



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB204 – LINEAR AND DIGITAL CIRCUITS

II YEAR/₁ III SEMESTER

UNIT 4 – COMBINATIONAL and SEQUENTIAL CIRCUITS

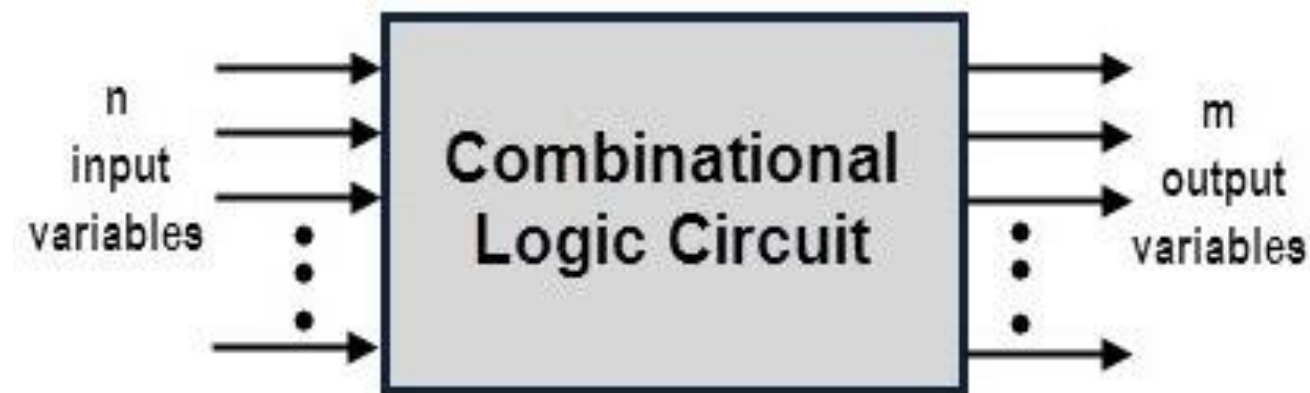
TOPIC 1 - HALF ADDER and FULL ADDER



WHAT IS COMBINATIONAL CIRCUIT?



- Output is function of input only
i.e. no feedback



Combinational Logic Circuits are memoryless digital logic circuits whose output at any instant in time depends only on the combination of its inputs.



