Jawad Ahmed

20P-0165

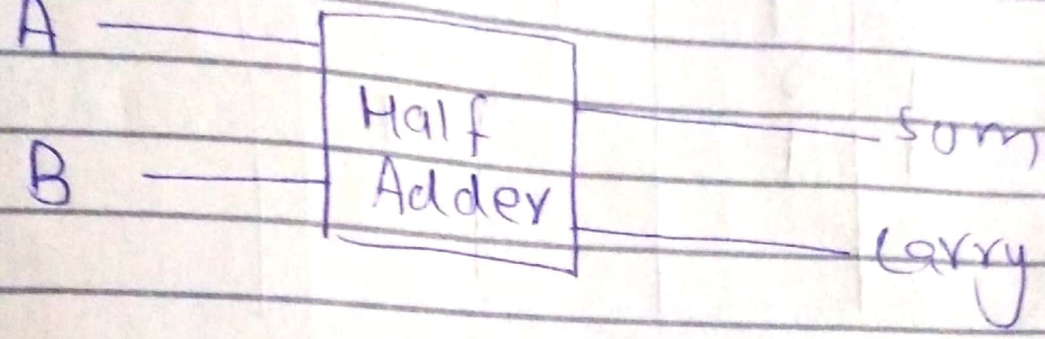
'2A'

MUHAMMA YOUSAF

Task

For Half Adder

(a) For Half adder two bits are used.



Input		Output	
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

(1) → carry

1

+1

0

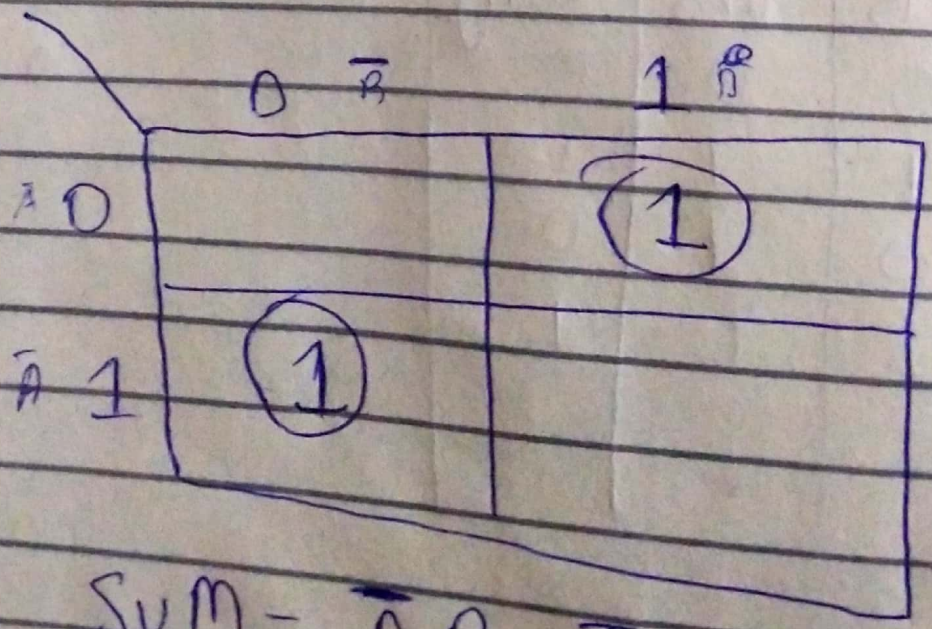
Now $2^2 = 4$ cells are required for k Map.

The input where are the output is high we write there 1.

Truth Table

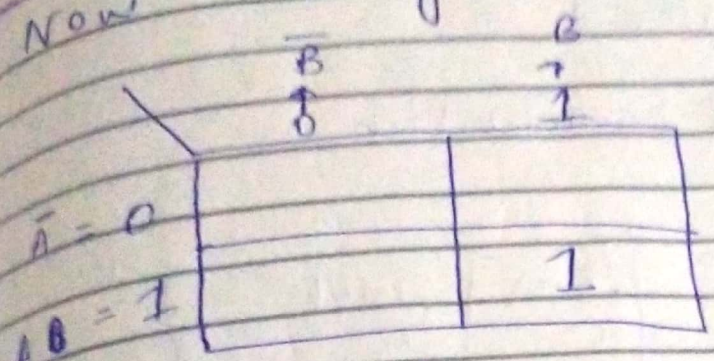
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Using K-Map



