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LAB REPORT - 12

Programmable 1-bit ALU

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Aim: To design a 1 bit ALU using the given function table.

Software used: Logisim

Provided table:

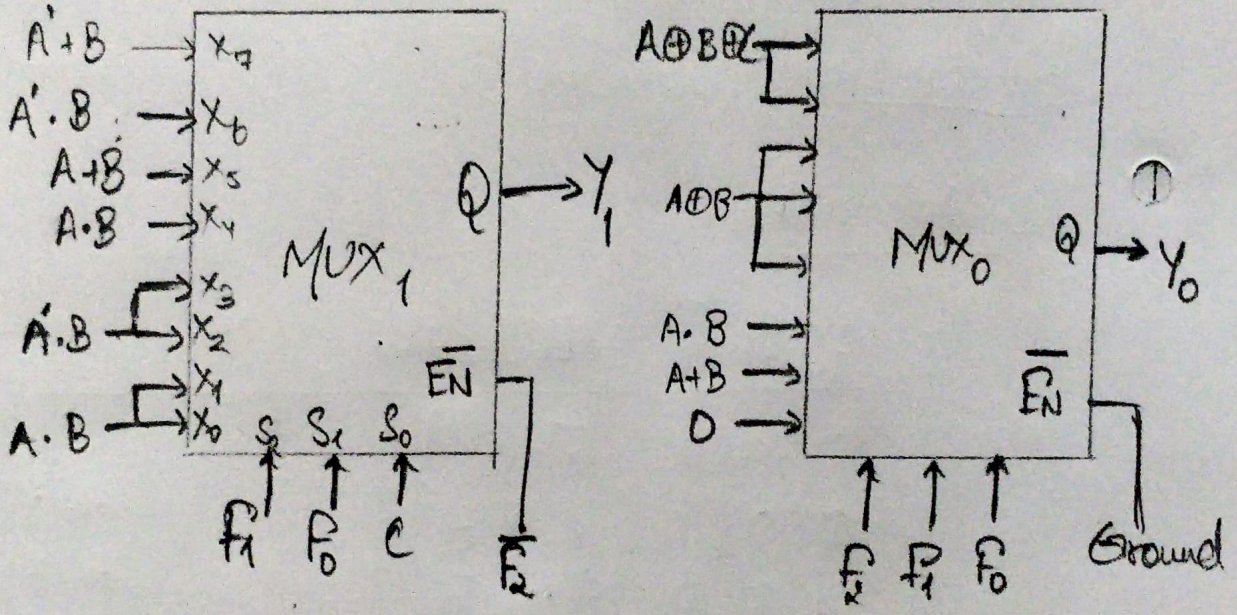
F_2	F_1	F_0	ALU function	Y_1	Y_0
0	0	0	Zero (0)	-	0
0	0	1	A OR B	-	A+B
0	1	0	A AND B	-	A.B
0	1	1	A XOR B	-	A⊕B
1	0	0	A PLUS B	Carry	Sum
1	0	1	A MINUS B	Borrow	Difference
1	1	0	A PLUS B PLUS C	Carry	Sum
1	1	1	A MINUS B MINUS C	Borrow	Difference

Theory →

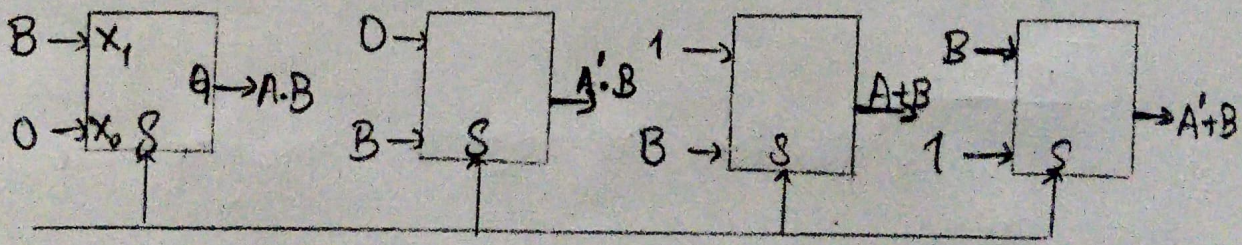
→ First 4 functions are logical and generate 1 bit output.

