A K T U

B.Tech II-Year

GATEWAY CLASSES

EC & EC Allied

DSD : Digital System Design

Unit-2 Lec-6

Gateway Classes



Today's target

- Circuit realization using Multiplexers
- PYQ

Avinash Sir

UNIT-2 : Combinational circuits:

- Analysis and Design of combinational circuits
- MSI devices like comparators, multiplexers, demultiplexers, encoder, decoder,
- circuit realization using Multiplexers and decoders, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU.

Gateway Classes

Multiplexer tree

32:1 → 4:1

$\frac{32}{4} = 8$, $\frac{8}{4} = 2$, $\frac{2}{4} = 0.5 \simeq 1$

8+2+1 = 11

A multiplexer tree (or mux tree) is a hierarchical way to build a large multiplexer (many-to-one selector) out of smaller multiplexers.

For Example "An 8:1 multiplexer can be made with two 4:1 multiplexers and one 2:1 multiplexer. The two 4:1 outputs feed into the 2:1, giving total select bits 3."

How To Calculate no. of Mux Required in a specific condition

Ex.:- How many MUX required to design 16:1 Mux using 2:1 MUX or 4:1 MUX

16:1 MUX By 2:1

$\frac{16}{2} = 8$

$\frac{8}{2} = 4$

$\frac{4}{2} = 2$

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

8+4+2+1 = 14



4:1