HALF ADDER



Half Adder

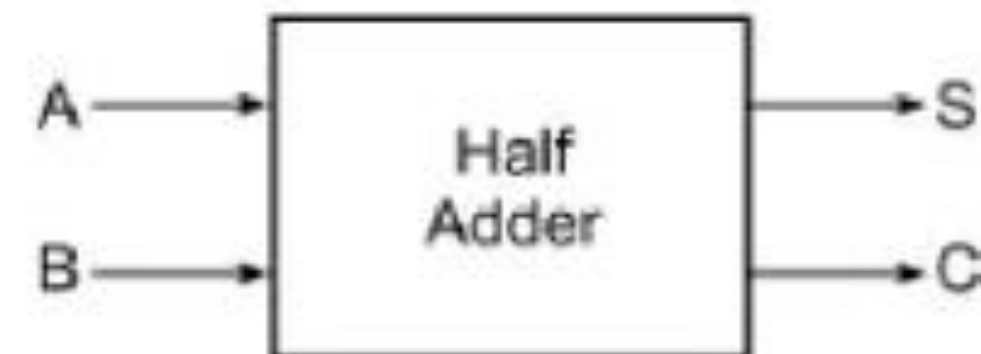
Adds **1-bit** plus **1-bit**

Produces **Sum** and **Carry**

$$\text{SUM } S = A.\bar{B} + \bar{A}.B$$

$$\text{CARRY } C = A.B$$

A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1





HALF ADDER



For Carry

A \ B	0	1
0	0	0
1	0	1

$$\text{Carry} = AB$$

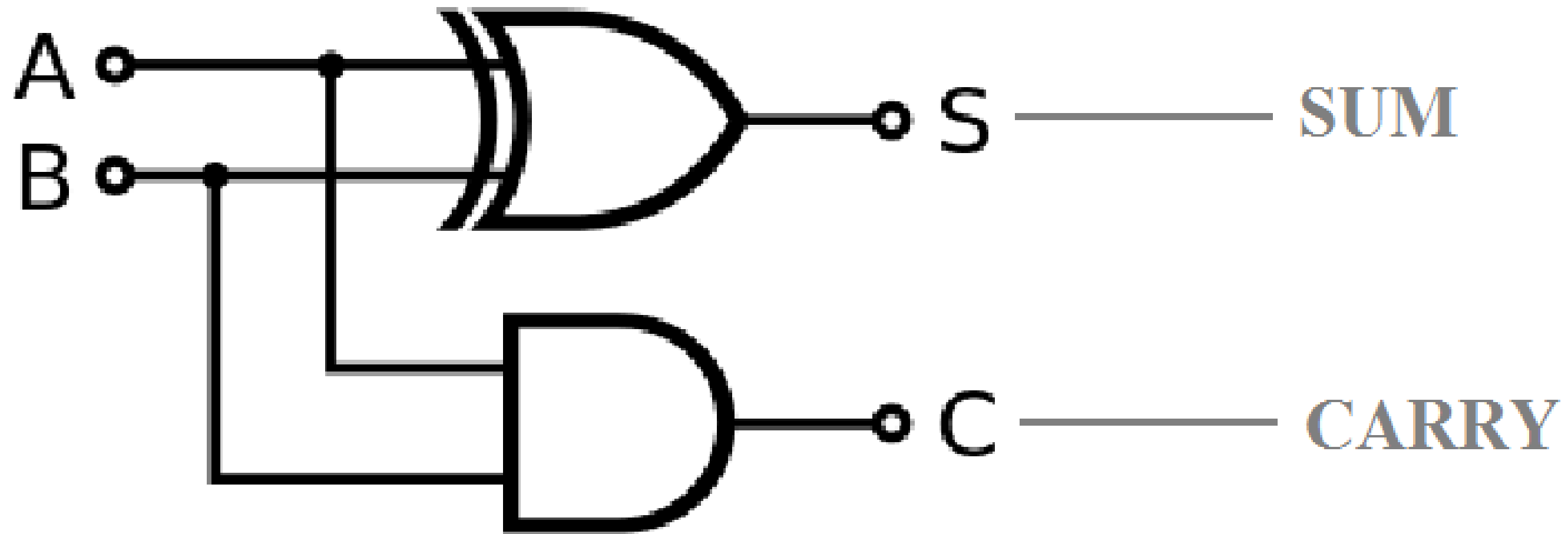
For Sum

A \ B	0	1
0	0	1
1	1	0

$$\begin{aligned}\text{Sum} &= A\bar{B} + \bar{A}B \\ &= A \oplus B\end{aligned}$$

