

# DLD Notes

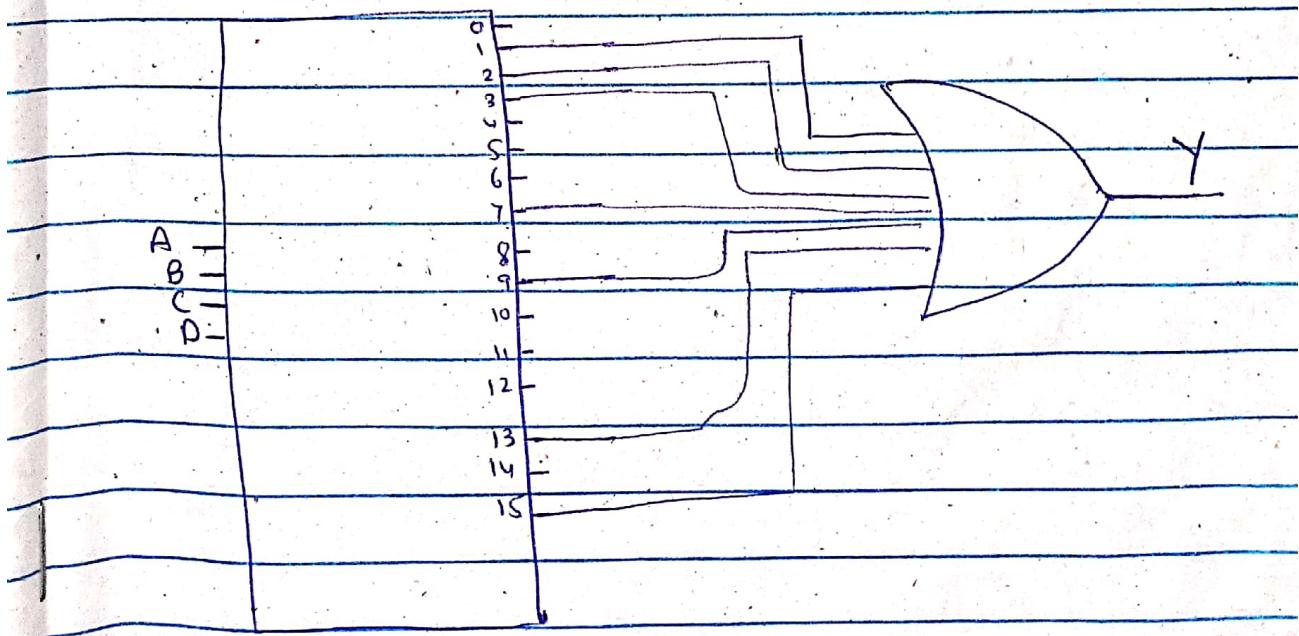
## Chap 6

### Topics To Be Covered :-

- Implementing Boolean function Using decoder ✓
- 74HC157 Multiplexer ✓
- 74 LS151 Multiplexer (16 datalines / 8) ✓
- 74 LS138 Demultiplexer ✓
- Implement Full Adder Using 3-8 line Decoder.
- Implement Full Adder Using 4x1 multiplexer -
- Construct 16x1 multiplexer with two 8x1  
And on 1x4 multiplexers.

### Implementing Boolean Function Using decoder:-

$$F(A, B, C, D) = \{ (1, 2, 3, 7, 9, 13, 15) \}$$



## 74HC157 Multiplexer:-

8x1 multiplexer

$I_0$	$S_2$	$S_1$	$S_0$	$Y$
$I_1$	0	0	0	$I_0$
$I_2$	0	0	1	$I_1$
$I_3$	0	1	0	$I_2$
$I_4$	0	1	1	$I_3$
$I_5$	1	0	0	$I_4$
$I_6$	1	0	1	$I_5$
$I_7$	1	1	0	$I_6$
				$I_7$