$\frac{16}{4} = 4$

$\frac{4}{4} = 1$

Total 4+1



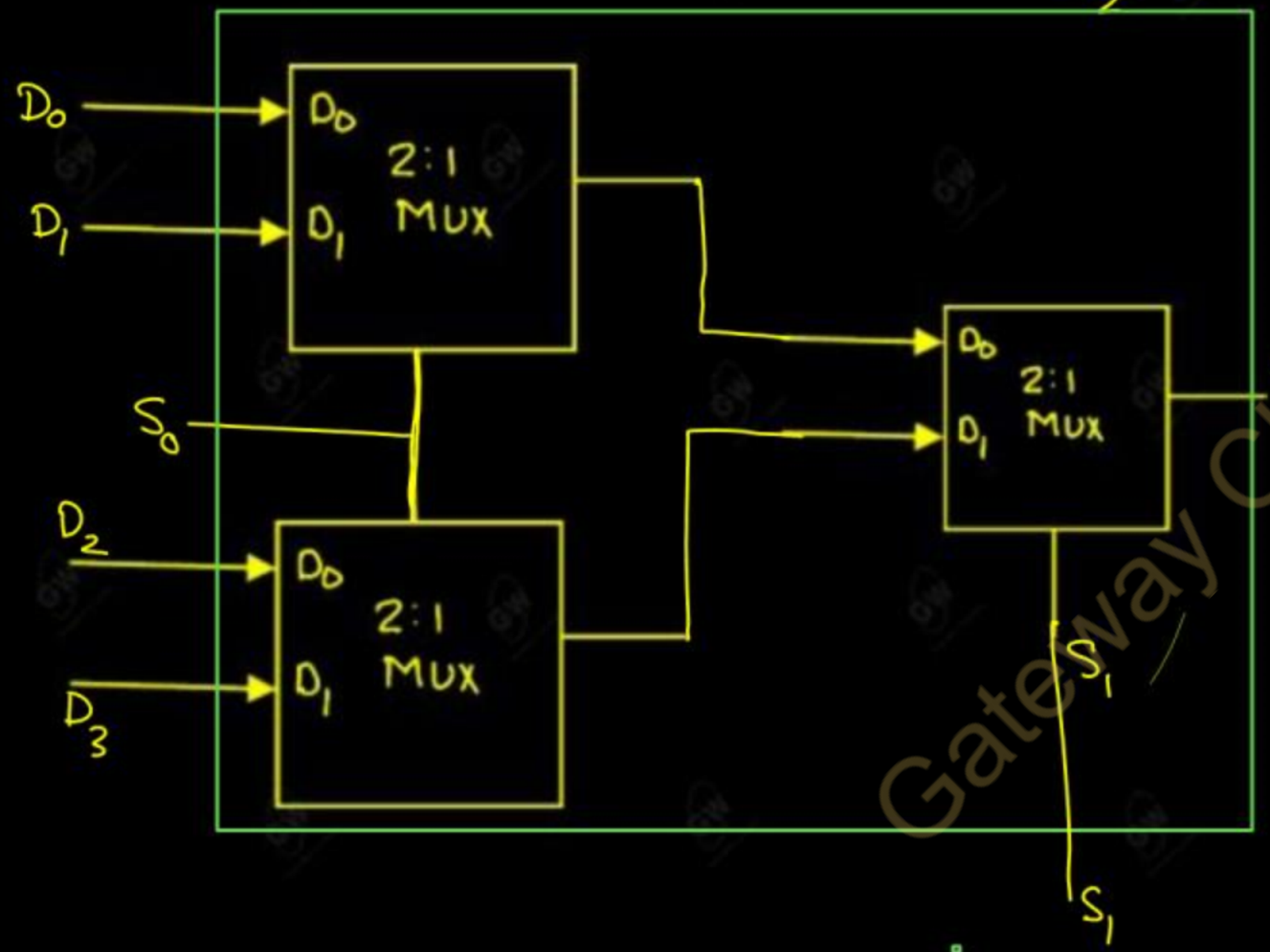
Gateway Classes

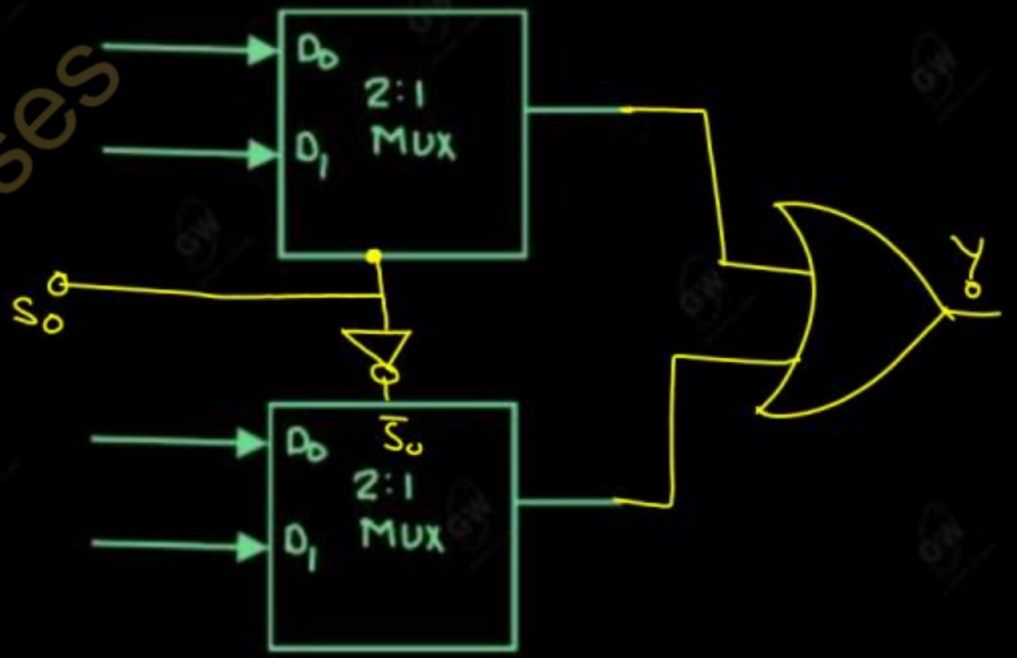
Q.1 . Design 4:1 MUX using 2:1 MUX

$\frac{4}{2} = 2$

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

(2+1) = 3





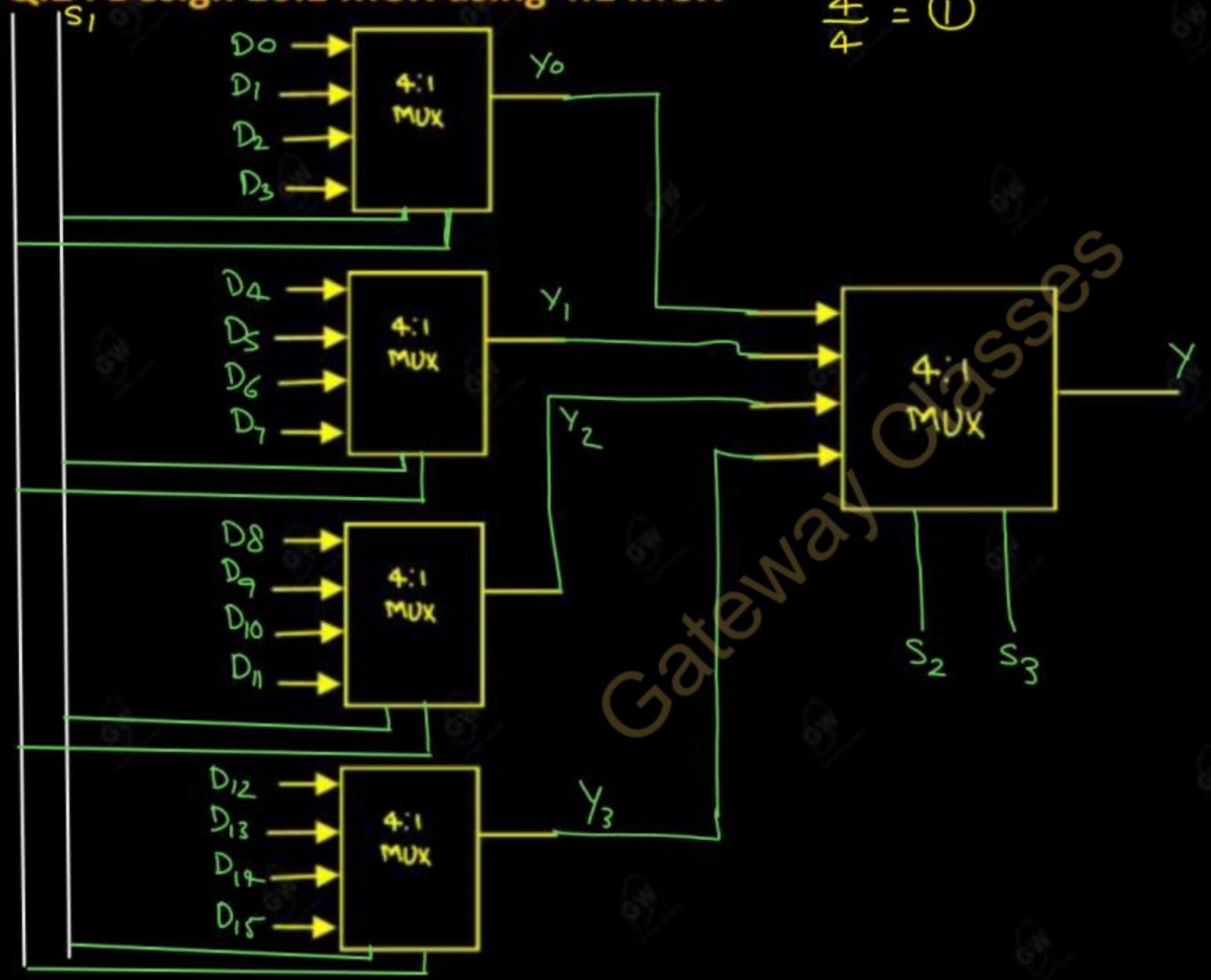
Gateway Classes

Q.2 . Design 16:1 MUX using 4:1 MUX

$\frac{16}{4} = 4$

