

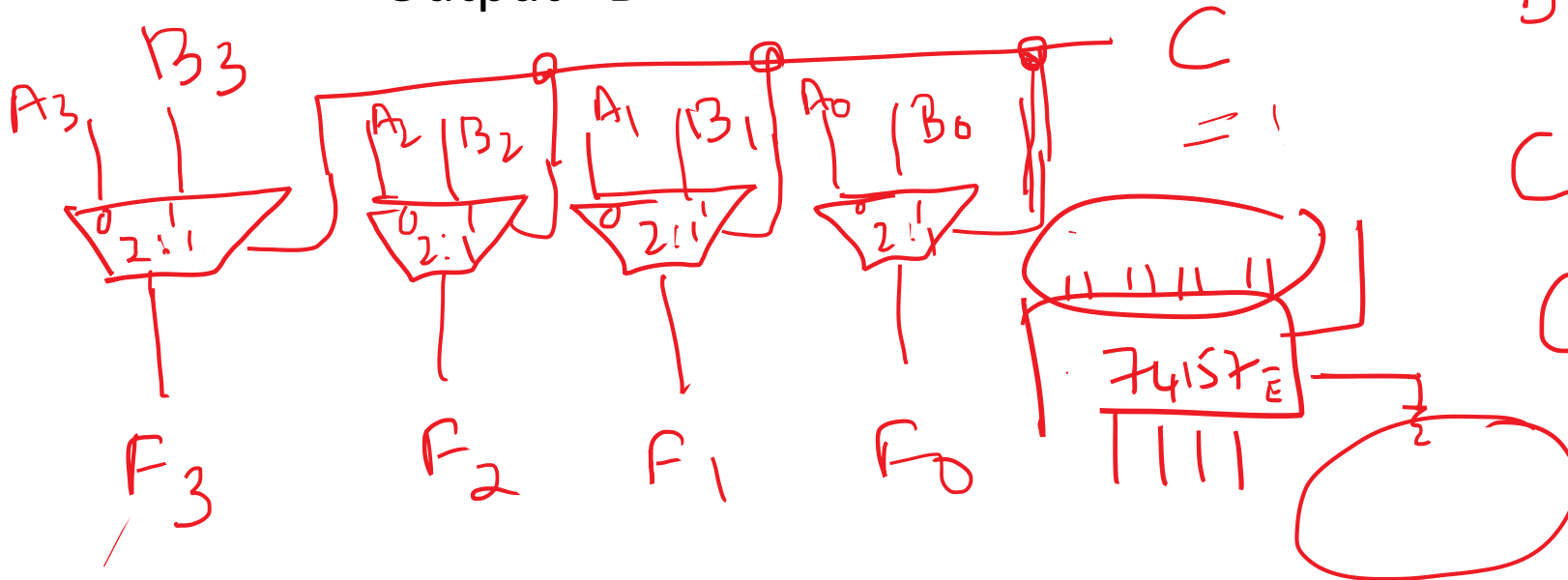
Multiplexers

Nibble Multiplexer

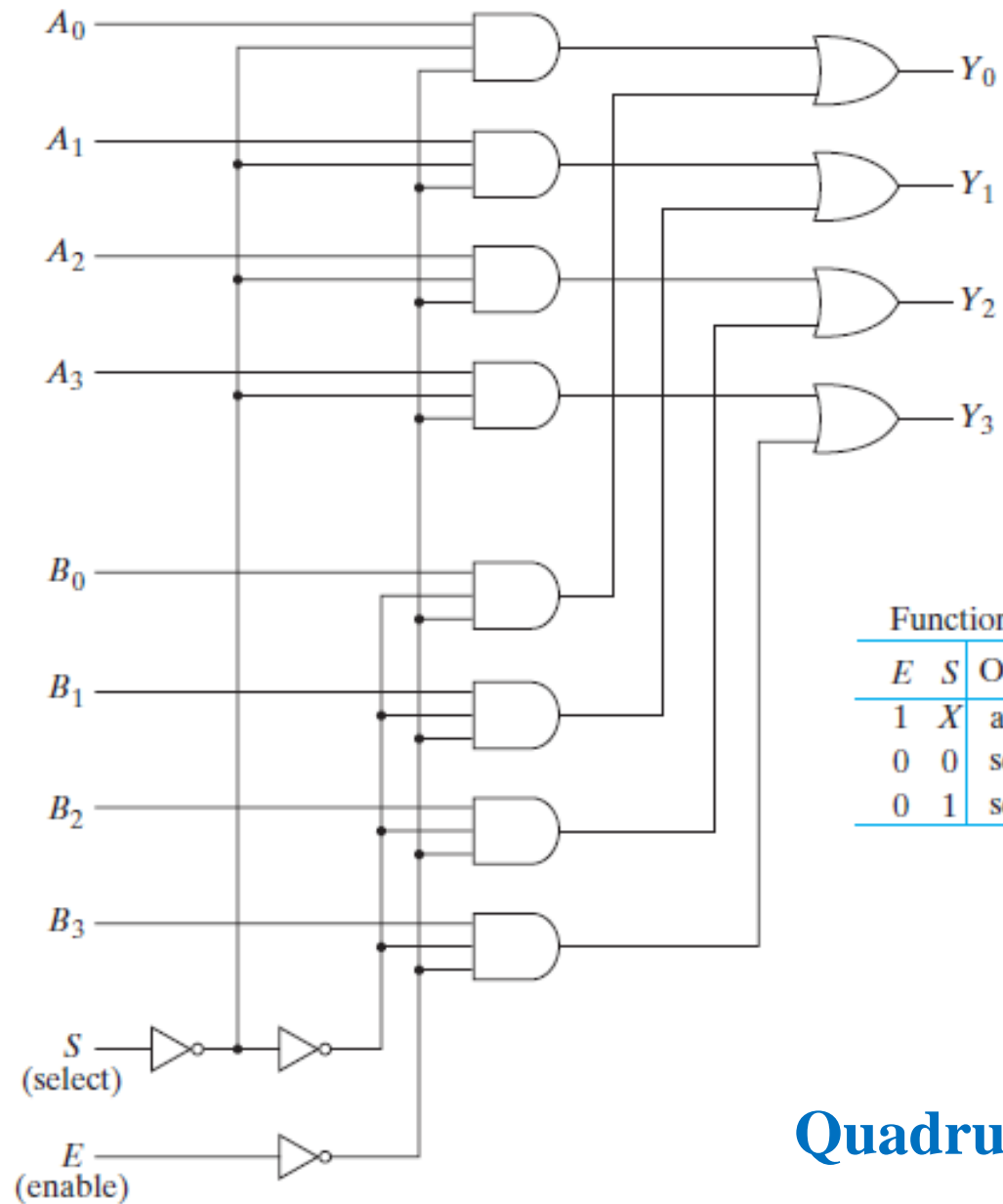
- A and B are two 4-bit numbers. Design a combinational circuit using suitable multiplexers according to following requirements.
 - If $\text{cntrl_ip} == 0$
Output=A
 - Else
Output =B

$$A = A_3 A_2 A_1 A_0$$

$$B = B_3 B_2 B_1 B_0$$



$$\begin{aligned} C = 0 &\Rightarrow F = A \\ C = 1 &\Rightarrow F = B \end{aligned}$$



