THE ARAB AMERICAN UNIVERSITY

FACULTY OF ENGINEERING

Computer Architecture (230215200)

Assignment – 15/01/2025

ID: _____

Name: _____

Section: _____

Best of Luck

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4-bit ALU design

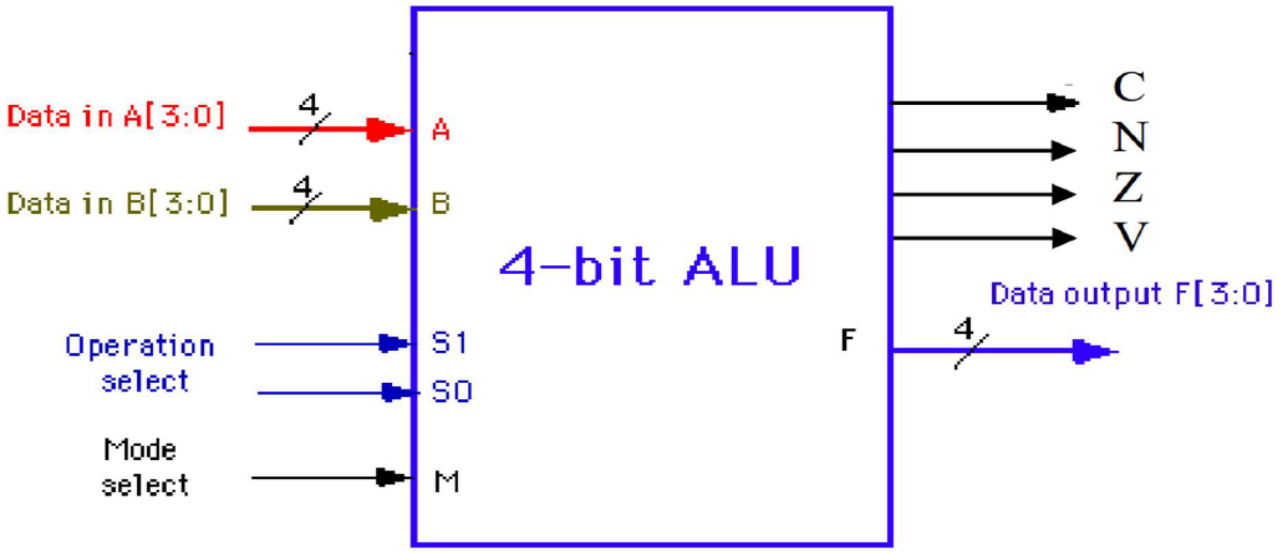
Using Multisim Workbench, design a 4-bit Arithmetic and Logic Unit (ALU) with 3 function-select inputs: Selects: S_0, S_1, and Mode: M, and two inputs A and B (both are 4 bits). The functions performed by the ALU are specified as follows:

Logic				
M	S1	S0	FUNCTION	OPERATION
0	0	0	A · B	AND
0	0	1	A + B	OR
0	1	0	AB'+A'B	XOR
0	1	1	A'	NOT
Arithmetic				
M	S1	S0	FUNCTION	OPERATION
1	0	0	A + B	Addition
1	0	1	A - B	Subtract
1	1	0	A + 1	Increment
1	1	1	A - 1	Decrement

Besides the functions, you are required to provide status bits (flags) that indicate whether or not certain conditions have taken place following an arithmetic or logic operation.

The status bits are equal to 1, if the result of a certain operation is negative or zero, or if a carry or a borrow or an overflow has happened.

For arithmetic operations you need flags for carry (C), negative (N), zero (Z), and overflow (V) conditions. For logic operations you need zero (Z) flag only.



Note: use probes to indicate the status bits and 7-segment display to indicate the result.