$$Sum = \bar{A}B + \bar{B}A$$

Now carry K - Map



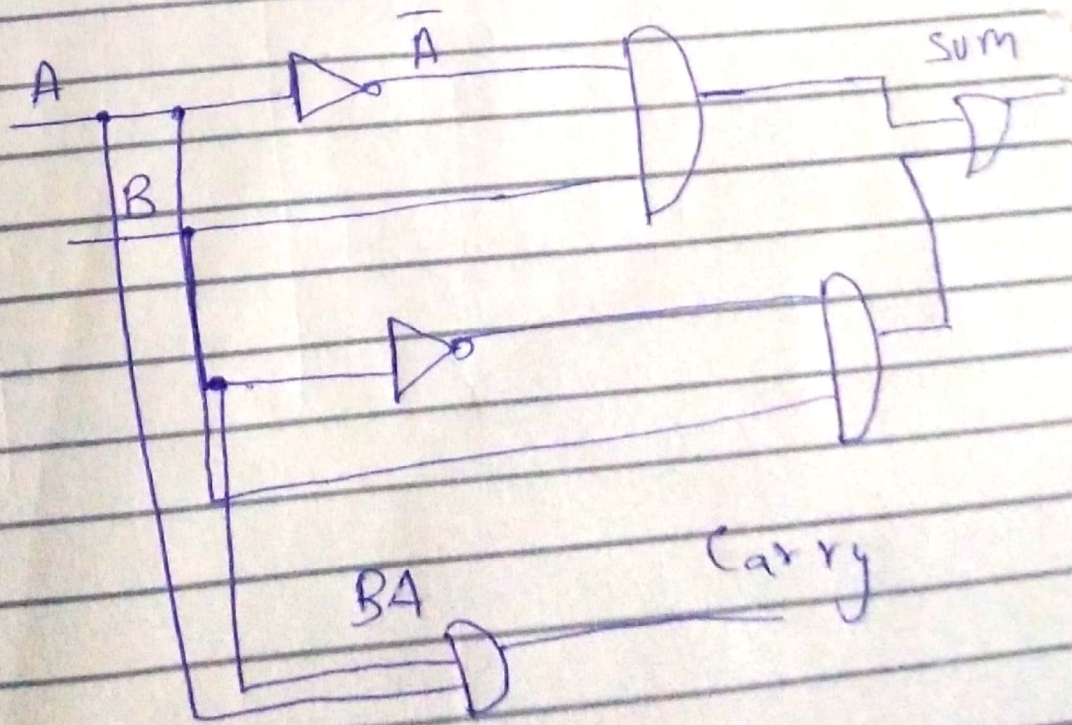
Carry Equation

Carry = A B

Digram

Sum = $\bar{A}B + \bar{B}A$

Carry = A B



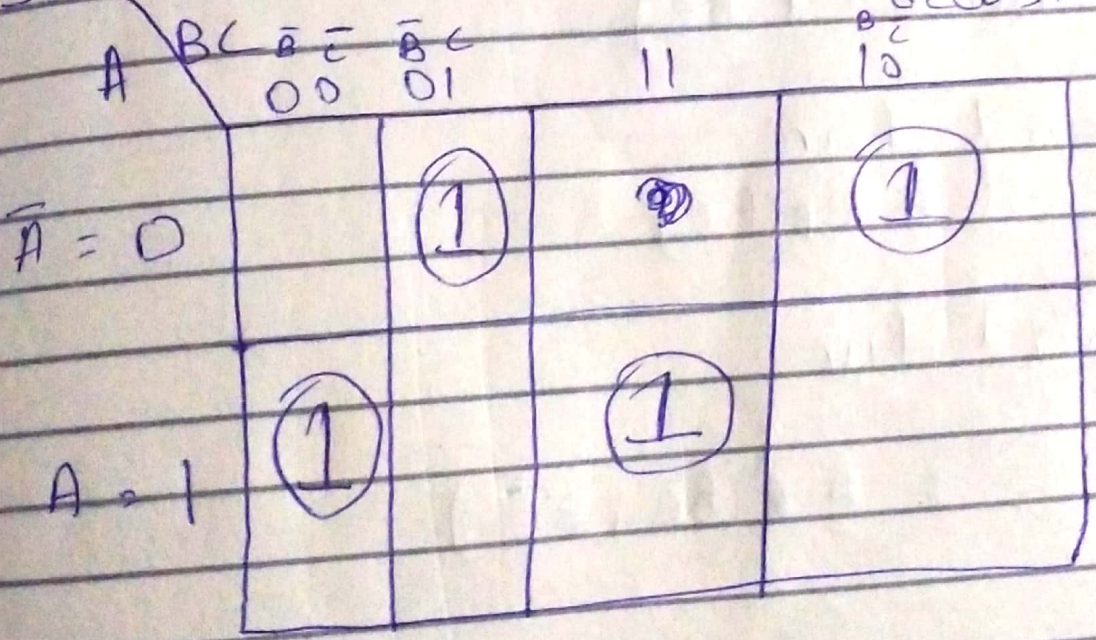
Full Adder

A	B	C	Sum	Cout
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

Now making K-Map where is 1

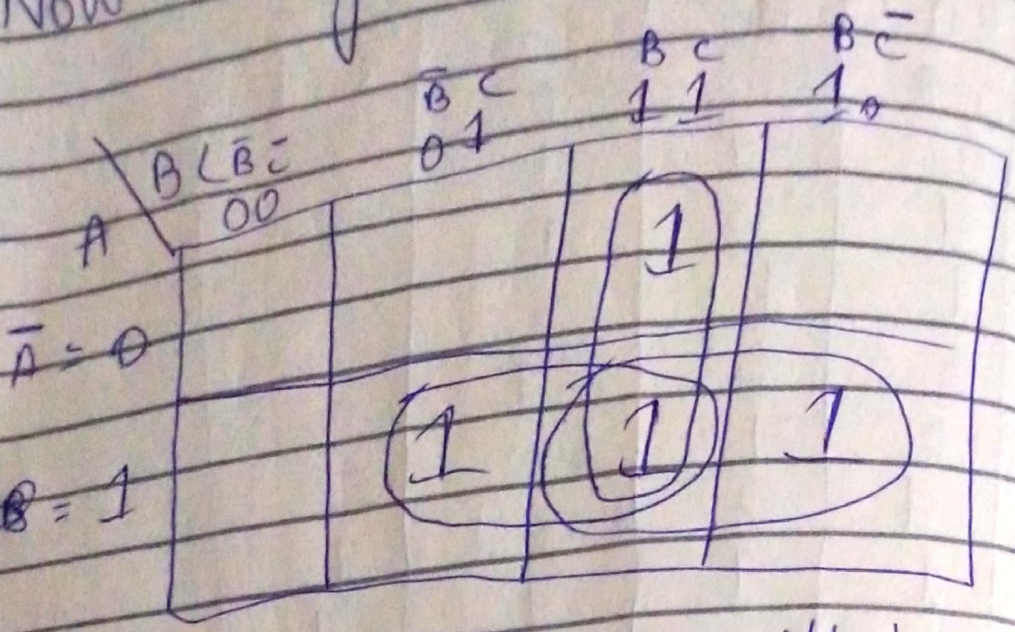
$2^3 = 8$ combination, 8 cells.

* SUM



$$Sum = A\bar{B}\bar{C} + \bar{A}\bar{B}C + ABC + \bar{A}B\bar{C}$$

Now Carry - Equation K - Map



Now the expression will be

First Pair

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

Second Pair

$= (\bar{A}A)(BC)$

Third Pair

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

Now Simplifying.

First Pair

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

$= AC \rightarrow (1)$

Second Pair.