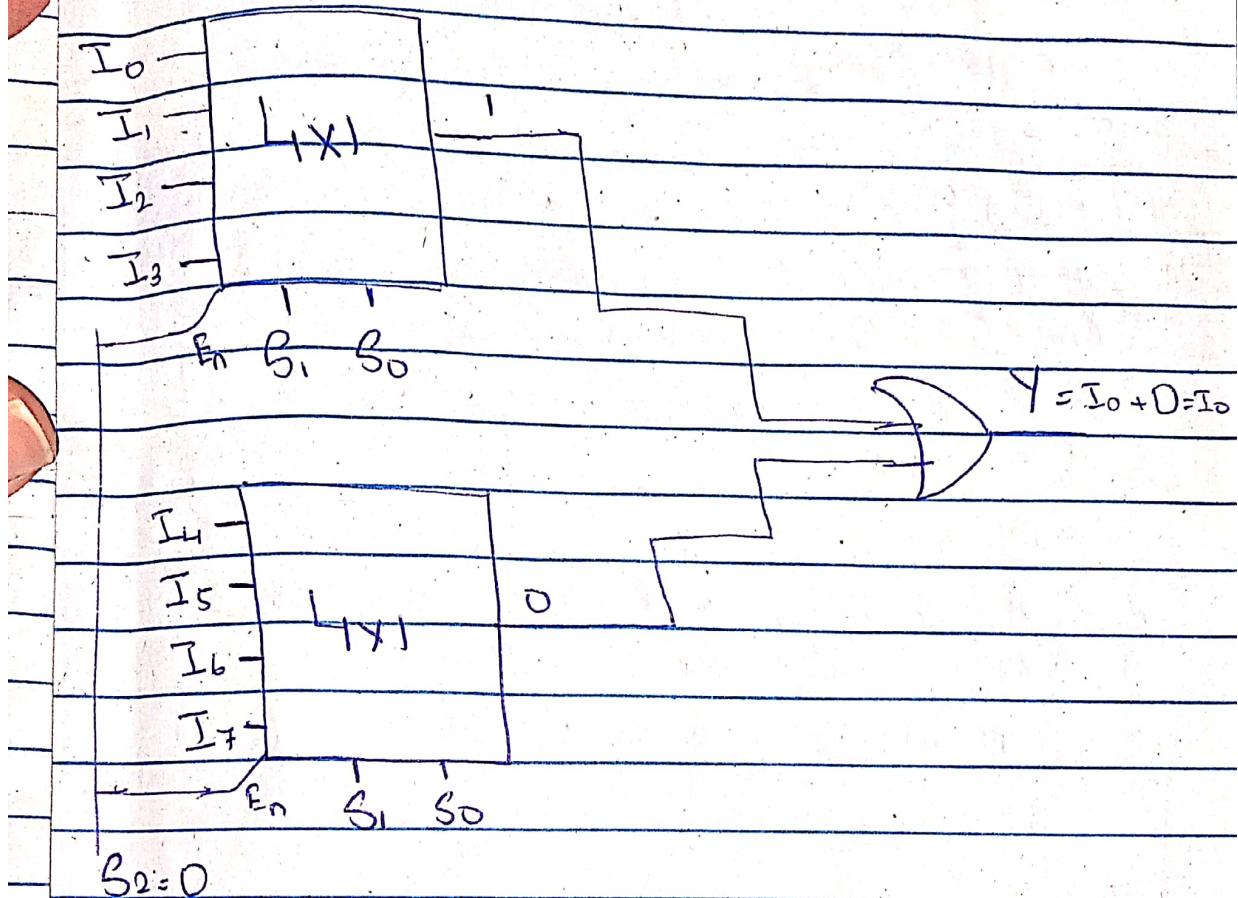
$$\begin{aligned}
 Y = & \bar{S}_2 \bar{S}_1 \bar{S}_0 I_0 + S_2 \bar{S}_1 S_0 I_1 + \bar{S}_2 S_1 \bar{S}_0 I_2 \\
 & + \bar{S}_2 S_1 S_0 I_3 + S_2 \bar{S}_1 \bar{S}_0 I_4 + \bar{S}_2 \bar{S}_1 S_0 I_5 \\
 & + S_2 S_1 \bar{S}_0 I_6 + S_2 S_1 S_0 I_7
 \end{aligned}$$