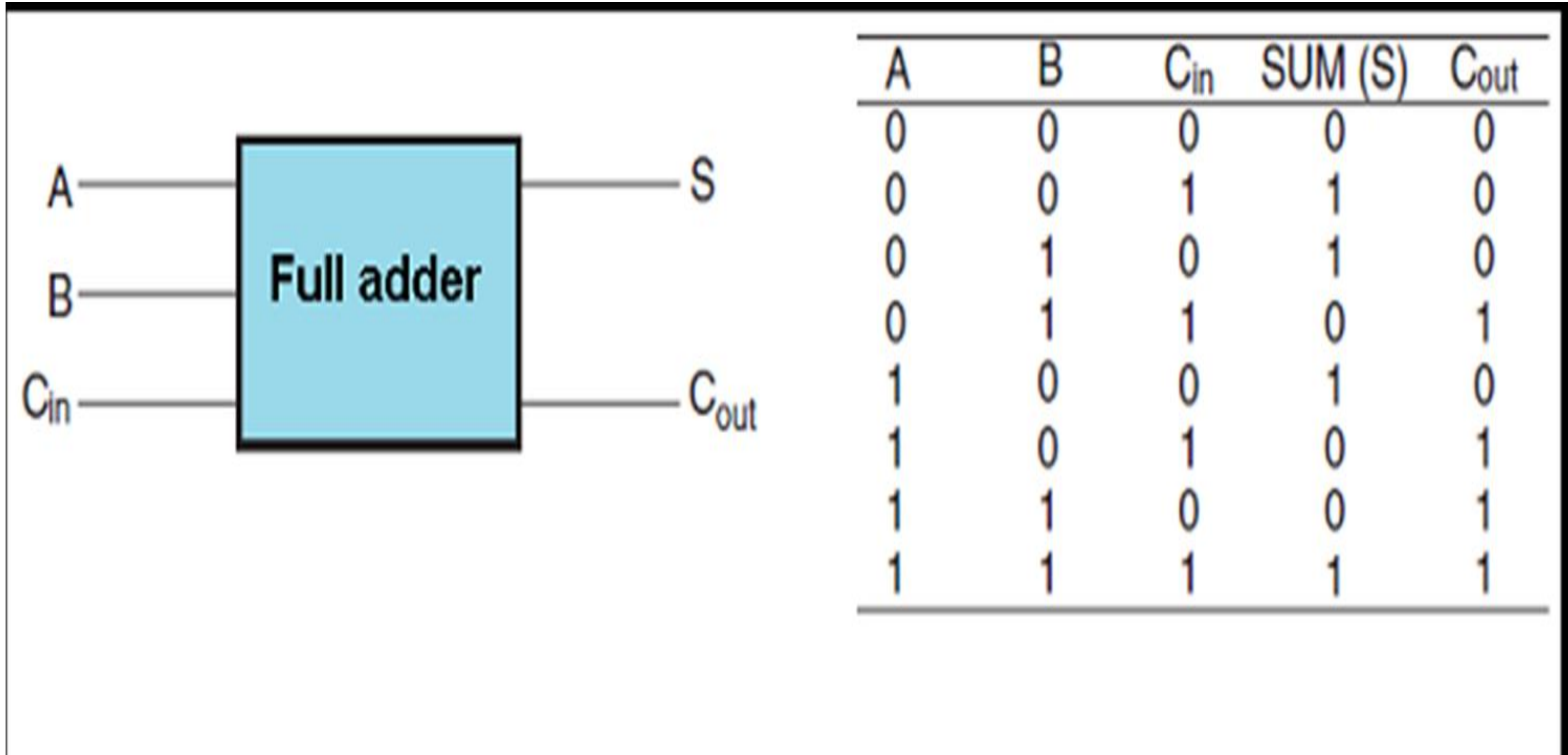


HALF ADDER





FULL ADDER





FULL ADDER

For Carry (C_{out})