Function table

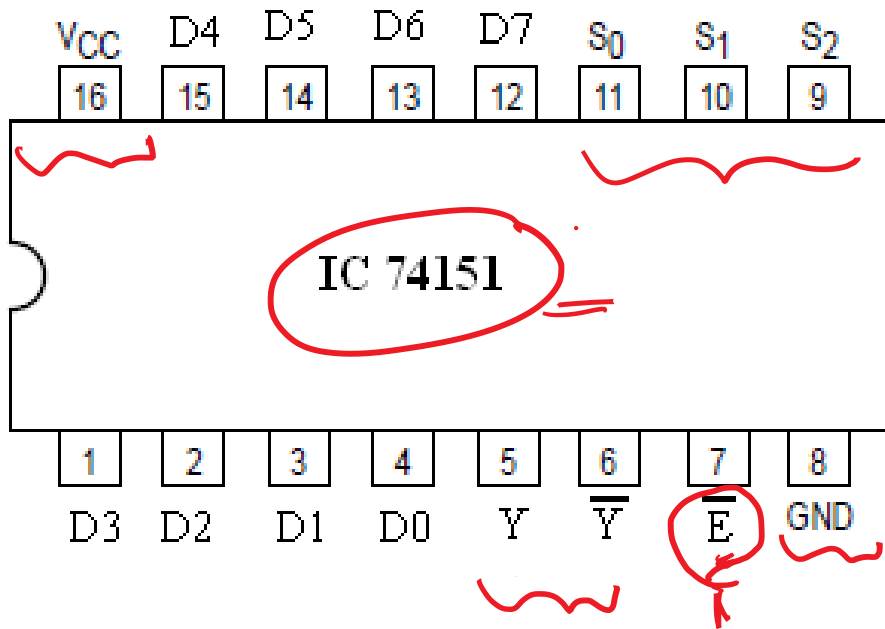
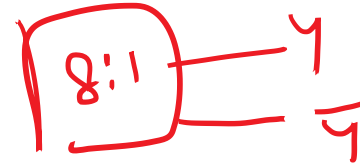
E	S	Output Y
1	X	all 0's
0	0	select A
0	1	select B

Quadruple 2:1 MUX or Nibble MUX

Multiplexer ICs :