16x1 Multiplexer

16x1 Multiplexed :-

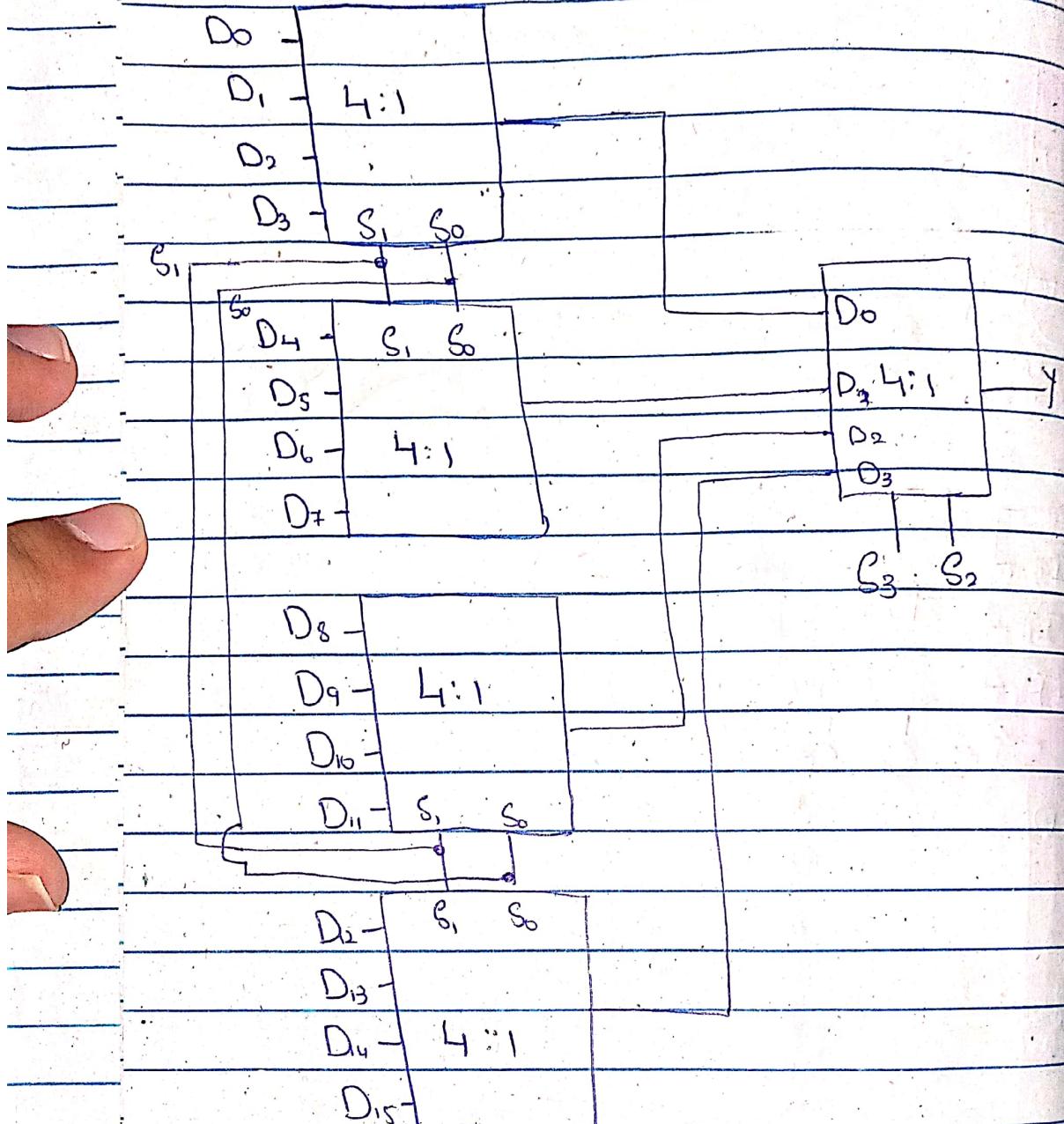
8x1 MUX Using 4x1 Mux :- (Special Case)

This will be done using ("Enable")



16x1 Mux :-

Using 4x1 mux:



## Implementation Of Boolean Function Using mux(4:1)

Implementation :-  $F(A, B, C, D) = \sum m(1, 4, 5, 7, 9, 12, 13)$

Using 4x1 Mux

$S_1, S_0$	$C_0$	$\bar{C}_0$	$C_1$	$\bar{C}_1$	$I_0$	$I_1$	$I_2$	$I_3$
$AB$	00	0	1	0	0	0	$\bar{C}D = I_0$	
	01	1	1	1	0	0	$\bar{C}+D = I_1$	
	11	1	1	0	0	0	$\bar{C} = I_3$	
	10	0	1	0	0	0	$\bar{C}D = I_2$	

Since  $AB$  is  $S_1, S_0$  so the Boolean expression for every <sup>row</sup> term of  $S_1, S_0$  is considered as  $I_0, I_1, I_2, I_3$  depending on the values of  $S_1, S_0$ .

