Report

1. Architecture Diagrams

2. Answer the following Questions.
    a. How is “overflow” calculated?

        Overflow happens in several situations:

        1) positive + positive = negative

        2) negative + negative = positive

        3) positive - negative = negative

        4) negative - positive = positive.

        When overflow occurs:

        - Carry out of highest bit is 1 and carry in of lowest bit is 0.
        - Carry out of highest bit is 0 and carry in of lowest bit is 1.

        So, we only need to calculate the difference of this two bit

    b. Explain why ALU control signal of SUB is 0110 and NOR is 1100?

        SUB (0110): The SUB operation typically involves an ALU operation to subtract the second operand from the first operand. Such as, 1*2^4 – 1*2^0.

        NOR (1100): The NOR operation is a logical operation that computes the NOR of two inputs, which results in a 0 output only when both inputs are 1.

c. (2cont'd) If you assign different signal to these operation, what problems you may encountered?

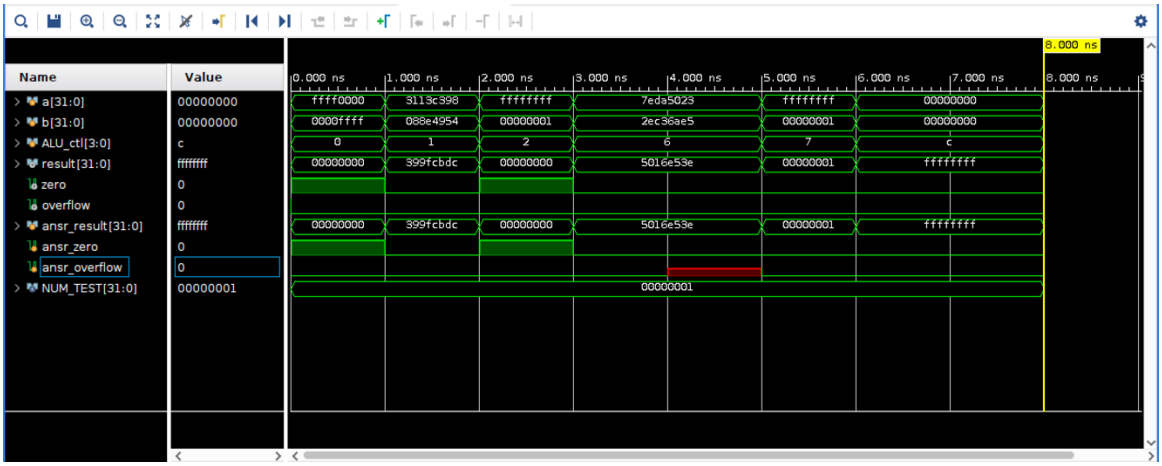
   Assigning incorrect control signals to operations can result in the ALU performing unintended operations. This can lead to incorrect computation and incorrect behavior of the system.

d. True or false: Because the register file is both read and written on the same clock cycle, any MIPS data path using edge-triggered writes must have more than one copy of the register file. Explain your answer.

   False. Edge-triggered writes mean that data is written to the register file on the rising edge of the clock signal. Having edge-triggered writes does not inherently require multiple copies of the register file.

3. Experimental Result (ALU Only)

   a. Show the waveform screen shot of the testbench t_alu.0.txt result.



   b. What other cases you've tested? Why you choose them?

   0x00000001 0 SLT 0x00000000 1 0: 0 is less than 1

   0x00000000 0x00000000 SUB 0x00000000 1 0: 0 – 0 is 0 and 32bit result is 0

   0x00000000 -1 SUB 0x00000001 0 0: 0-(-1) which is subtracting negative number