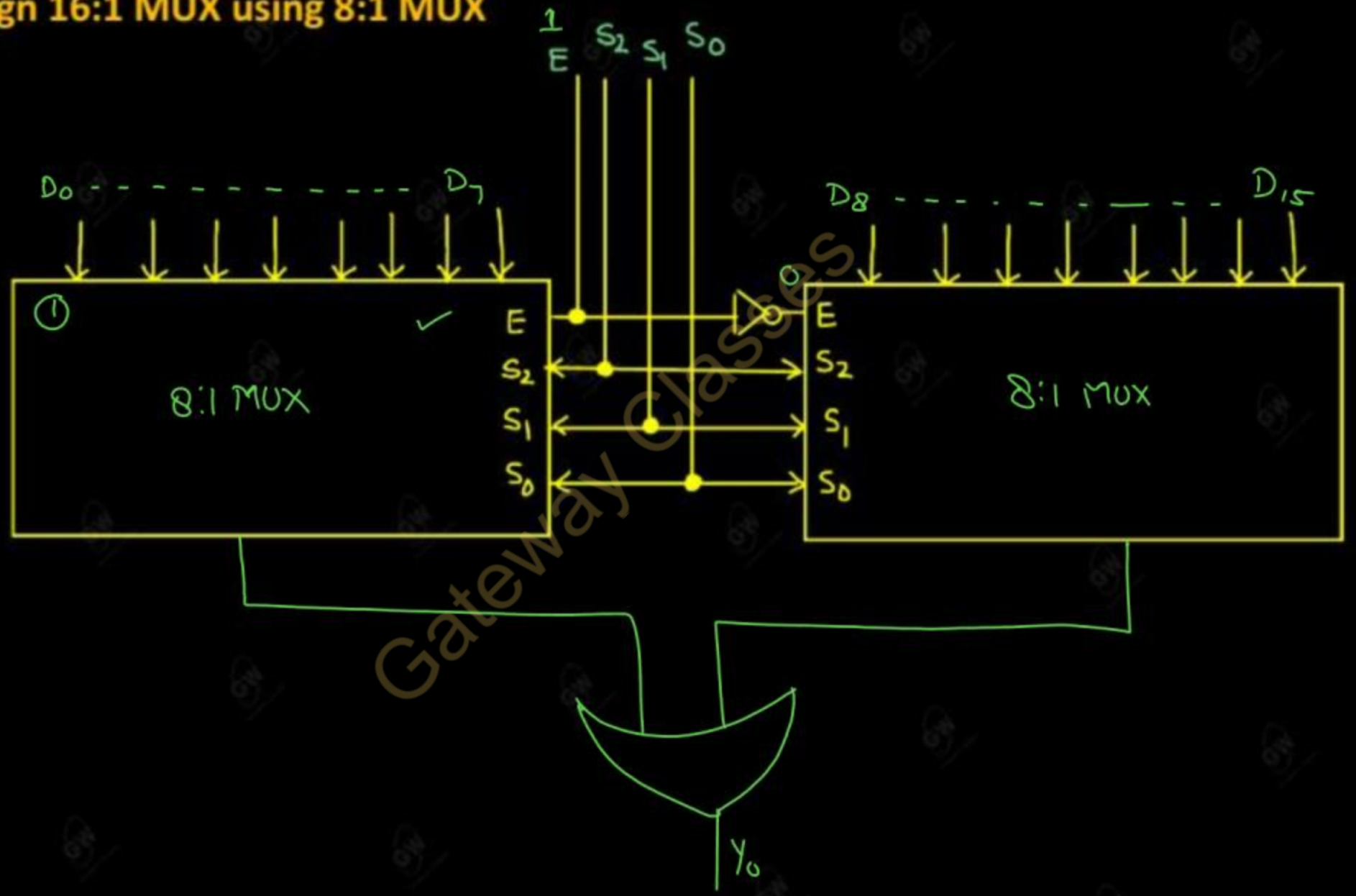
$\frac{4}{4} = 1$

AKTU- 2024-25



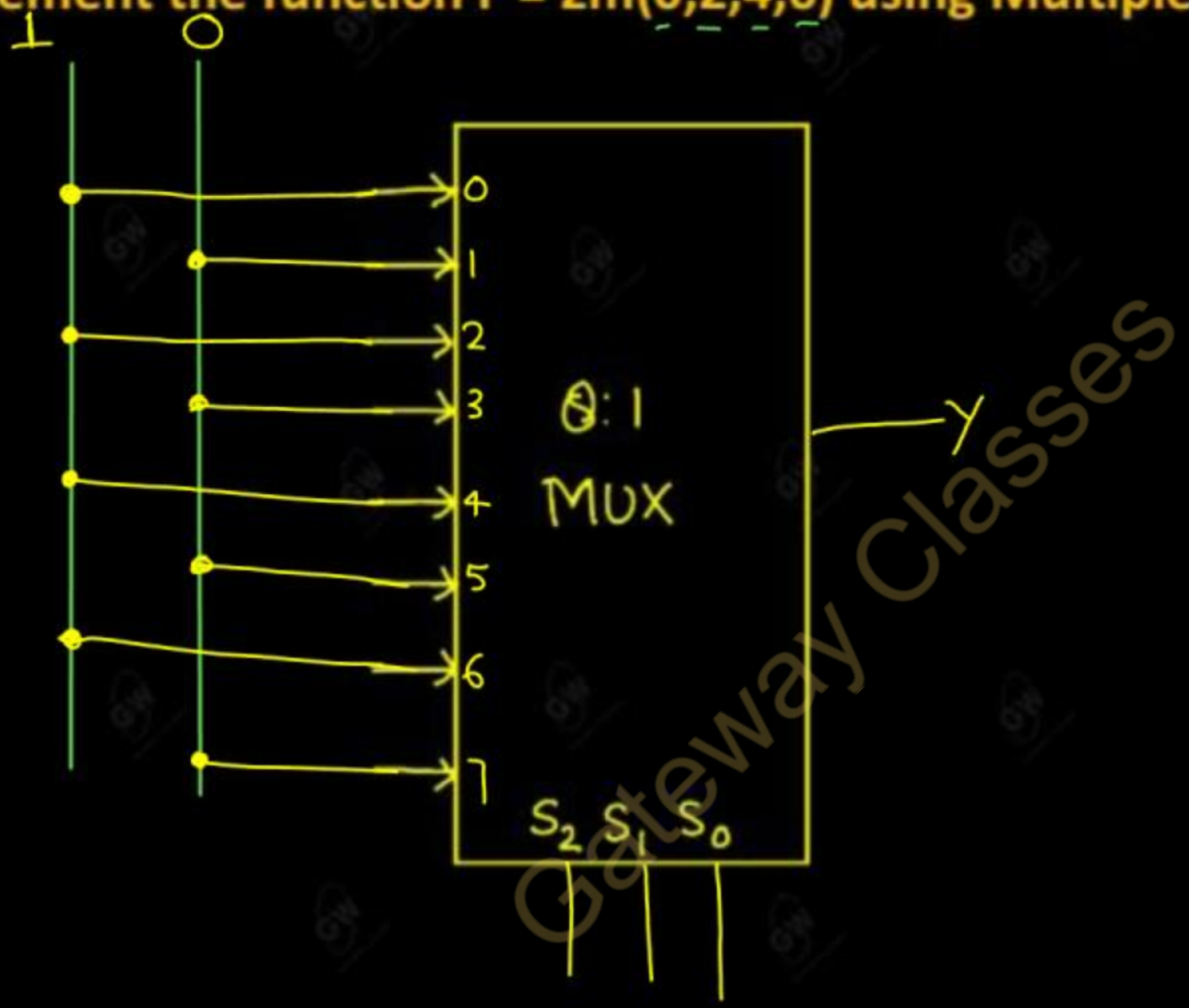
Gateway Classes

Q.3 . Design 16:1 MUX using 8:1 MUX



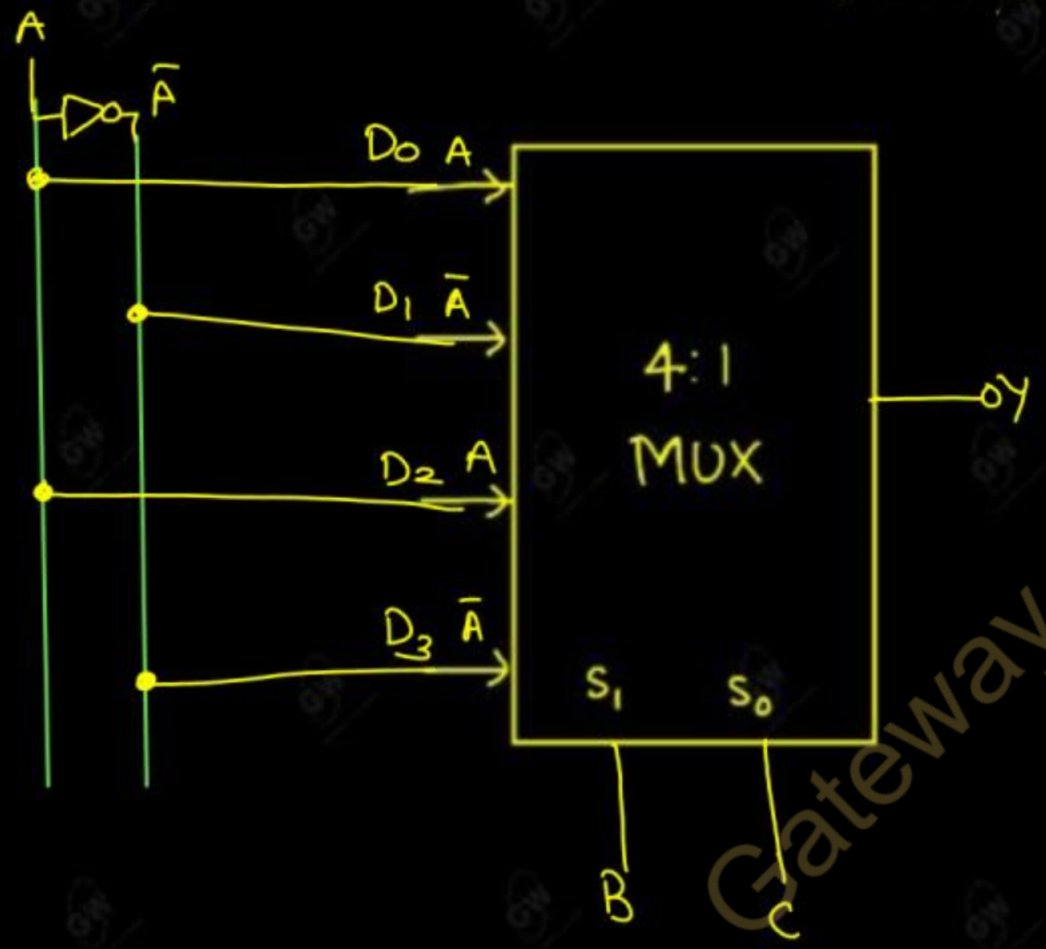
Gateway Classes

Q.4 . Implement the function $F = \Sigma m(0,2,4,6)$ using Multiplexer.



Gateway Classes

Q.5 . Implement the function F = Σm(1,3,4,6) using 4:1 multiplexer.