$\bar{C}D$	$I_0$	$S_1, S_0$	$Y$
$D$	$I_1$	$0\ 0$	$I_0 = \bar{C}D$
$\bar{C}D$	$I_2$	$0\ 1$	$I_1 = D$
$\bar{C}$	$I_3$	$1\ 1$	$I_2 = \bar{C}D$
		$1\ 0$	$I_3 = \bar{C}$
		$S_1, S_0$	

$$S_1 = A$$

$$S_0 = B$$

## 16x1 Mux Using 8:1 Mux

In Case Of 8:1 Mux

$$\text{N.O of inputs} = 2^3 = 8$$

$\therefore 3$  Select Lines

In Case Of 16:1 mux

$$\text{N.O of inputs} = 2^4 = 16$$

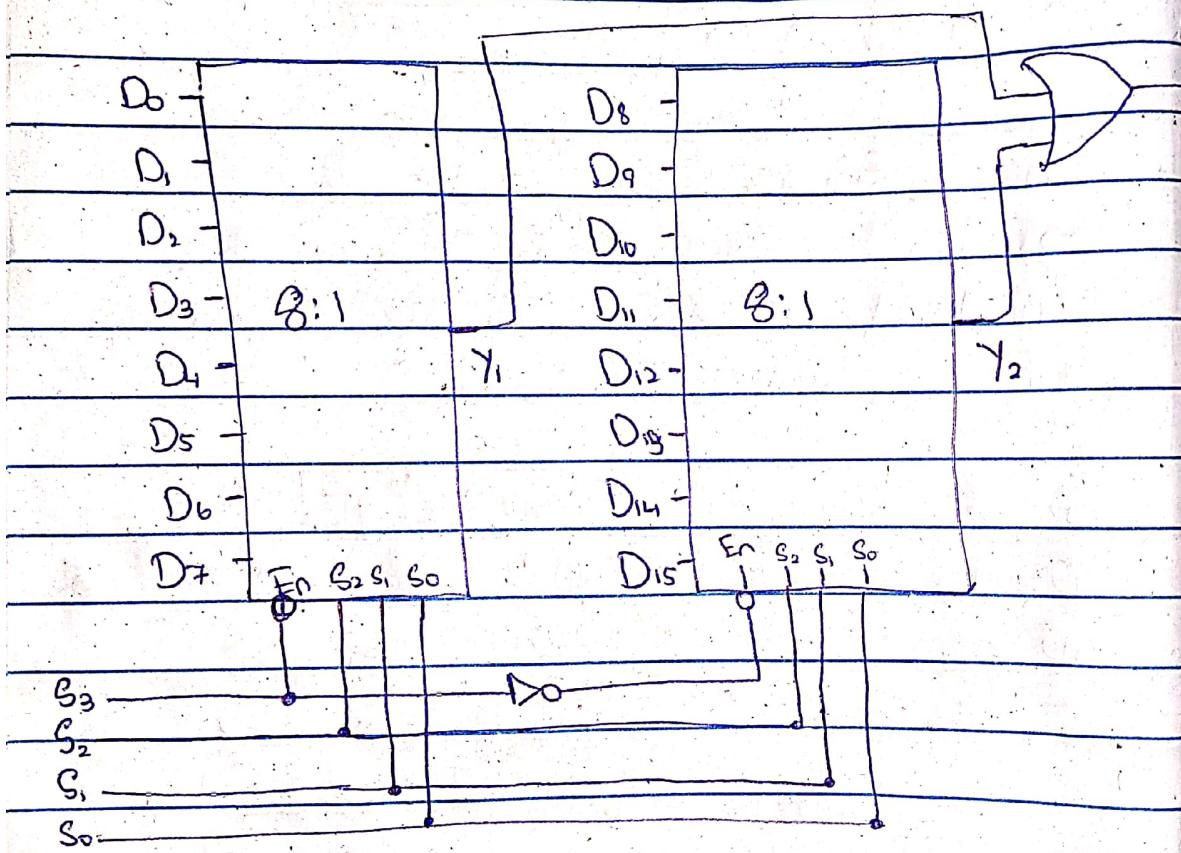
$\therefore 4$  Select Lines

$$60 - 4 - 3 = 1$$



Have To Add

One Select line



① Select lines



$S_0, S_1, S_2,$

$S_3 \rightarrow \text{ORED}$

② Output line



2 outputs  
will be  
ORED

74LS18 Demux

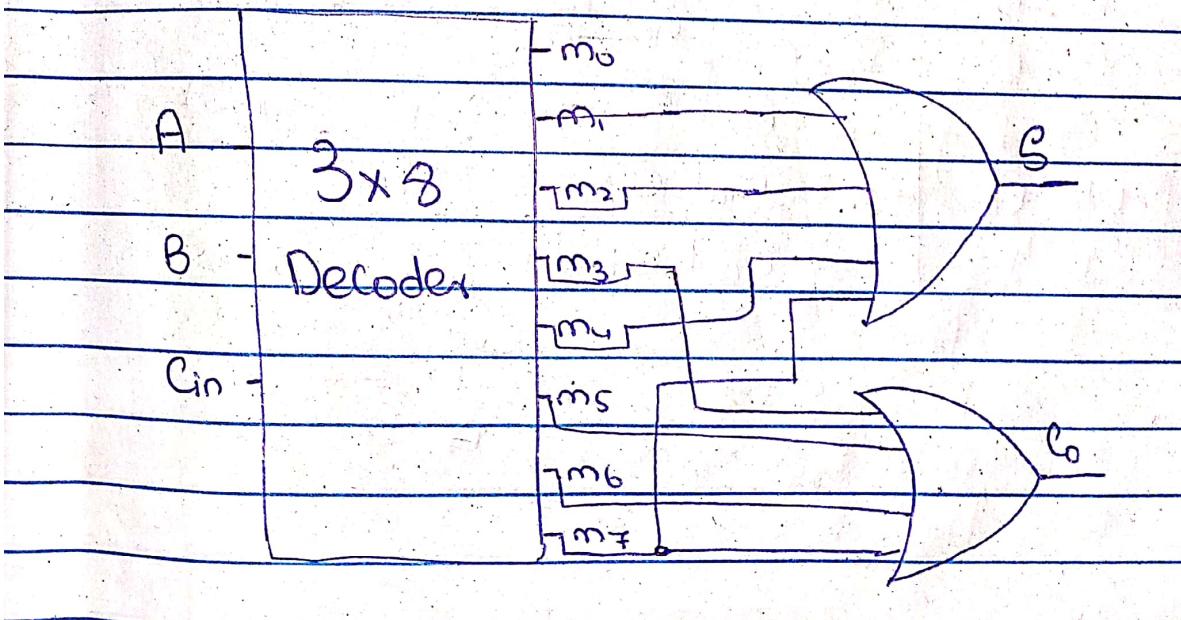
## Implementing Full Adder Using 3x8 Decoder

Truth Table:-

A	B	Cin	S	C <sub>o</sub>	minterm
0	0	0	0	0	m <sub>6</sub>
0	0	1	1	0	m <sub>1</sub>
0	1	0	1	0	m <sub>2</sub>
0	1	1	0	1	m <sub>3</sub>
1	0	0	1	0	m <sub>4</sub>
1	0	1	0	1	m <sub>5</sub>
1	1	0	0	1	m <sub>6</sub>
1	1	1	1	1	m <sub>7</sub>

