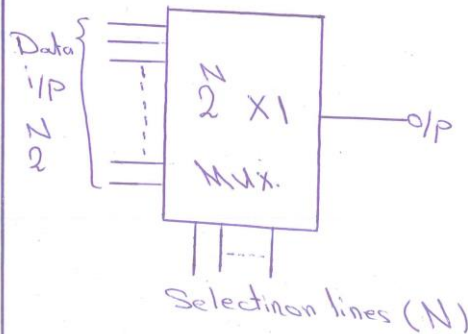


Multiplexer and Demultiplexer: -

Multiplexer :

A multiplexer (MUX) is a device that allows digital information from several sources to be routed onto a single line for transmission over that line to a common destination. The basic multiplexer, then has several data input lines (2^N) and a single o/p line. It also has data selector inputs (N) that permit digital data on any one of the input to be switched to the o/p line.

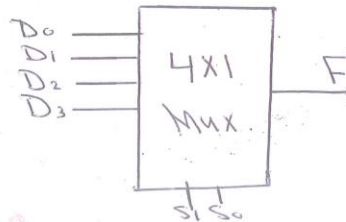
The block diagram for such multiplexer ($2^N \times 1$) is shown below: -



The multiplexer may be considered as a multi-switch.

The block diagram of 4x1 Mux and its truth table is shown below: -

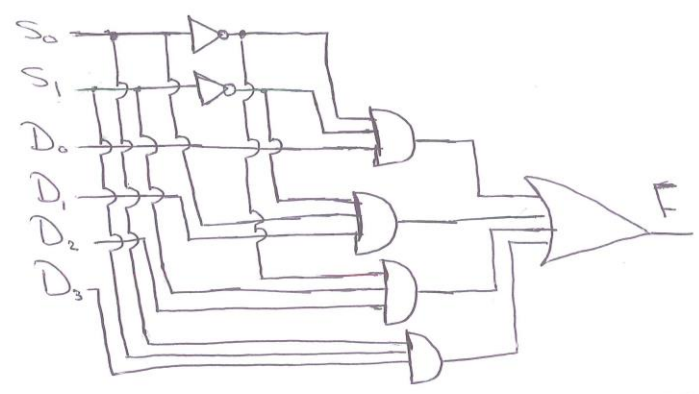
S_1	S_0	F
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3



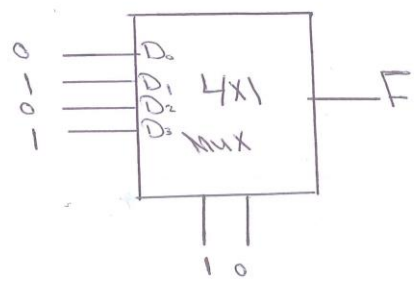
The equation of F is: -

$$F = \bar{S}_1 \bar{S}_0 D_0 + \bar{S}_1 S_0 D_1 + S_1 \bar{S}_0 D_2 + S_1 S_0 D_3$$

The Circuit diagram of the equation is: -



Ex :- Find the o/p of the following: -



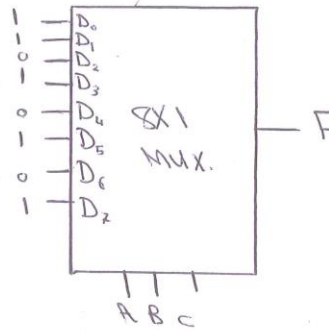
Solution:- $S_1 S_0 = \frac{10}{2}$
 $F = D_2 = 0$

Ex:- Implement the following function by means of using the suitable Mux. $F = \sum 0, 1, 3, 5, 7$.

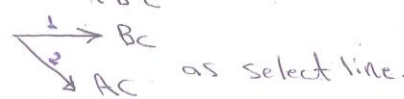
Solution:-

1) By using 8X1 MUX

ABC	F
000	1
001	0
010	1
011	1
100	0
101	1
110	0
111	1

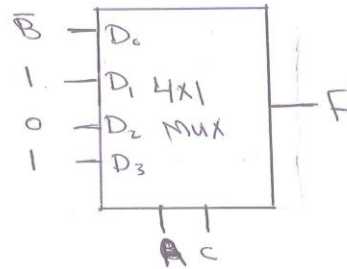
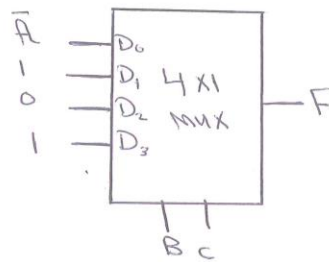


2) By using 4x1 MUX.



Select line input	D ₀ B̄c	D ₁ B̄c	D ₂ Bc	D ₃ Bc
Ā	0	1	2	3
A	4	5	6	7
result	Ā	1	0	1

Select line input	D ₀ Āc	D ₁ Āc	D ₂ Ac	D ₃ Ac
B̄	0	1	4	5
B	2	3	6	7
result	B̄	1	0	1



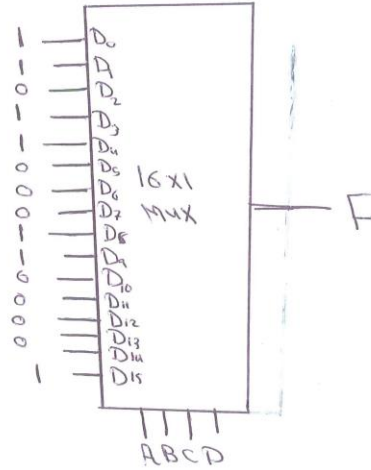
Ex: - If $F = \sum m(0, 1, 3, 4, 8, 9, 15)$, Implement it using :-

- 1- 16x1 Mux.
- 2- 8x1 Mux.
- 3- 4x1 Mux.
- 4- 2x1 Mux.

Solution:-

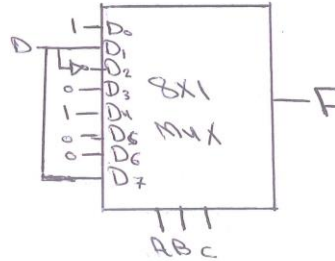
1- By using 16x1 Mux

ABCD	F
0000	1
0001	1
0010	0
0011	1
0100	1
0101	0
0110	0
0111	0
1000	1
1001	1
1010	0
1011	0
1100	0
1101	0
1110	0
1111	1



2- 8x1 Mux.

Select input	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7
	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
\bar{D}	0	2	4	6	8	10	12	14
D	1	3	5	7	9	11	13	15
result	1	D	\bar{D}	0	1	0	0	D



3- 4x1 Mux.

Select input	D_0	D_1	D_2	D_3
	AB	AB	AB	AB
$\bar{C}\bar{D}$	0	4	8	12
$\bar{C}D$	1	5	9	13
$C\bar{D}$	2	6	10	14
CD	3	7	11	15
result		$\bar{C}\bar{D}$	\bar{C}	$C\bar{D}$

$\bar{C}\bar{D} + \bar{C}D + C\bar{D} = \bar{C} + D$

