DIGITAL ELECTRONICS:
FULL ADDER

SNS COLLEGE OF ENGINEERING

Kurumbapalayam (PO), Coimbatore – 641 107

An Autonomous Institution

Accredited by NAAC – UGC with 'A' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FULL ADDER

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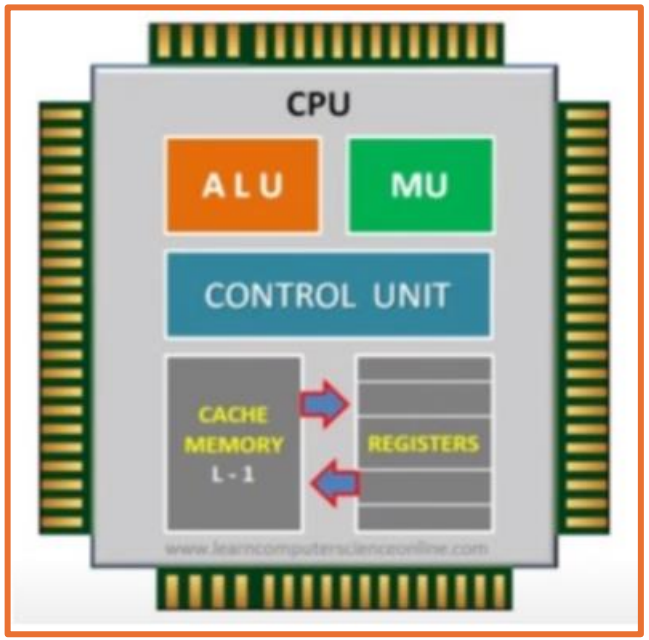
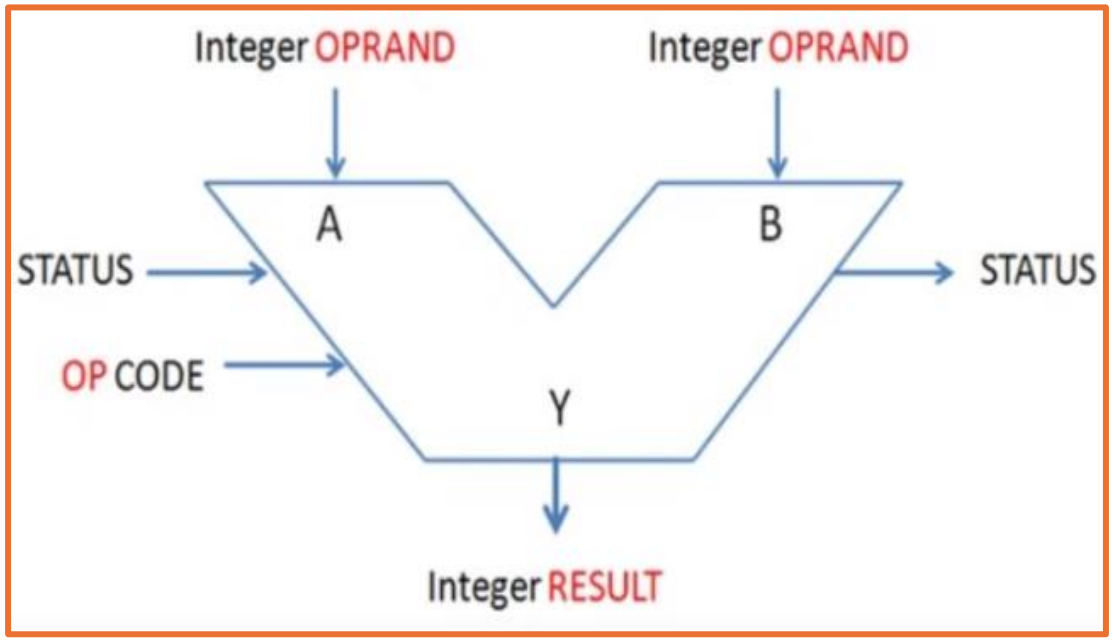
ADDER

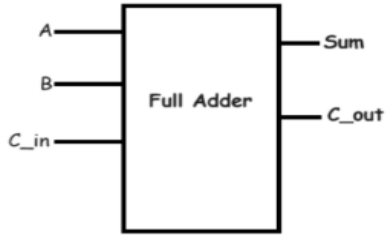
- ✓ Adders are used to make arithmetical and logical Units(ALU).
- ✓ Types of Adders : Half Adders and Full Adders.





FULL ADDER

- ✓ A combinational logic circuit that can add two binary digits (bits) and a carry bit, and produces a sum bit and a carry bit as output is known as a full-adder.
- ✓ It has three input terminals and two output terminals for sum and carry.
- ✓ The full adder circuit is designed by connecting two EX-OR gates two AND gates and one OR gate.