	D_0	D_1	D_2	D_3
$\bar{A}$	0	1	2	3
A	4	5	6	7

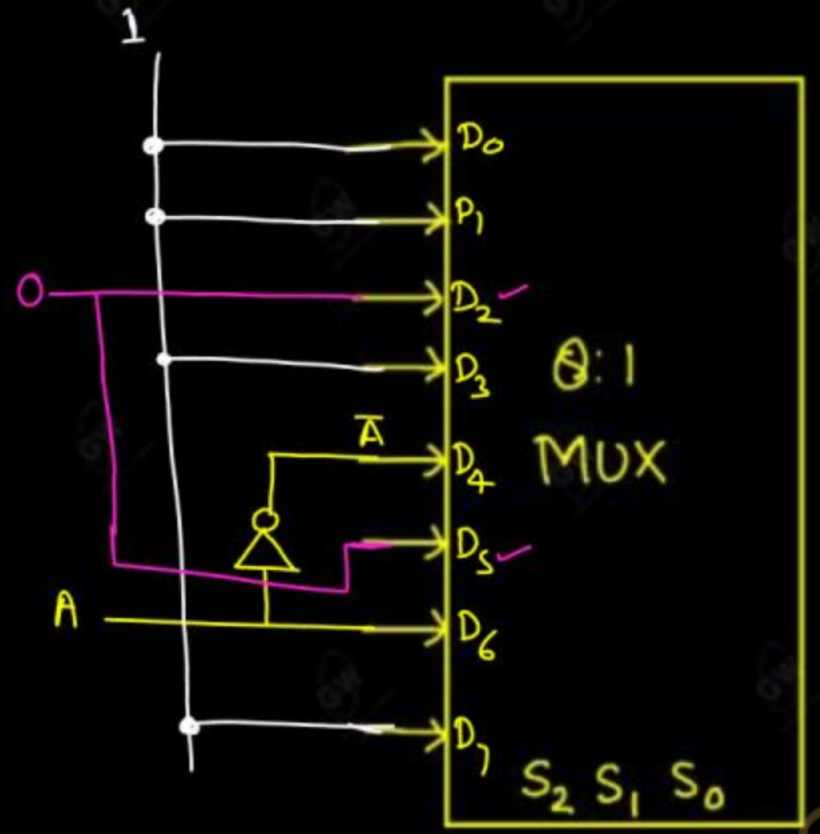
I/P to MUX: A $\bar{A}$ A $\bar{A}$

"Design Table"

Gateway Classes

Q.6 . Implement the function F = Σm(0,1,3,4,7,8,9,11,14,15) using 8:1 MUX.

AKTU- 2022-23



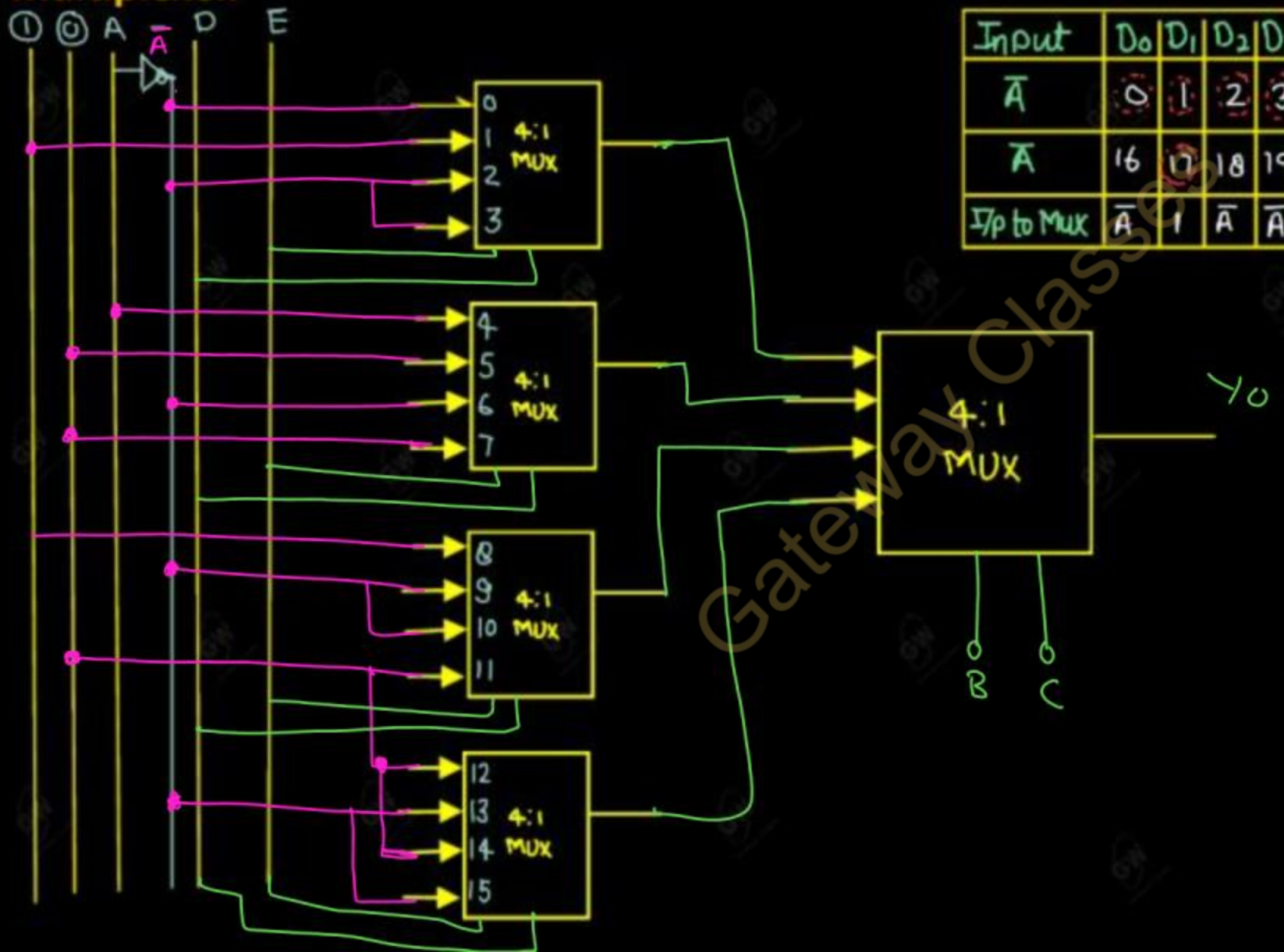
	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7
$\bar{A}$	0	1	2	3	4	5	6	7
A	8	9	10	11	12	13	14	15
	1	1	0	1	$\bar{A}$	0	A	1