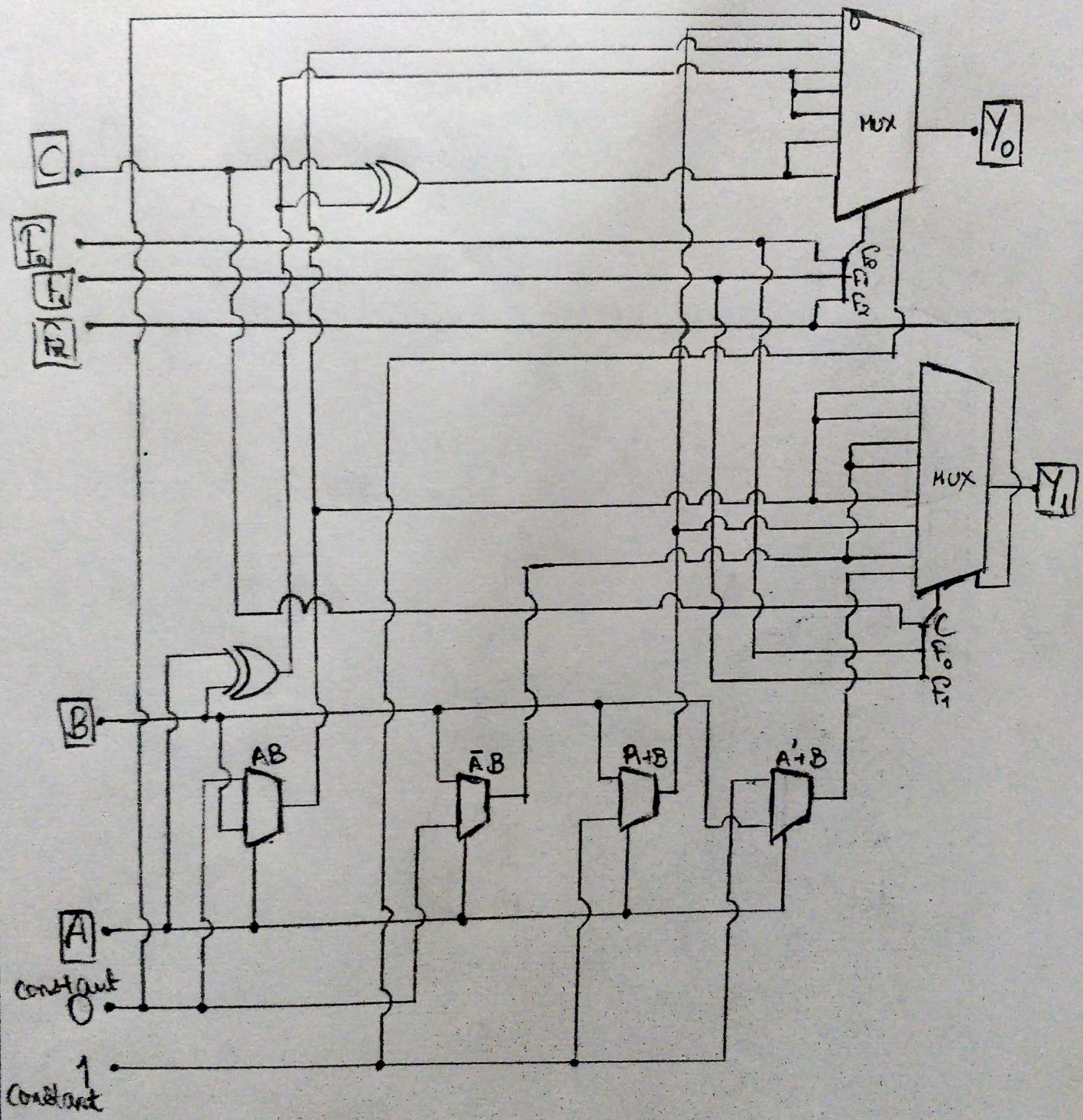
→ Last 4 functions give 2 bit outputs, are arithmetic functions.

