Date :

FULL ADDER:

```
        1 1        Cin
 28     11100      A
+22     10110      B
 50    110010
```

* Inputs: Numbers (bits) to be added - A, B
  Carry from adding 2 bits - C
* Outputs: Sum, Carry

INPUT			OUTPUT	
A	B	Cin	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

K-MAP FOR SUM

A \ BCin	00	01	11	10
0	0	1	0	1
1	1	0	1	0

Sum = $A'B'C_{in} + A'BC_{in}' + AB'C_{in}' + ABC_{in}$

FOR CARRY

A \ BCin	00	01	11	10
0	0	0	1	0
1	0	1	1	1

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

$= AB + C_{in}(A+B)$

(using XOR instead of OR, because in A=1, B=1 case, AB is already 1, ⇒ OR gate will give 1 irrespective of using XOR or OR)

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$$Sum = A'BC_{in}' + AB'C_{in}' + ABC_{in} + A'B'C_{in}$$

$$C_{in}'(A'B + AB') + C_{in}(AB + A'B')$$

$$C_{in}'(A'B + AB') + C_{in}(A'B + AB')'$$

$$C_{in} \oplus (A'B + AB')$$

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

$$Carry = AB + AC_{in} + BC_{in}$$

$$AB + AC_{in} + BC_{in}(A + A')$$

$$ABC_{in} + AB + AC_{in} + A'BC_{in}$$

$$AB(C_{in} + 1) + AC_{in} + A'BC_{in}$$

$$AB + AC_{in} + A'BC_{in}$$

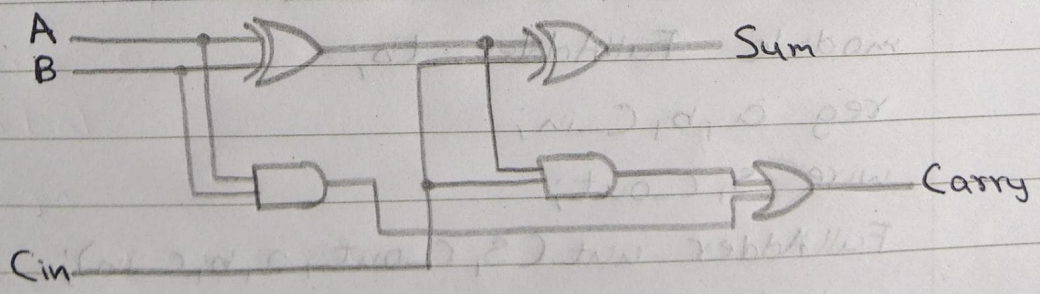
$$AB + AC_{in}(B + B') + A'BC_{in}$$

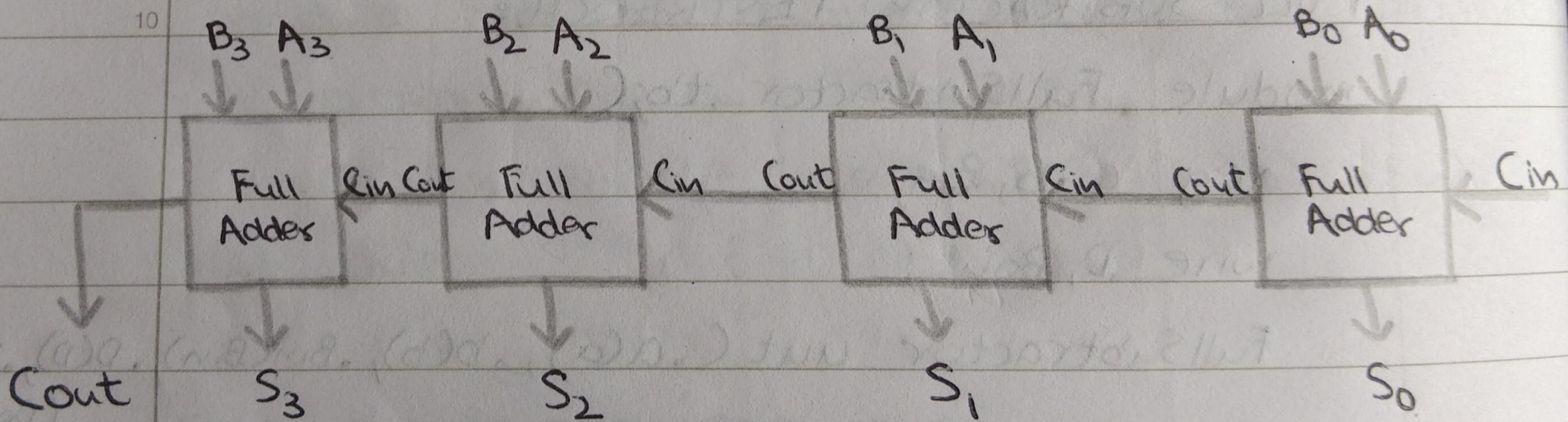
$$ABC_{in} + AB + A'BC_{in} + AB'C_{in}$$

$$AB(C_{in} + 1) + C_{in}(A'B + AB')$$

$$AB + C_{in}(A \oplus B)$$

LOGIC DIAGRAM:




B3 A3
B2 A2
B1 A1
B0 A0
Full Adder
Full Adder
Full Adder
Full Adder
Cin
Cout
Cin
Cout
Cin
Cout
Cin
Cout
S3
S2
S1
S0