CSCI 160 Project

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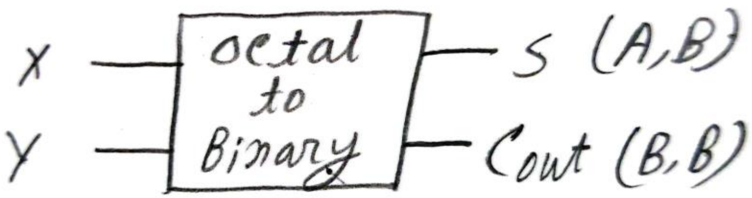
Octal to Binary Encoder



Here,

Octal = X, Y

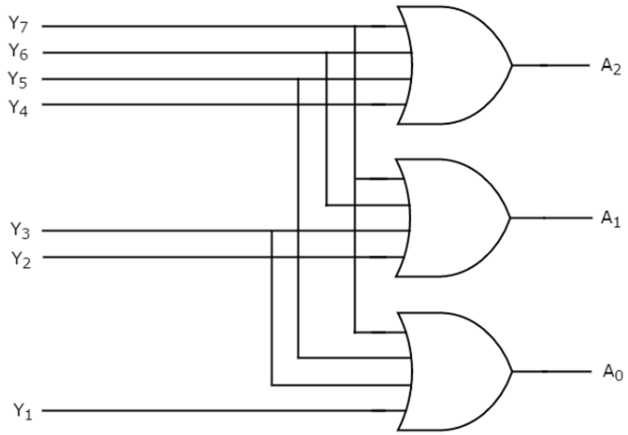
Binary = AB

S = A for X

S = B for Y

Cout = B for X

Cout = B for Y



Input								Output		
Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	A2	A1	A0
0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	1	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	1	0	1
0	1	0	0	0	0	0	0	1	1	0
1	0	0	0	0	0	0	0	1	1	1

