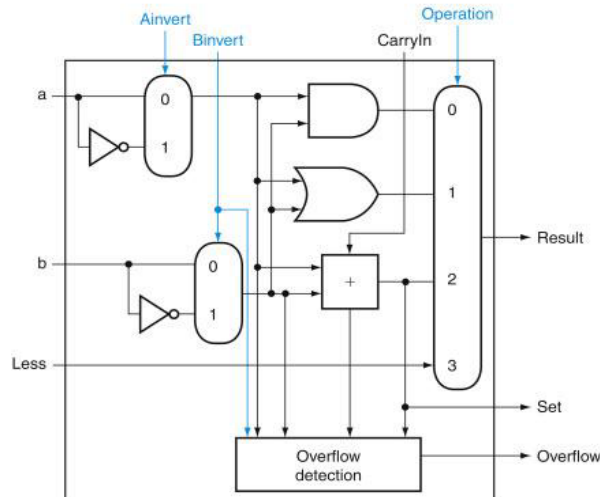


SP22 CSCI 113 Assignment 2 15 pts due: 02/10 (Th)
Practice for Logic Design - more

1. Overflow condition is checked in the 1-bit ALU for the most significant bit (sign bit).



Overflow cases:

1. adding 2 positive #s \rightarrow sum is negative #;
2. adding 2 negative #s \rightarrow sum is positive #;
- (3=1. subtracting a neg# from a pos# \rightarrow result neg#;)
- (4=2. subtracting a pos# from a neg# \rightarrow result pos#;)

Overflow checking logic:

if (sign of op1 == sign of op2)
 if (sign of op != sign of sum)
 \rightarrow overflow

Draw a complete schematic diagram for the overflow detection component, using only three basic gates (2-input AND, 2-input OR, and negator).

2. Prove that the following logic for checking overflow condition is equivalent to the logic shown in #1.

if ('carry_in to sign_bit' != 'carry_out from sign_bit') \rightarrow overflow

3. Implement (draw a schematic diagram for your design) a switching network that has two inputs (X and Y), two outputs (P and Q), and a control input (C).

The logic for the switching network is:

- if (C == 0), the network is in the crossing mode, i.e., $Y \rightarrow P$ and $X \rightarrow Q$;
- if (C == 1), the network is in the pass-through mode, i.e., $X \rightarrow P$ and $Y \rightarrow Q$;

Hint: use two 2x1 mux's;

Please show your schematic diagram using only three basic gates (negator and 2-input AND/OR).

4. Study (from any source) and write Amdahl's law (explain the terms used) and solve the following problem.

Suppose that we enhance a computer system to make all floating-point instructions run faster than the original version. Assume that a benchmark program consists of floating point instructions (30%) and other instructions (70%).

To achieve the speedup of 2 for running this benchmark program, what should be the speedup of the enhanced mode (floating point part)?

- Submission: Please write answers on blank papers and submit a .pdf version (single file).

Please organize your answer sheets in the order of #1,2,3,4 and don't forget to write your name on the first page.