

# COMP3350 Spring, 2024

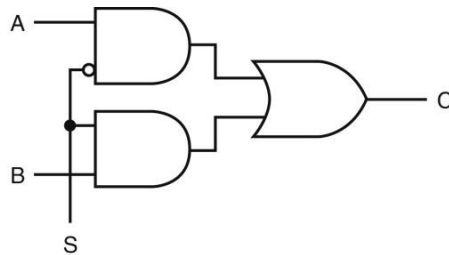
## Homework Assignment 3

### Important Notes:

- Solutions turned in must be your own. Please, mention references (if any) at the end of each question.
- All solutions must be accompanied by the equations used/logic/intermediate steps. Writing only the final answer will receive **zero** credits.
- Partial score of every question is dedicated to each correct final answer provided by you. Please ensure both your equation/logic and final answer are correct. Moreover, you are expected to provide explanation for your solutions.
- All units must be mentioned wherever required.
- We encourage all solutions to be typed in for which you could use software programs like L<sup>A</sup>T<sub>E</sub>X, Microsoft Word etc. If you submit handwritten solutions, they must be readable by the TAs to receive credits.
- All submitted solutions must be in the PDF format unless otherwise mentioned.

### Problem Set for Logic Blocks, Processor, and Datapath.

1. In the following logic block, A, B, and S are input signals, and C is the output. Please write the truth table of the logic block (8 points) and describe its functionality (6 points).



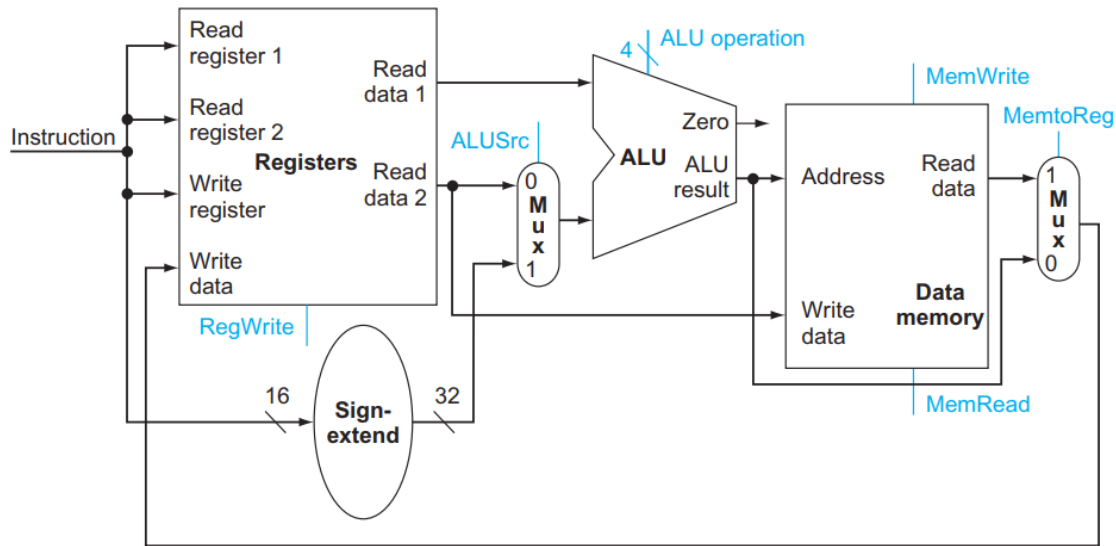
2. Consider a logic function with three inputs,  $A$ ,  $B$ , and  $C$ , and three outputs,  $D$ ,  $E$ , and  $F$ . The function is defined as follows:  $D$  is true if at least one input is true,  $E$  is true if exactly two inputs are false, and  $F$  is true only if all three inputs are false. Please

1) complete the following truth table for this function (8 points).

2) write the two-level representation of  $E$  (6 points) and  $F$  (2 points) (Hint: review lecture 13).

Inputs			Outputs		
A	B	C	D	E	F
0	0	0	0		
0	0	1	1		
0	1	0	1		
0	1	1	1		
1	0	0	1		
1	0	1	1		
1	1	0	1		
1	1	1	1		

3. Considering the following processor design,



Please answer:

1) which of the following statements **is** correct for a **load** instruction? Explain why. (6 points)

- MemtoReg should be set to cause the data from memory to be sent to the register file.
- MemtoReg should be set to cause the correct register destination to be sent to the register file.

2) whether each of the following statements is correct for an **add** instruction? Explain why. (8 points)

- MemtoReg should be set to cause the correct register destination to be sent to the register file.
- ALUSrc should not be set so to receive the 2<sup>nd</sup> ALU input from the register file.

(Hint: review lectures 15, 16 and 17).

4. In the following processor design, when executing the instruction `beq $s1, $t1, offset`, please answer:

1) what would be the output of the logic block highlighted in red (4 points)

2) what would be the next PC value? (8 points)

3) what type of addressing method is used? (4 points)

We assume that before the instruction is executed, both `$t1` and `$s1` store a value of 0, the offset is 10 (in decimal), and the current PC value is 80012.

(hint: review lecture 6 and lecture 19)