DESIGN OF FULL ADDER

Step 1 : Write the Truth Table

Step 2 : Draw K-Map

Sum (S) = A ⊕ B

Carry (C) = A . B

Step 3 :Form the Boolean Expression

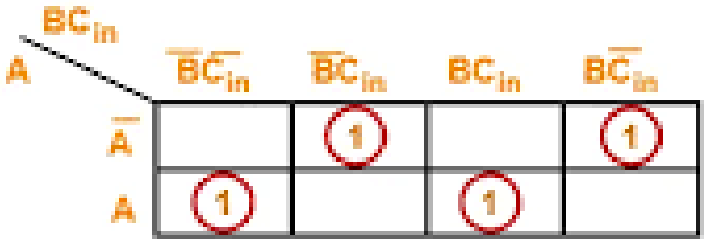
Step 4 :Draw the circuit Diagram

FULL ADDER-TRUTH TABLE

Inputs			Outputs	
A	B	C_{in}	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

FULL ADDER – K MAP

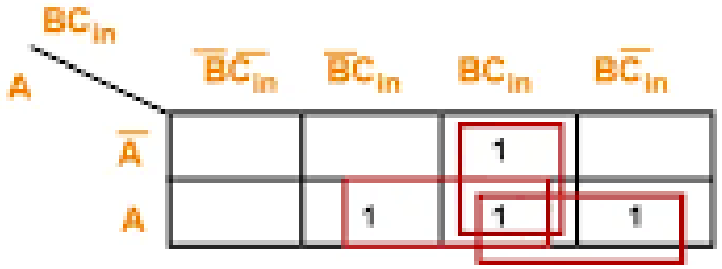
For S:



$$S = A \oplus B \oplus C_{in}$$

Inputs			Outputs	
A	B	C_{in}	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

For C_{in}:



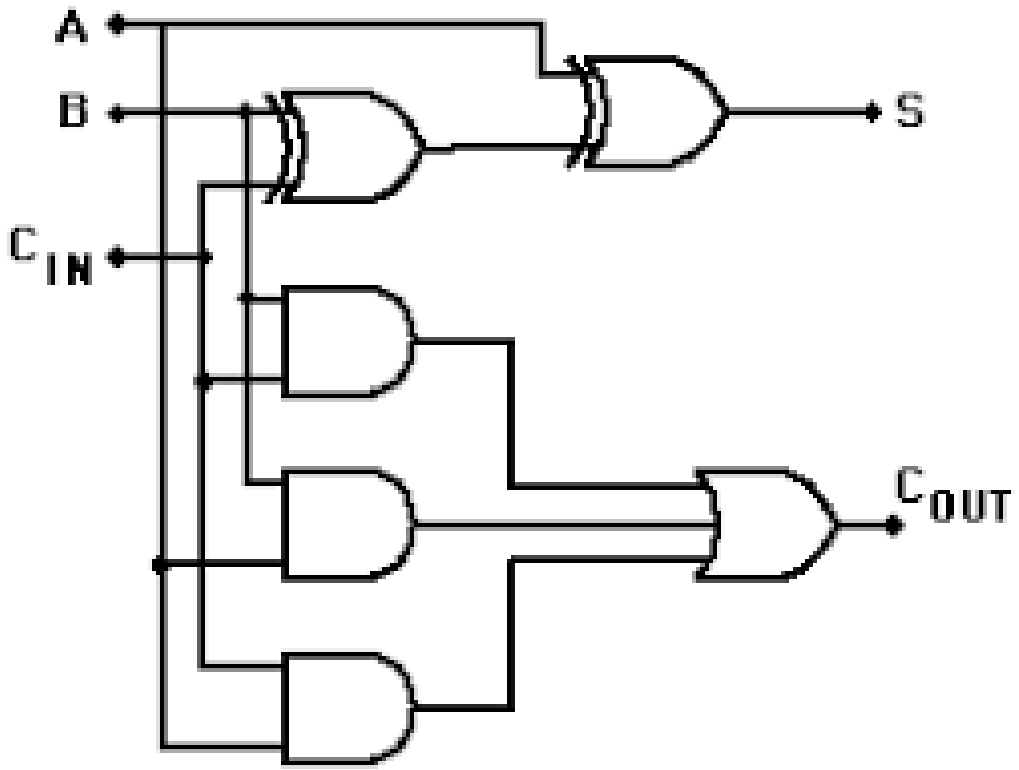
$$C_{out} = AB + BC_{in} + C_{in}A$$

FULL ADDER - CIRCUIT

Boolean Expression

$$\text{Sum, } S = A \oplus B \oplus C_{in} = A'B'C_{in} + A'BC'_{in} + AB'C'_{in} + ABC_{in}$$

$$\text{Carry, } C = AB + AC_{in} + BC_{in}$$



APPLICATIONS

- Full adder provides facility to add the carry from the previous stage.
- The power consumed by the full adder is relatively less as compared to half adder.
- Full adder can be easily converted into a half subtractor just by adding a NOT gate in the circuit.
- Full adder is one of the essential part of critic digital circuits like multiplexers.
- Full adder performs operation at higher speed.

Assessment

1. How many variable K-Map is required to realize a full adder?

2. Write the equation for sum and carry of full adder.


Thank
you