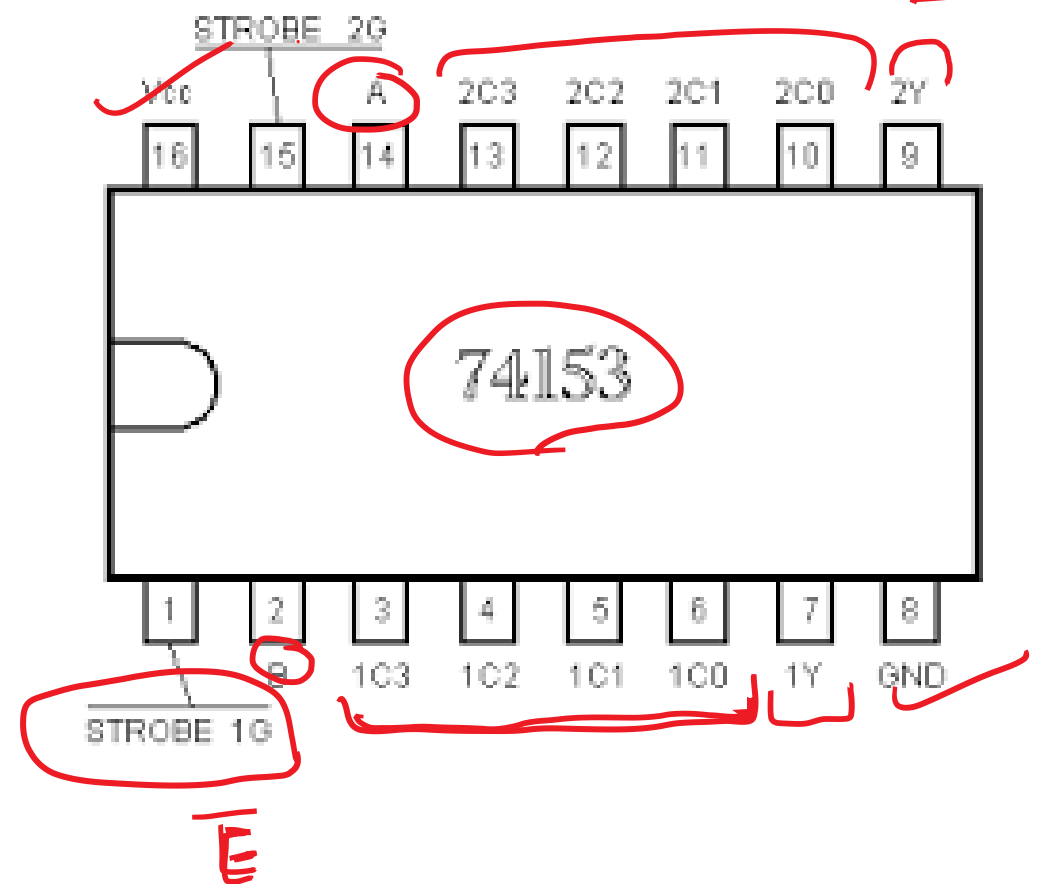
74151- 8:1 MUX

1 - 8:1 MUX



74153- 4:1 MUXs

→ 2, 4:1 MUX

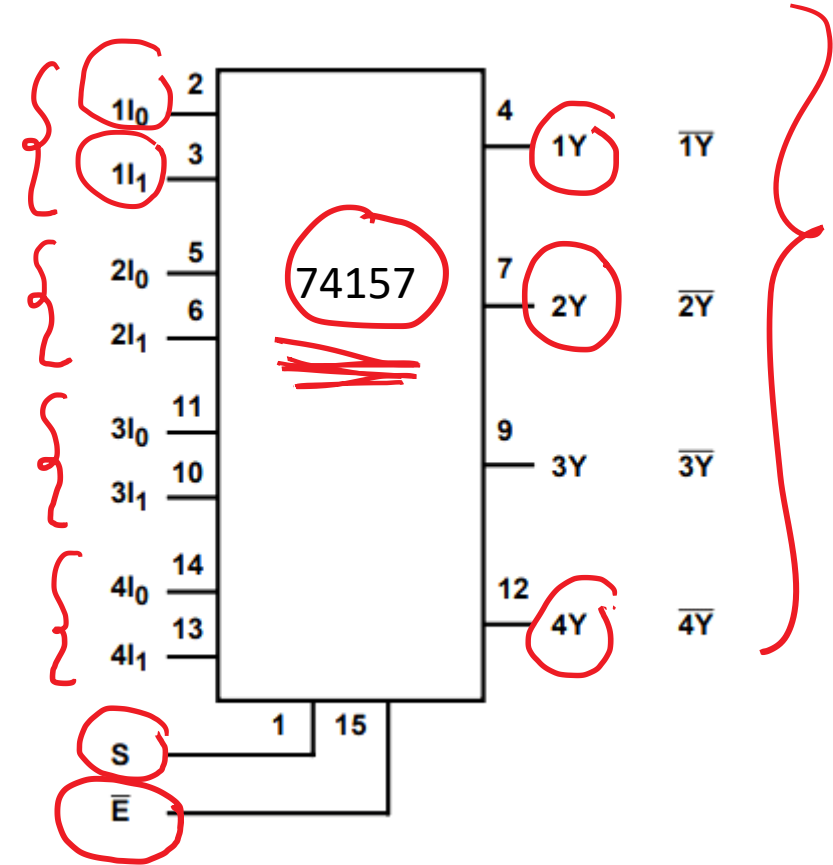


74157 Quad 2:1 MUX IC



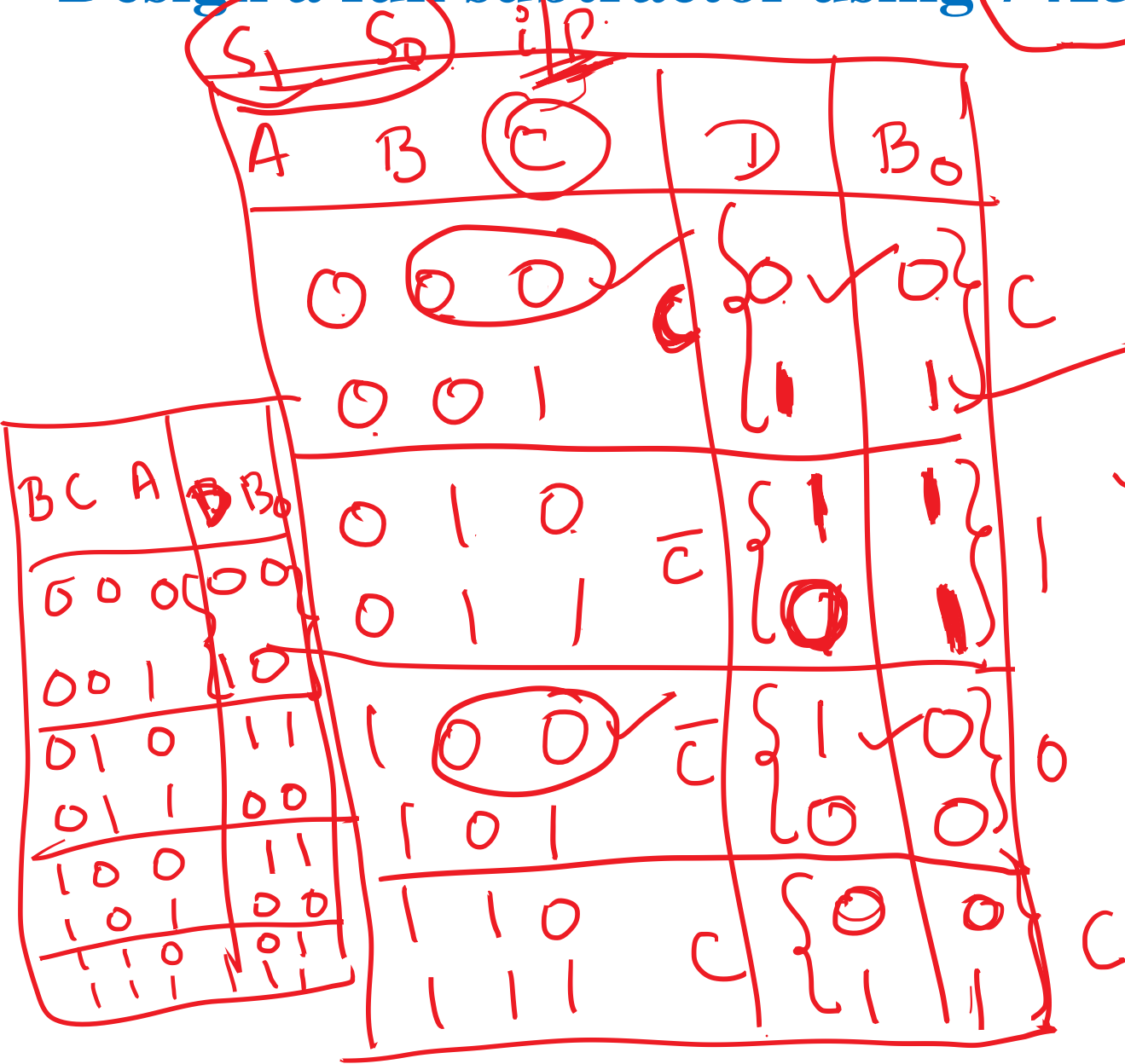
Handwritten notes in red ink:

- 74151 → 8:1 mux, 1
- 74153 → 4:1 mux, 2
- 74157 → 2:1 mux, 4



2, 4:1 Mux ? 2-SL

Design a full subtractor using 74153 IC and one external gate.

