

(Question)

Required = 8 , Available = 2

↳ Step 1:- $\frac{\text{Required}}{\text{Available}} = \frac{8}{2} = (4) \rightarrow$ Step 1

$\frac{4}{2} = (2)$ - II

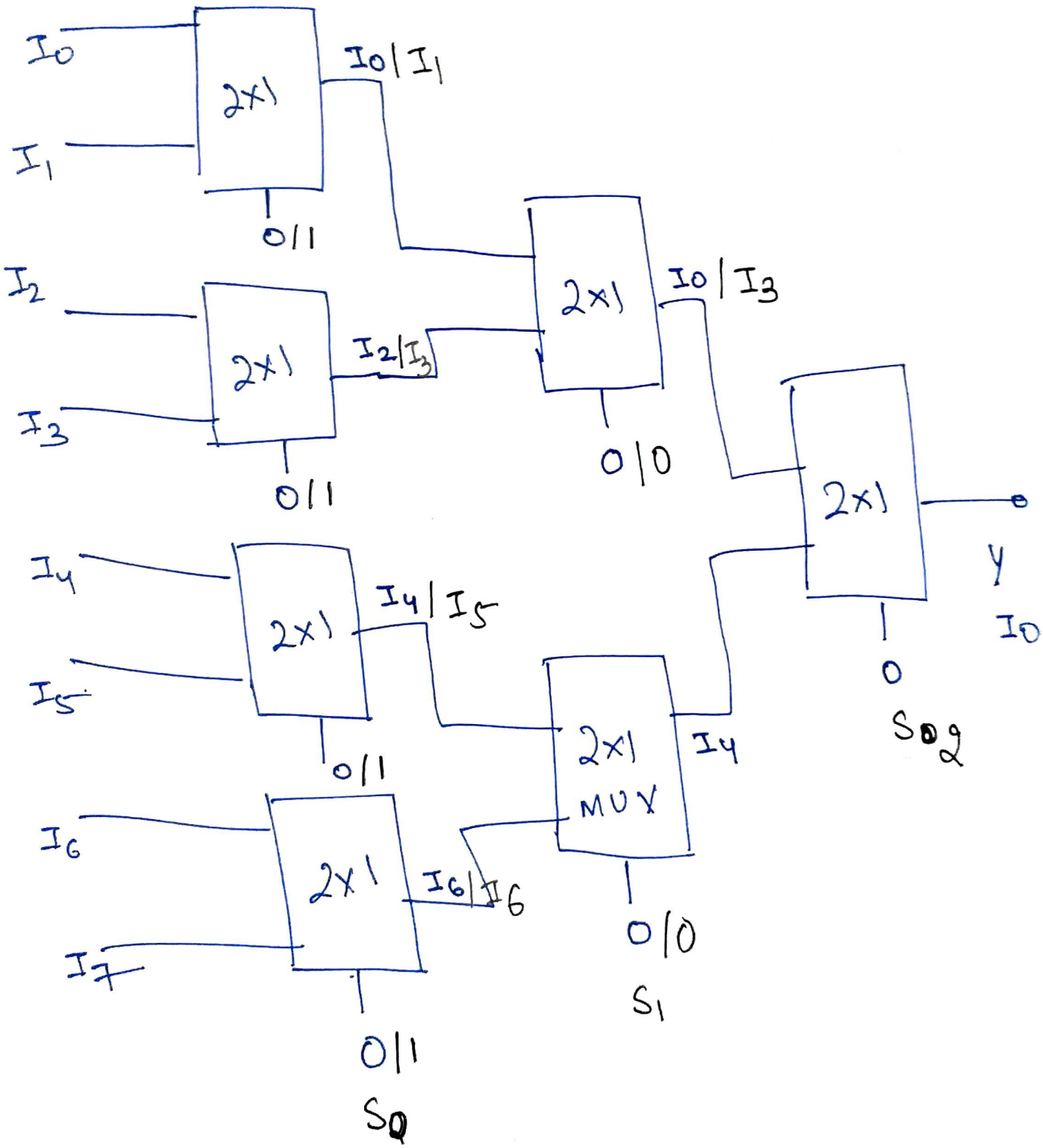
$\frac{2}{2} = (1) \rightarrow$ Stop here

III

↳ Total 2x1 MUX are $4 + 2 + 1 = 7$.

↳

| $S_2$ | $S_1$ | $S_0$ | Y |
|---|---|---|---|
| 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 | $I_7$ |




NOTE: 8:1 MUX by 4:1 MUX (Imp) will be discussed.

H.W i) 16:1 MUX by 4:1 MUX