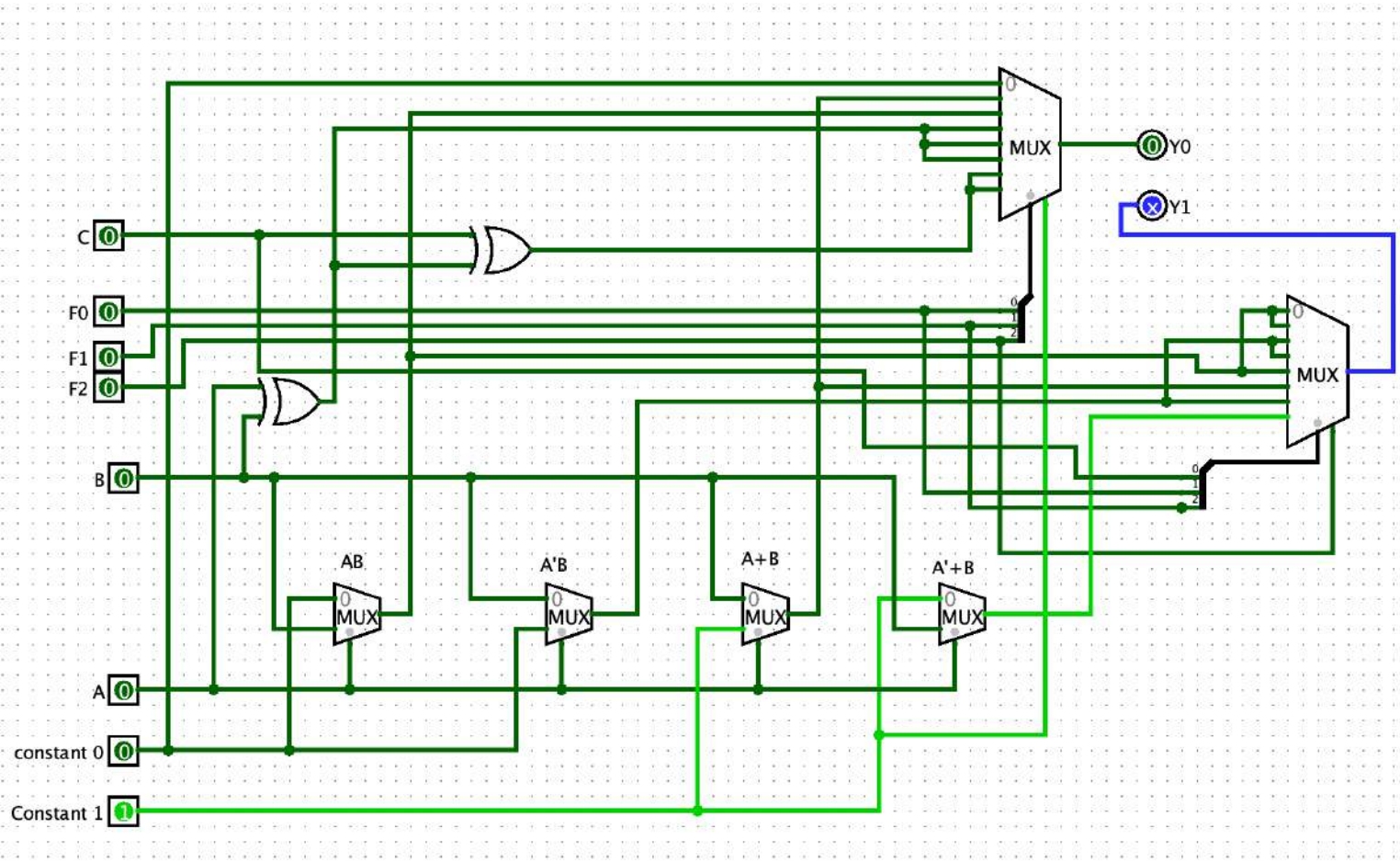
→ The final ALU output is generated using 2 8-bit MUXs: MUX_0 for Y_0 and MUX_1 for Y_1. The required inputs and outputs are mentioned below. MUX_0 is always enabled.



→ The inputs A.B, A'.B, A+B and A'+B can be generated using 4 2-bit MUXs.




C
C_0
C_1
C_2
B
A
Constant 0
Constant 1
AB
$\bar{A}B$
$A+B$
$A'+B$
MUX
MUX
Y_0
Y_1
C_0 C_1 C_2
C_0 C_1


C
F0
F1
F2
B
A
constant 0
Constant 1
AB
A'B
A+B
A'+B
MUX
MUX
MUX
MUX
MUX
Y0
Y1