$$F_S = \{ (m_1, m_2, m_4, m_7) \text{ for sum} \}$$

$$F_{C_o} = \{ (m_3, m_5, m_6, m_7) \text{ for carry} \}$$



## Full Adder Using 4:1 mux

A	B	Cin	S	C0	
0	0	0	0	0	For S:-
0	0	1	1	0	$\bar{A} \oplus \bar{B}$
0	1	0	1	0	$\bar{A} \oplus B$
0	1	1	0	1	$\bar{A} \oplus \bar{B}$
1	0	0	1	0	$\bar{A} \oplus \bar{B}$
1	0	1	0	1	$\bar{A} \oplus \bar{B}$
1	1	0	0	1	$\bar{A} \oplus \bar{B}$
1	1	1	1	1	For C0:-

A	B	Cin	I0	I1	I2	I3
0	0	0	1	1	1	1
1	1	1	1	1	1	1

$B = S_0$   
 $A = S_1$

A	B	S	
0	0	$I_0 = C_{in}$	$C_{in} \rightarrow I_0$
0	1	$I_1 = \bar{C}_{in}$	$\bar{C}_{in} \rightarrow I_1$ 4x1 Mux Sum(S)
1	0	$I_2 = \bar{C}_{in}$	$\bar{C}_{in} \rightarrow I_2$ Mux
1	1	$I_3 = C_{in}$	$C_{in} \rightarrow I_3$ $S_1 \quad   \quad S_0 \quad S_1 = A$ $A \quad B$

For Co:-

A	0	0	0	1	1	1	0
O	/	/	/	/	X	/	/
1	X	X	X	X	X	X	X

A	B	C <sub>o</sub>
0	0	C <sub>in</sub> 0
0	1	C <sub>in</sub>
1	0	C <sub>in</sub>
1	1	1

O -		
C <sub>in</sub> -	4x1	C <sub>o</sub>
C <sub>in</sub> -	MUX	
1 -		
A : B		