$= \bar{A}ABC \quad (\bar{A}A = 1)$

$= BC \rightarrow (2)$

Third Pair

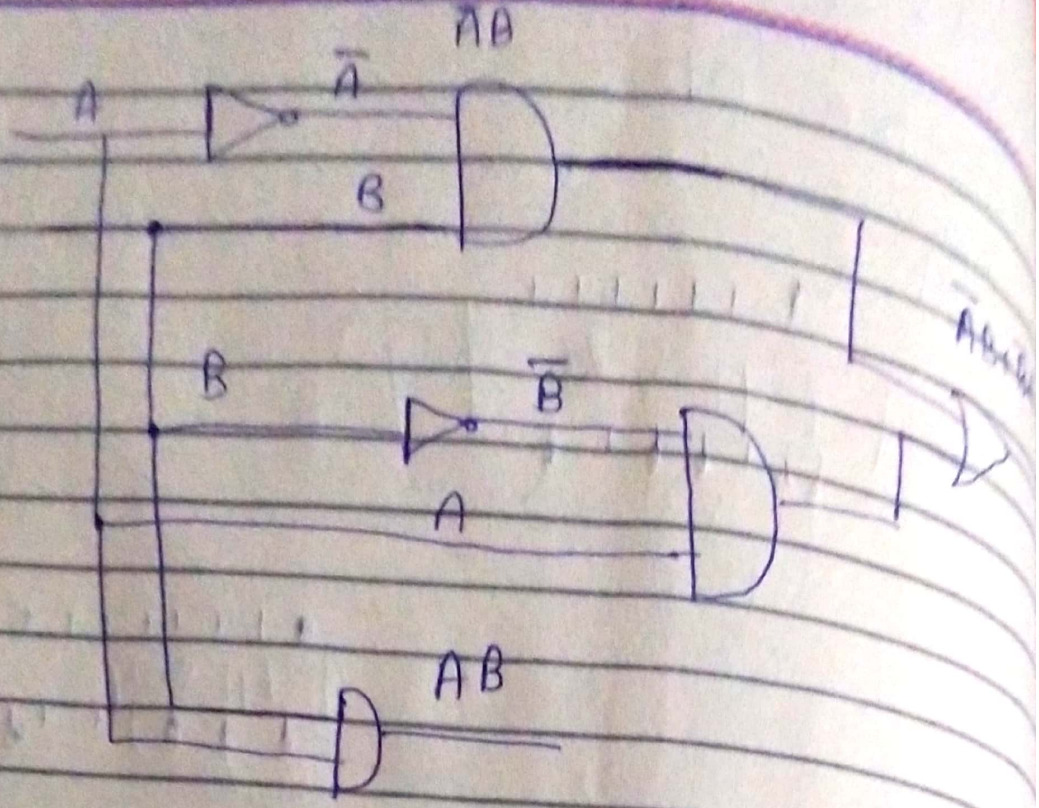
$= A(B(C+\bar{C}))$

$= AB \rightarrow (3)$

$\boxed{Carry = AC + BC + AB}$

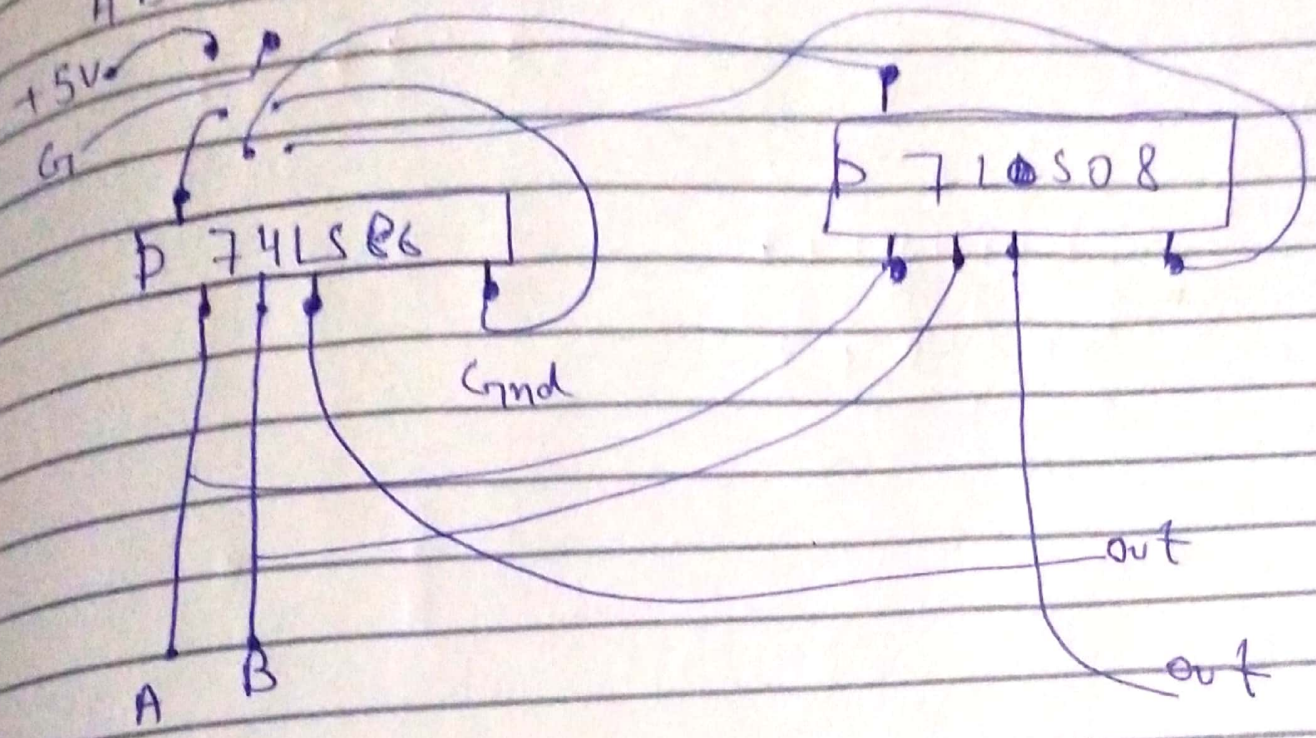
$\boxed{SUM = A\bar{B}\bar{C} + \bar{A}\bar{B}C + ABC + \bar{A}B\bar{C}}$

$\boxed{Carry = AC + BC + AB}$



HALF Adder

$\bar{A}B + \bar{B}A$



Full Adder