Gateway Classes

Q.7 . Implement the function F(A,B,C,D,E) = Σm(0,1,2,3,6,8,9,10,13,15,17,20,24) using 4:1 Multiplexer.

$\frac{16}{4} = 4$, $\frac{4}{4} = 1$

Input	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D_{11}	D_{12}	D_{13}	D_{14}	D_{15}
$\bar{A}$	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$\bar{A}$	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
I/p to Mux	$\bar{A}$	1	$\bar{A}$	$\bar{A}$	A	0	$\bar{A}$	0	1	$\bar{A}$	$\bar{A}$	0	0	$\bar{A}$	0	$\bar{A}$



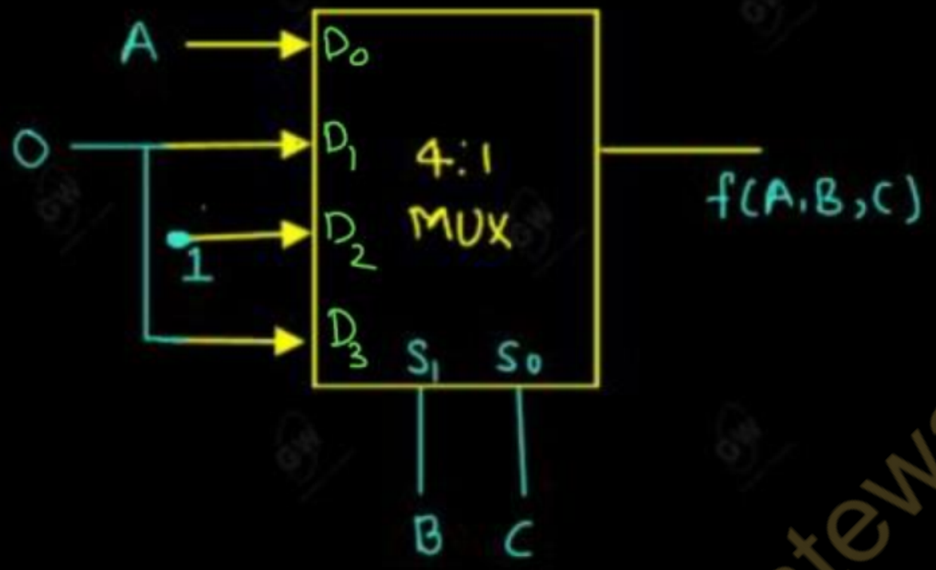
Gateway Classes

Q.8 . Implement the function F(A,B,C) = Π (0,1,3,5,7) using 4:1 Multiplexer.