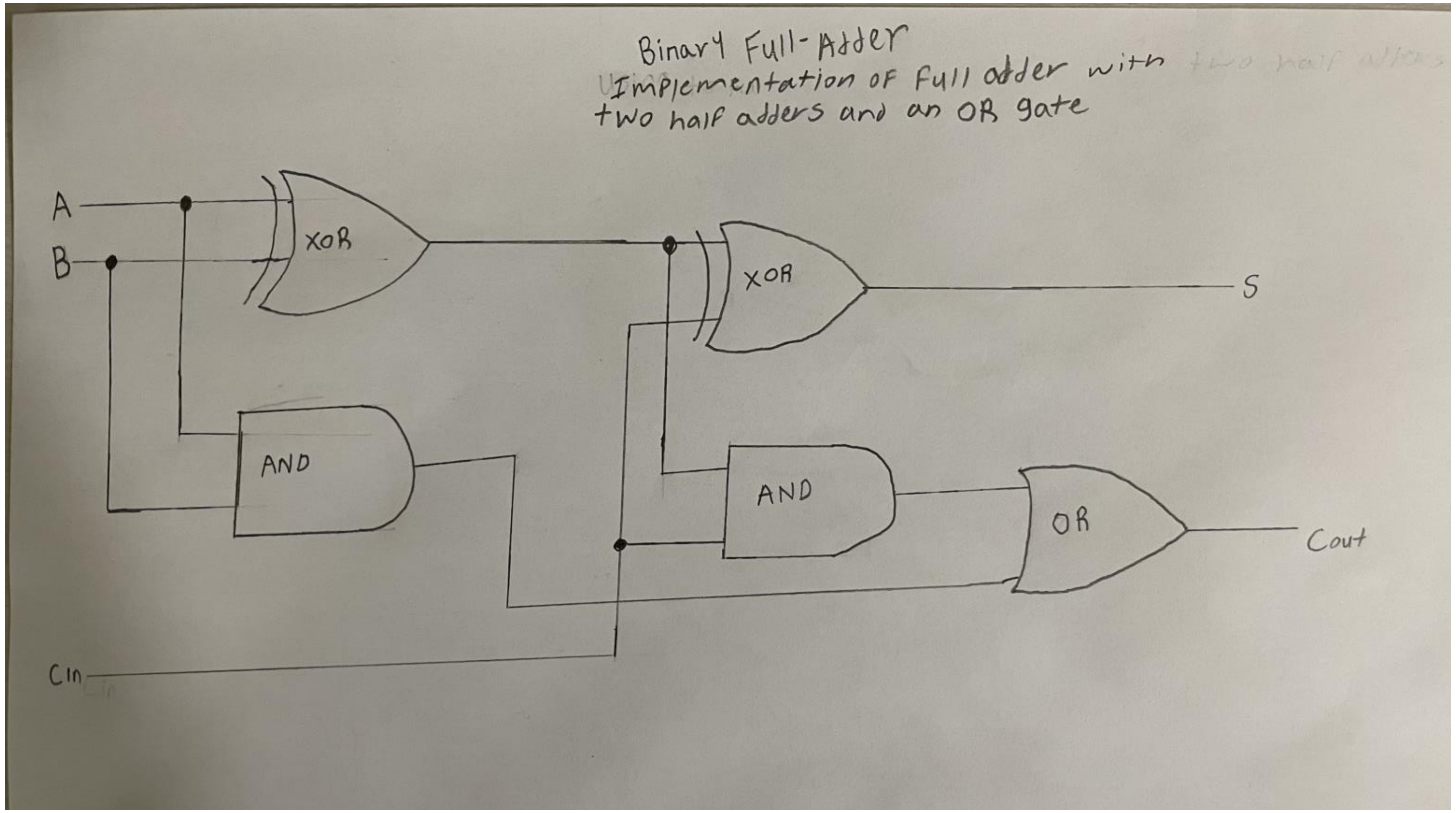
Expression

$$A_0 = Y_1 + Y_3 + Y_5 + Y_7$$

$$A_1 = Y_2 + Y_3 + Y_6 + Y_7$$

$$A_2 = Y_4 + Y_5 + Y_6 + Y_7$$

Binary Full-Adder



Inputs			Outputs	
A	B	C_{in}	S	C_{out}
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

Then the Boolean expression for a full adder is as follows.

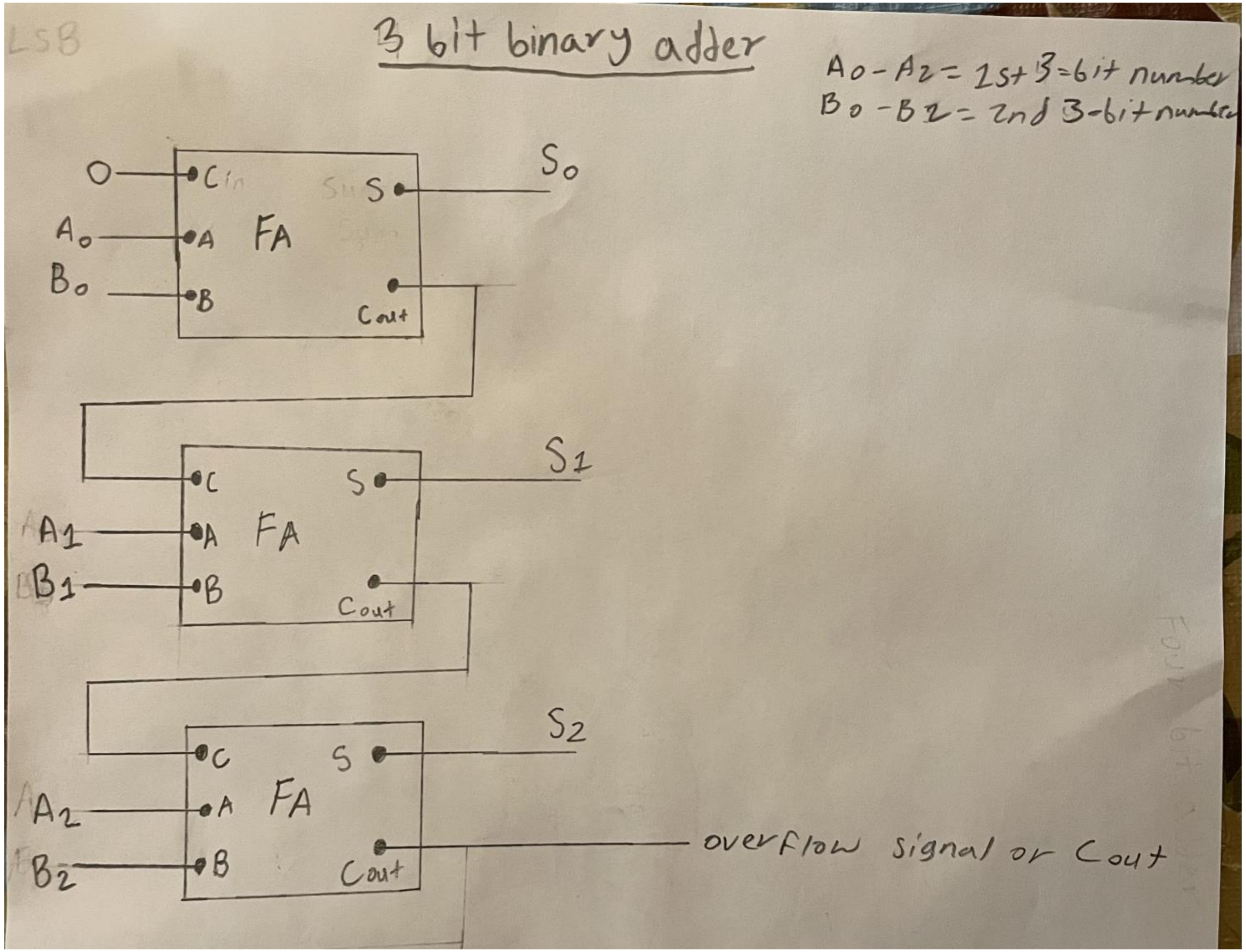
For the **SUM** (S) bit:

SUM = (A XOR B) XOR Cin = (A ⊕ B) ⊕ Cin

For the **CARRY-OUT** (Cout) bit:

CARRY-OUT = A AND B OR Cin(A XOR B) = A.B + Cin(A ⊕ B)

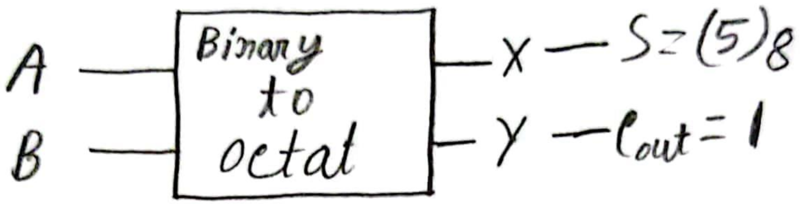
Adding using 3-bit Binary Full Adder



After converting Octal to Binary, we can now use a 3-bit Binary Full Adder which is built with 3 Full Adders to get the SUM(S0, S1, S2) and the Cout. The logic diagram is shown in the picture.

Now we can convert the SUM (S0, S1, S2) that we have in Binary, to convert Binary to Octal we can use a 3-to-8-bit Decoder shown in the next slide

Binary to Octal Decoder



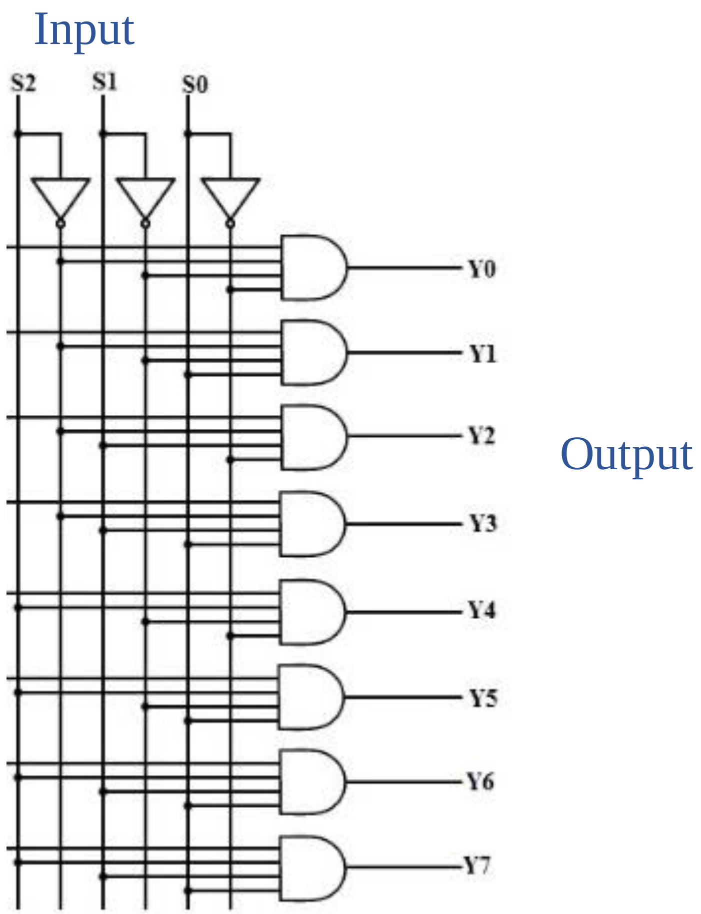
Here,

$$(7)_8 + (6)_8 = (13)_{10}$$

$$(13)_{10} = 1 \times 8^1 + 5 \times 8^0 = (15)_8$$

3 Bit			8 bit							
S2	S1	S0	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

3-to-8-bit Diagram



Complete FAs Logic Diagram