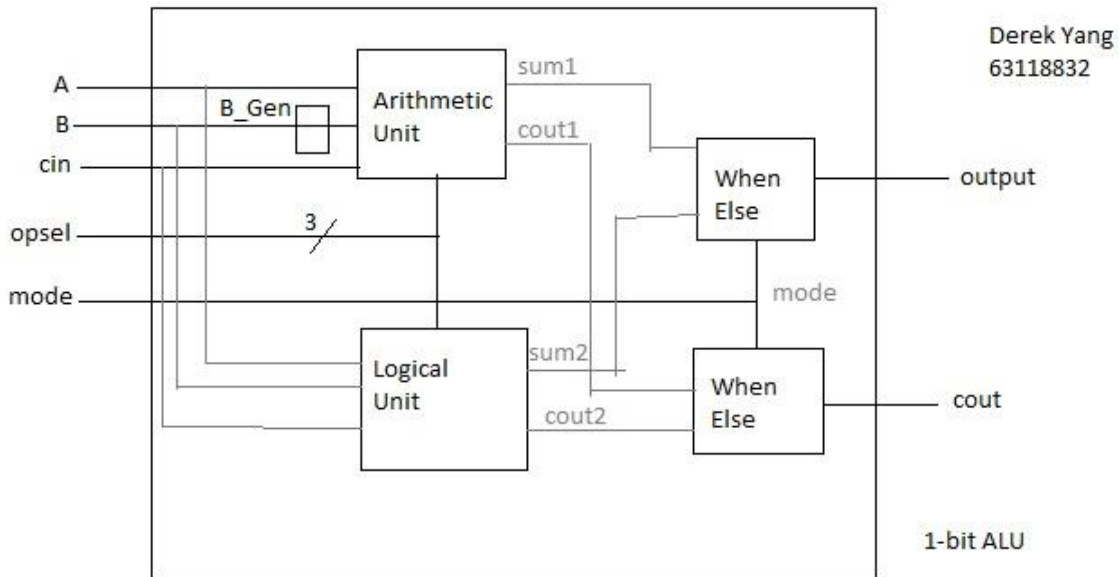


Assignment 2: ALU

Arithmetic Logical Unit:

This unit is a combination of a 1-bit arithmetic and logical unit. This circuit takes an initial input A and B and performs different operations depending on the mode selected and the operation selection code. There are in total 7 arithmetic operations that the arithmetic unit is responsible for running and 5 logical operations that the logical unit is responsible for running. When the mode is 0, the arithmetic unit connects to the output and when the mode is 1, the logical unit connects through to the output.

Circuit Design:



Truth Table:

B_Generator:

b	s ₂	s ₁	s ₀	b_gen	b	s ₂	s ₁	s ₀	b_gen
---	----------------	----------------	----------------	-------	---	----------------	----------------	----------------	-------

0	0	0	0	0	1	0	0	0	1
0	0	0	1	1	1	0	0	1	0
0	0	1	0	X	1	0	1	0	X
0	0	1	1	1	1	0	1	1	0
0	1	0	0	0	1	1	0	0	0
0	1	0	1	1	1	1	0	1	1
0	1	1	0	0	1	1	1	0	1
0	1	1	1	X	1	1	1	1	X

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Assignment 2: ALU

K-Map:

B_Generator

s1s0/ Bs(2)	00	01	11	10
00		1	1	X
01		1	X	
11		1	X	1
10	1			X

Boolean Equations:

Arithmetic Unit:

Output = A XOR B_Gen XOR cin

$B_Gen = (opsel(0) \times B') + (opsel(2) \times opsel(0)) + (B \times opsel(2)' \times opsel(0)') + (B \times opsel(2) \times opsel(0)')$

$Cout = (A \times B_Gen) + (A \times cin) + (B_Gen \times cin)$

Logical Unit:

Output =

{
 A AND B,
 A OR B,
 A XOR B,
 NOT A,
 cin
}

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Assignment 2: ALU

Wave Map