POS

$(A+B+C)(\bar{A}+\bar{B}+C)$

$F(A,B,C) = \Sigma m(2,4,6)$

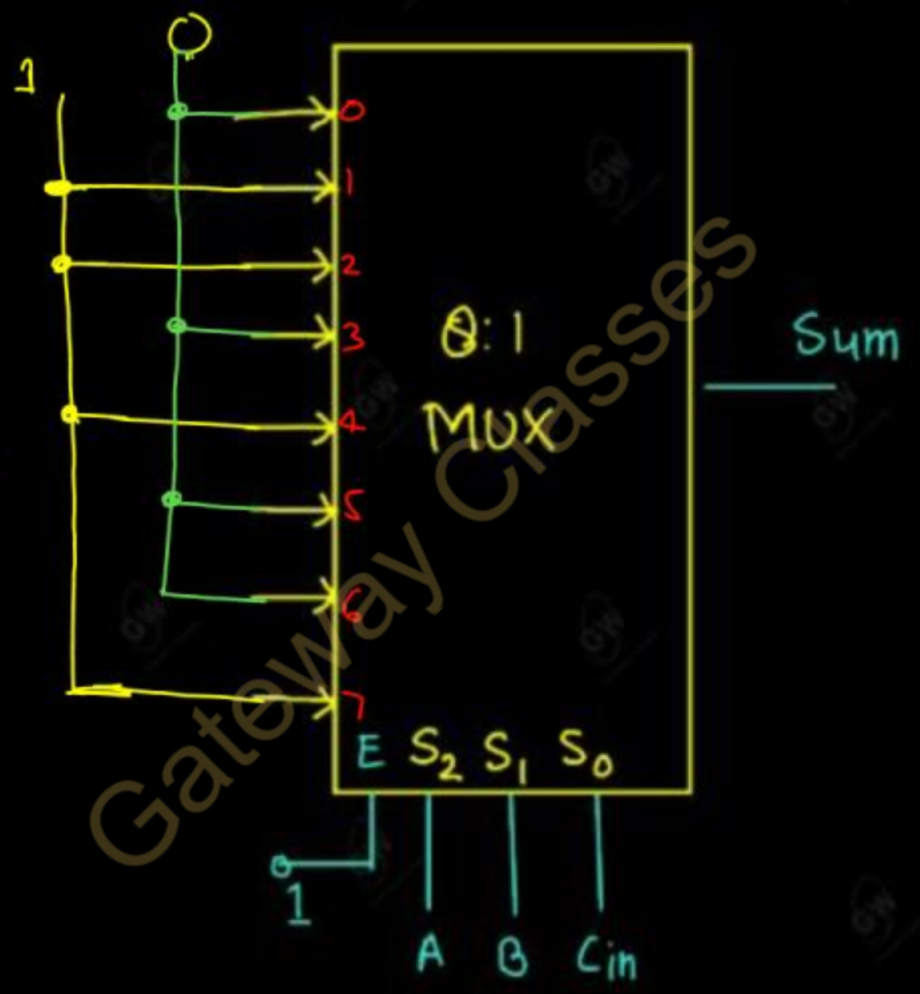


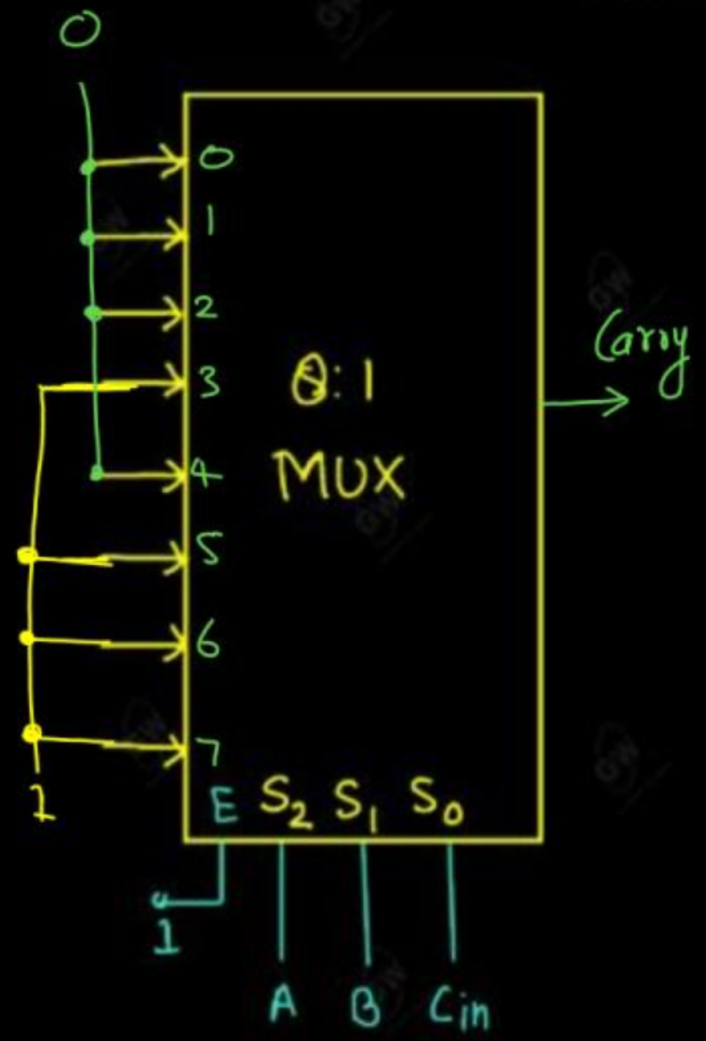
Input	D_0	D_1	D_2	D_3
$\bar{A}$	0	1	2	3
A	4	5	6	7
I/P to MUX	A	0	1	0

Gateway Classes

Q.9 . Implement Full Adder using 8:1 Multiplexer.

INPUTS			OUTPUTS		
A	B	C_{in}	Sum (S)	Carry out (C)	
0	0	0	0	0	D_0
0	0	1	1	0	D_1
0	1	0	1	0	D_2
0	1	1	0	1	D_3
1	0	0	1	0	D_4
1	0	1	0	1	D_5
1	1	0	0	1	D_6
1	1	1	1	1	D_7





Gateway Classes

Gateway Classes

Empowering Learners, Transforming Futures

GATEWAY CLASSES

Thank You

Gateway Classes



Helpline No- 7819 0058 53