$A \backslash BC_{in}$	00	01	11	10
0	0	0	1	0
1	0	1	1	1

$$C_{out} = AB + AC_{in} + BC_{in}$$

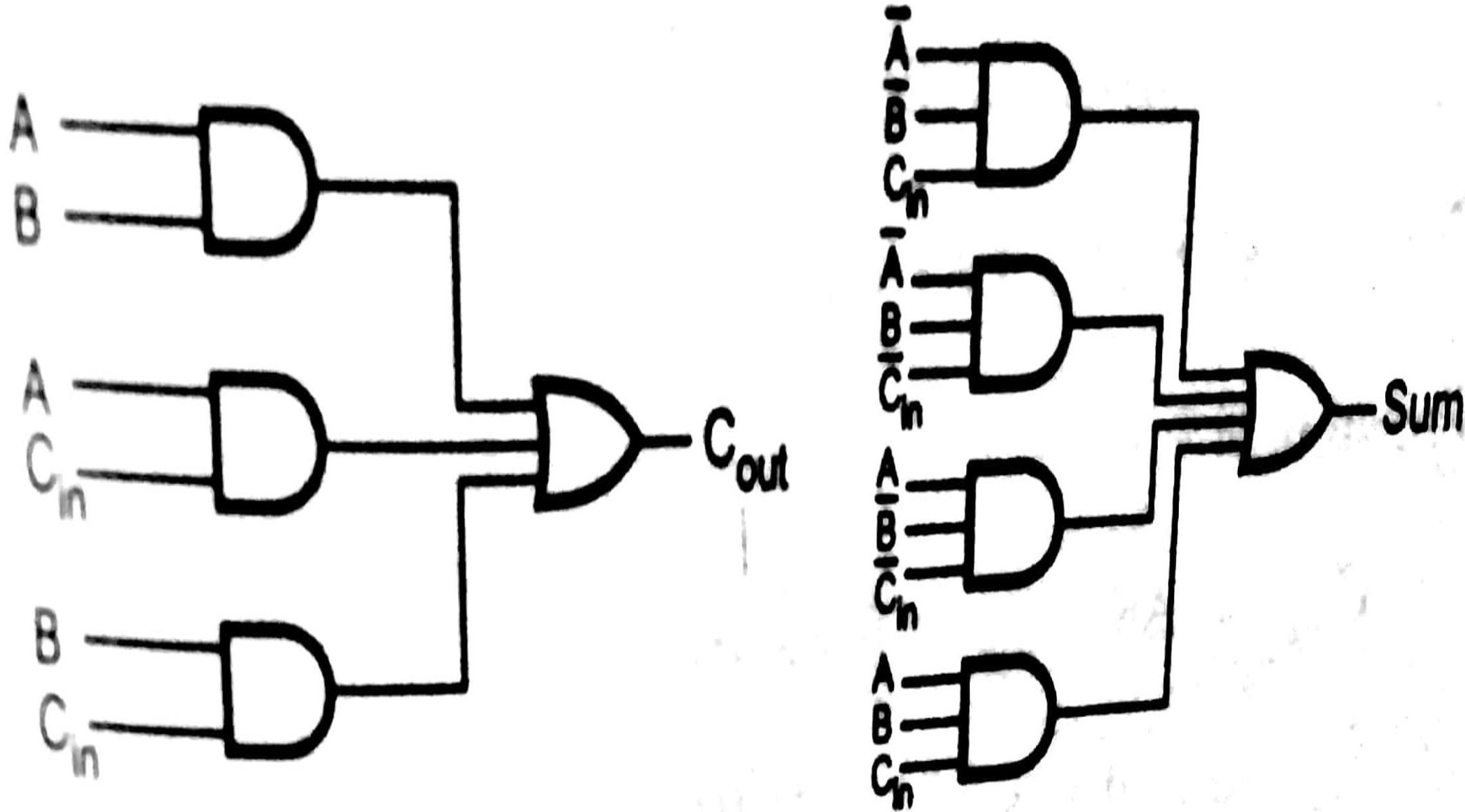
For Sum

$A \backslash BC_{in}$	00	01	11	10
0	0	1	0	1
1	1	0	1	0

$$Sum = \bar{A}\bar{B}C_{in} + \bar{A}B\bar{C}_{in} + A\bar{B}\bar{C}_{in} + ABC_{in}$$