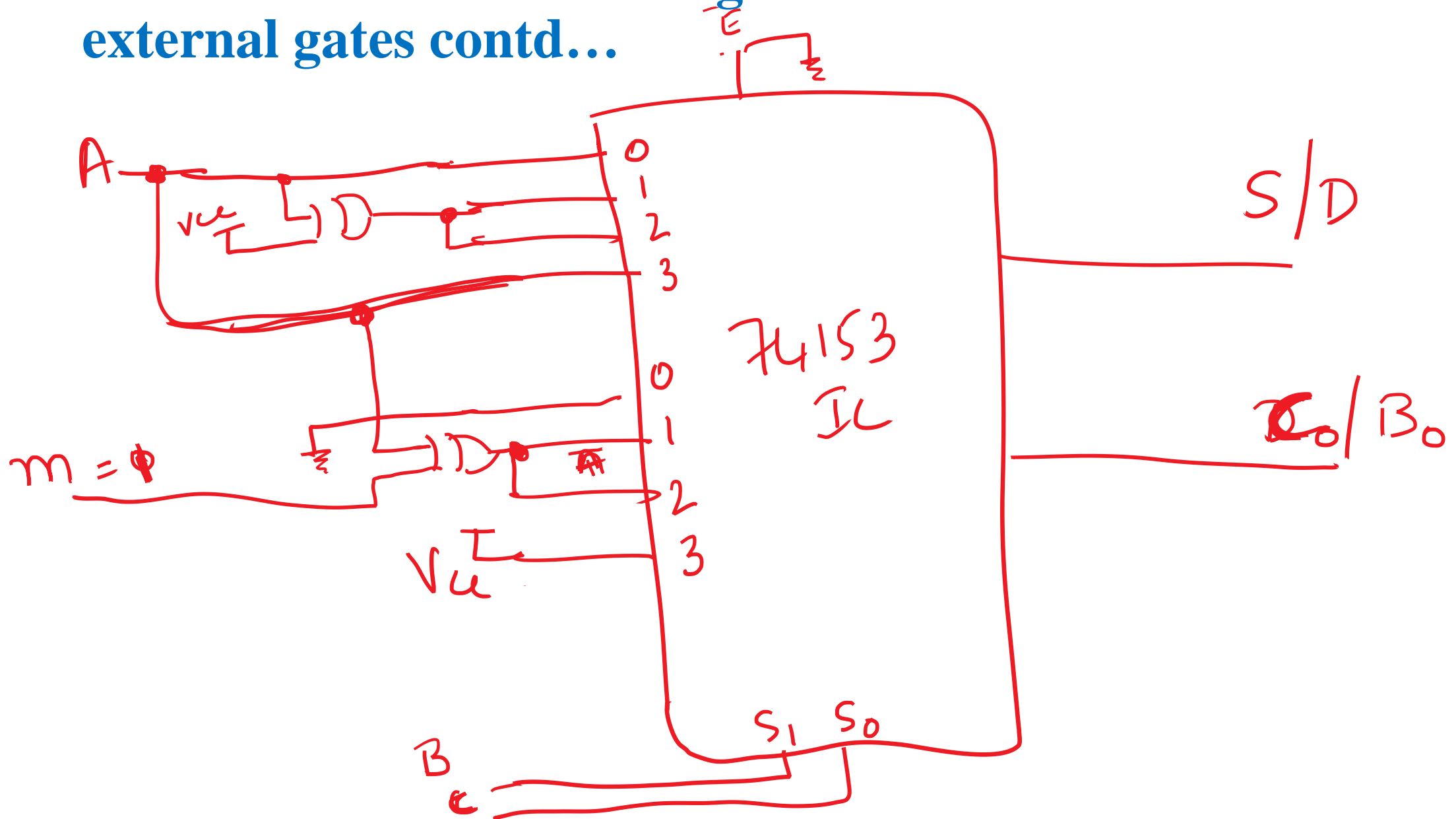


Design a full adder/ subtractor using 74153 IC and minimum external gates.

A	B	C	S	Co	D	Bo
0	0	0	0	0	0	0
0	0	1	1	0	1	1
0	1	0	1	0	1	1
0	1	1	0	1	0	1
1	0	0	1	0	1	0
1	0	1	0	1	0	0
1	1	0	0	1	0	0
1	1	1	1	1	1	1

B	C	A	S	Co	D	Bo
0	0	0	0	0	0	0
0	0	1	1	0	1	0
0	1	0	1	0	1	1
0	1	1	0	1	0	1
1	0	0	1	0	1	0
1	0	1	0	1	0	0
1	1	0	0	1	0	0
1	1	1	1	1	1	1

Full adder/subtractor using 74153 IC and minimum external gates contd...



Exercise:

- Realize the Boolean expression $f(w,x,y,z) = \sum m(4,5,7,8,10,12,15)$ using
 - 74157 multiplexer and external gate
 - 74153 IC and external gates
 - 74151 IC & external gate
- Refer the prescribed book for additional problems

SI Sp ~~So~~
W X Y Z | F

0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1

$$\begin{aligned} & \bar{y}\bar{z} + \bar{y}z \\ & + yz \\ & \bar{y}\bar{z} + yz \\ & (y+z) \end{aligned}$$

W X Y Z | F

1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

$$(\bar{y} + z)$$

74151

$$\bar{y}\bar{z} + y\bar{z}$$

$$\bar{y}\bar{z} + yz = y \oplus z$$

Question?