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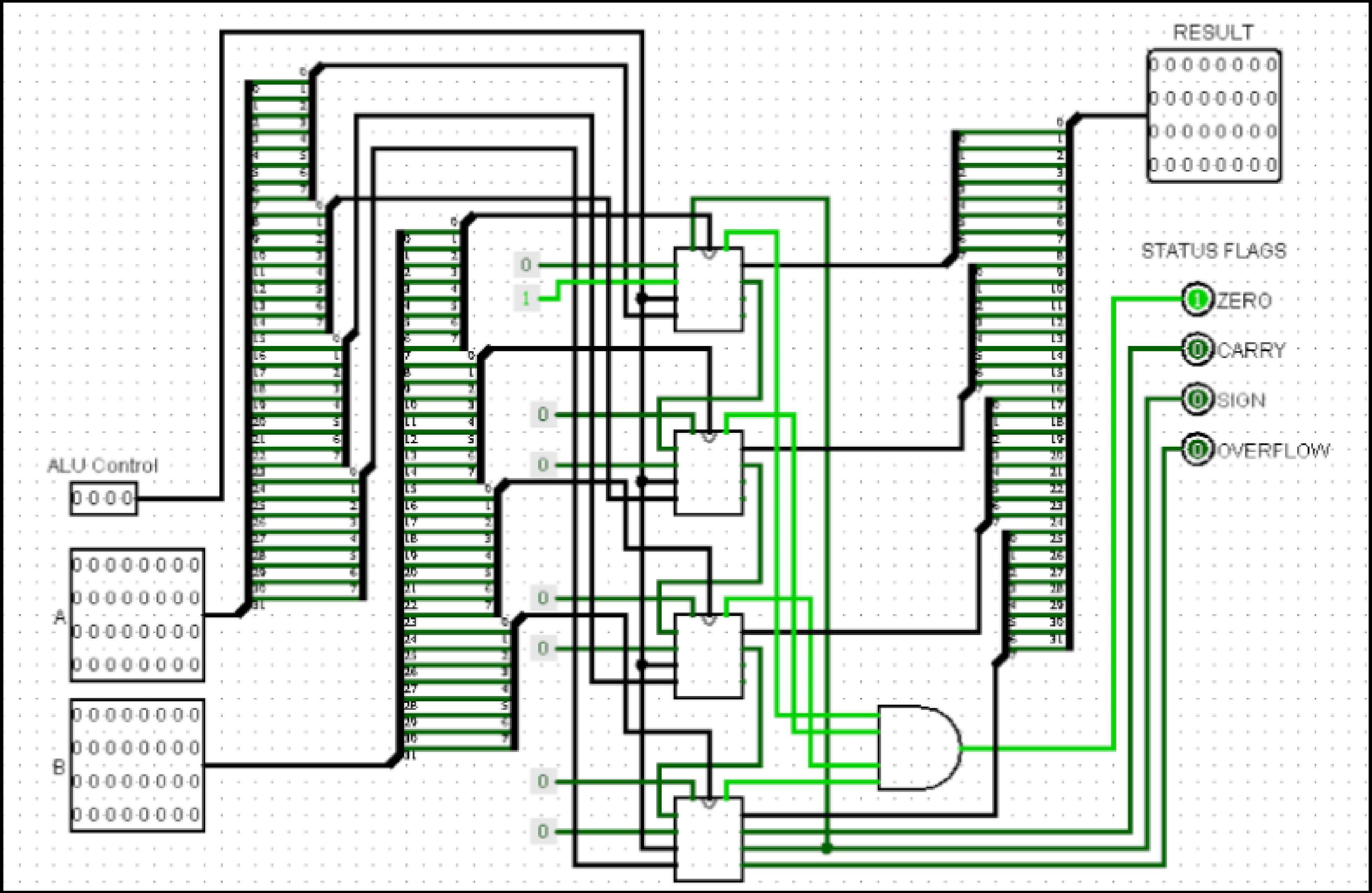
Assignment #6: LogiSim Design of a N-bit ALU Due: 12 NOV 2020
(from Hennesey and Patterson, <u>Computer Organization and Design</u>)

Use LogiSim to design the 32-bit ALU discussed before. The overflow flag OF is the XOR or the CarryIn and CarryOut of the msb. The carry flag CF is the CarryOut of the msb. The zero flag ZF is a Zero detector. The sign flag SF is the msb of result. Submit a printed copy of the LogiSim ALU design, complete this table by entering the values of A, B, and ALUOp shown in the table and record your results as shown on the LogiSim simulation and also indicate the operation and common name (if there is one) that the ALUOp code performs, e.g. operation A&B is AND for ALUOp =0. Get your results from your ALU unit. Some ALUOp inputs do not perform very useful operations, and leave the common name of those blank. The various inputs below investigate the 16 possible operations of the ALU. Notice which pattern of (ZF,CF,OF) does not appear.

#	A_{16}	B_{16}	ALUOp	Operation Performed	Common Name	32-bit Result (8 digit HEX)	ZF	CF	OF	SF
1	0x00000009	0x00000005	0	A&B	AND	0x00000001	0	0	0	0
2	0x00000005	0x0000000d	1	A|B	OR	0X00000008	0	1	0	1
3	0x80000000	0x80000000	2	A+B	ADD	0X00000000	1	1	0	0
4	0x0000005c	0x0000003e	3	A<B	LESS	0XFFFFFE3	0	1	0	1
5	0x0000008c	0x00000042	4	A&!B		0X000000CE	0	0	0	0
6	0x00000027	0x00000055	5	A|!B		0XFFFFFFDD	0	1	0	0
7	0x0000003f	0000000x61	6	A+(!B+1)	SUBTRACT	0XFFFFFFBF	0	0	0	1
8	0x00000074	0x0000009a	7	A<!B		0XFFFFFFEF	0	1	0	1
9	0x00000012	0x00000088	8	!A&B		0X0000009A	0	0	0	0
10	0x000000cd	0x000000bf	9	!A|B		0XFFFFFFF1	0	0	0	1
11	0x000000d3	0x00000000	10	!A+B		0X000000D3	0	1	0	0
12	0x00000078	0x00000032	11	!A<B		0XFFFFFF55	0	1	0	1
13	0xf7e0005f	0xabc00031	12	!A&!B		0X00000001	0	1	0	1
14	0x00000034	0x000000f9	13	!A|!B		0X00000000	0	1	0	0
15	0xffffffff	0x00000001	14	!A+!B		0X00000001	0	1	0	1
16	0x00000001	0xffffffff	15	!A<!B		0X00000001	0	0	0	1
17	0x7fffffff	0x00000003	2	A+B		0X7FFFFFFC	0	1	0	0
18	0xffffffff	0x00000002	6	A+(!B+1)		0X00000000	0	0	0	1
19	0x80000000	0xf0000000	2	A+B		0XE00000002	0	1	0	1
20	0xf0000000	0x10000000	2							


RESULT
00000000
00000000
00000000
00000000
STATUS FLAGS
1 ZERO
0 CARRY
0 SIGN
0 OVERFLOW
ALU Control
0000
A
00000000
00000000
00000000
00000000
B
00000000
00000000
00000000
00000000
0
1
0
0
0
0
0
0