LOGICAL DIAGRAM



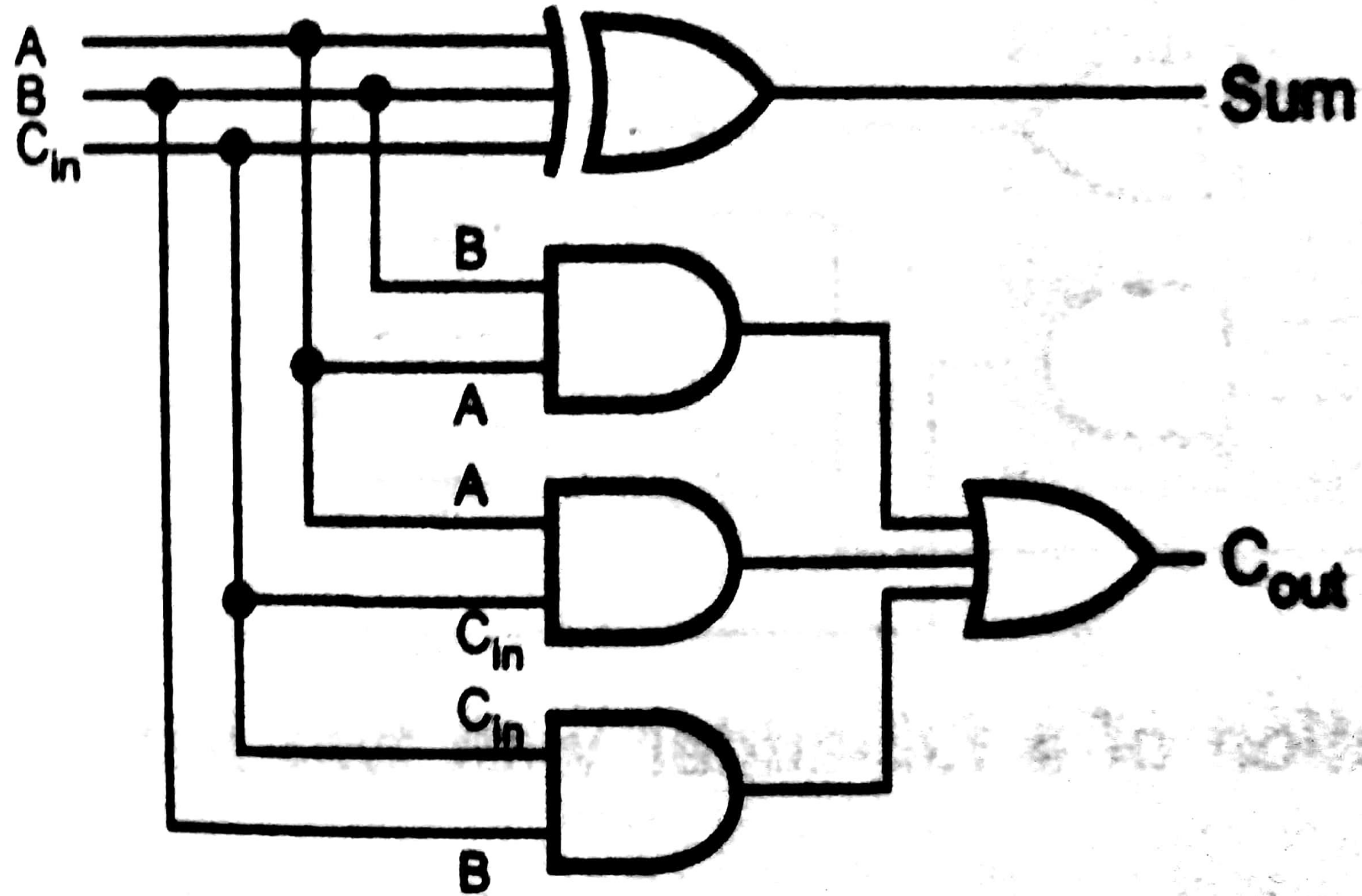


FULL ADDER

$$\begin{aligned}\text{Sum} &= \bar{A} \bar{B} C_{in} + \bar{A} B \bar{C}_{in} + A \bar{B} \bar{C}_{in} + ABC_{in} \\ &= C_{in} (\bar{A} \bar{B} + AB) + \bar{C}_{in} (\bar{A} B + A \bar{B}) \\ &= C_{in} (A \cdot B) + \bar{C}_{in} (A \oplus B) \\ &= C_{in} (\overline{A \oplus B}) + \bar{C}_{in} (A \oplus B) \\ &= C_{in} \oplus (A \oplus B)\end{aligned}$$

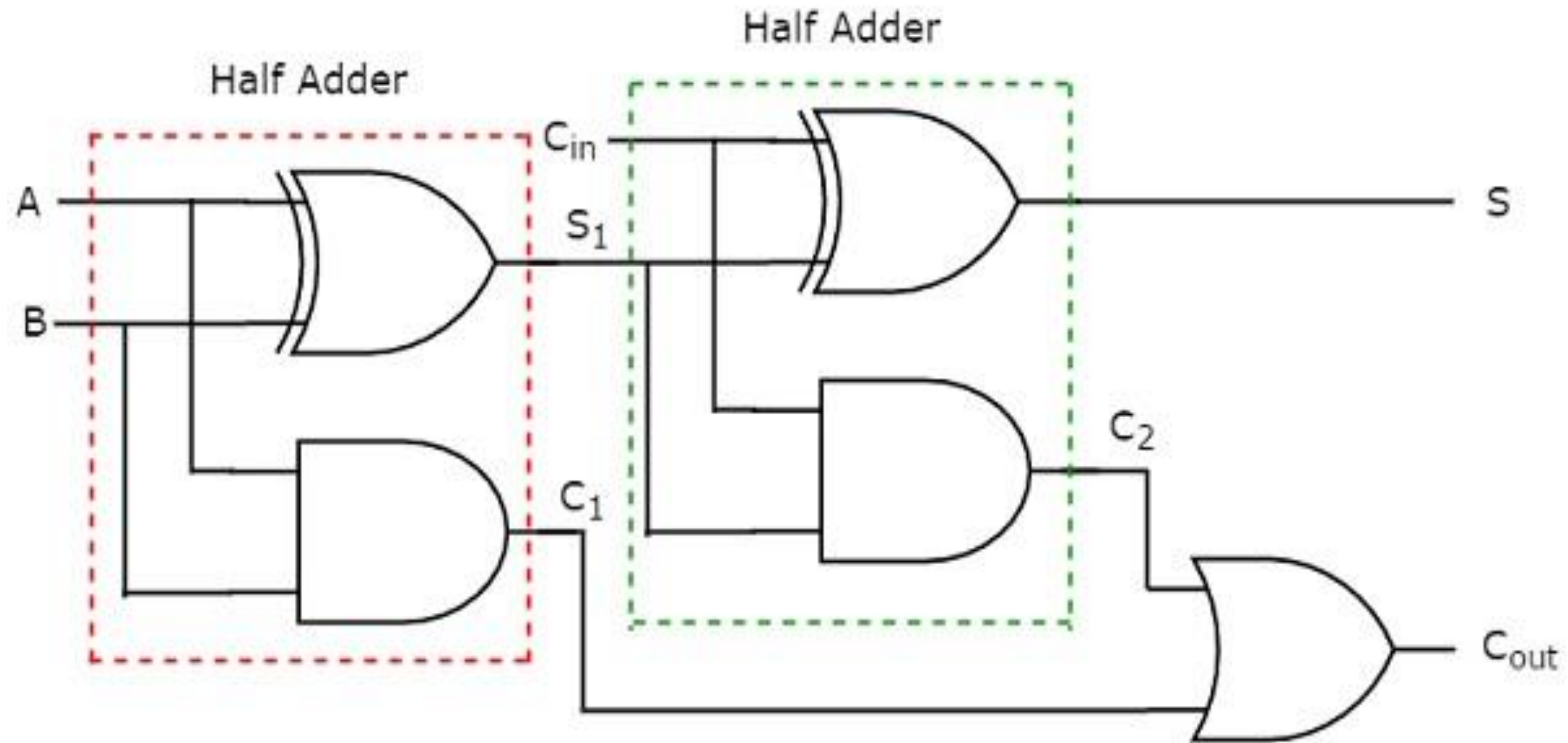


LOGICAL DIAGRAM



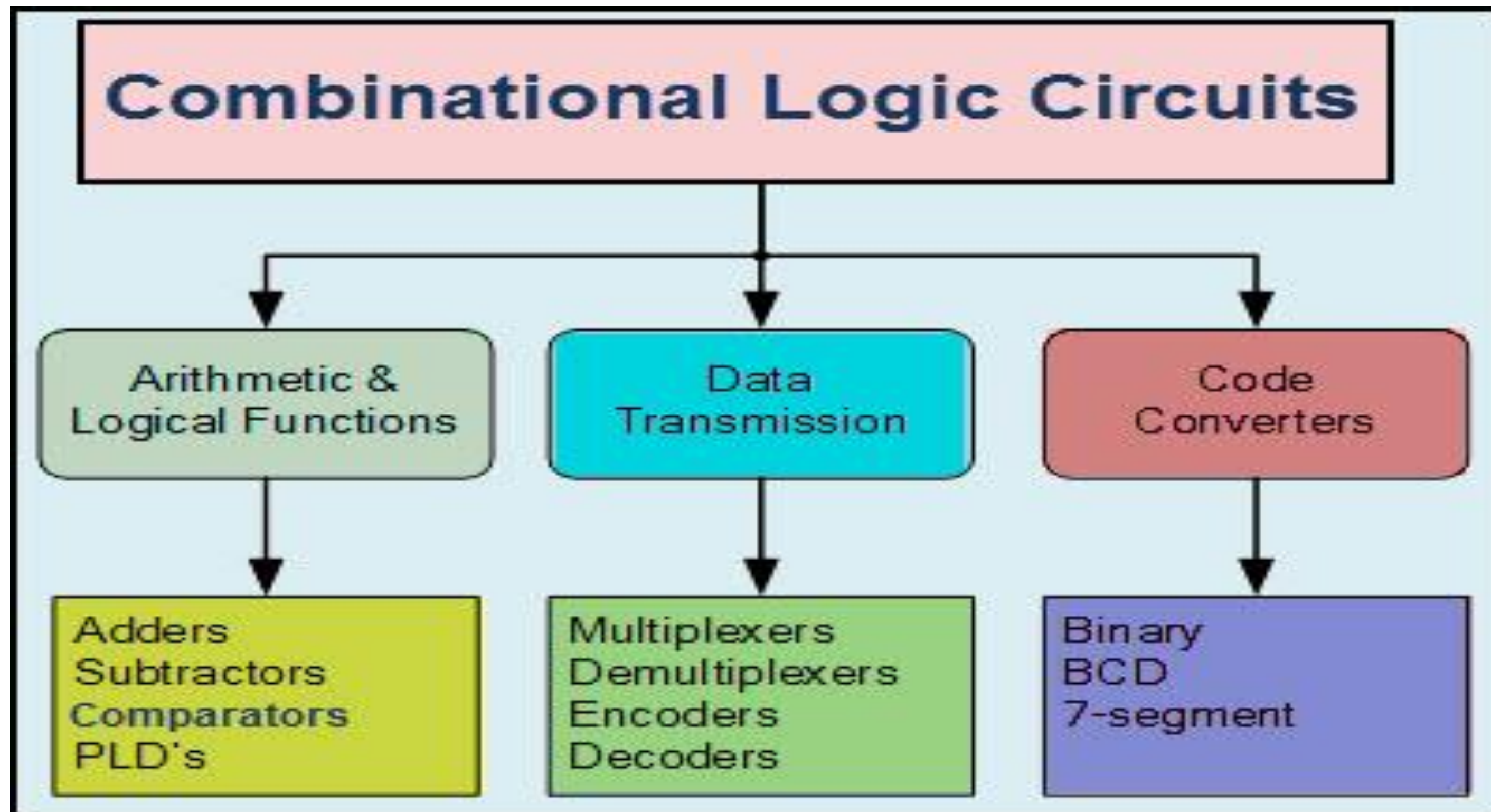


IMPLEMENTATION OF FULL ADDER USING TWO HALF ADDERS





APPLICATIONS OF COMBINATIONAL CIRCUITS





THANK YOU