Computer Organization and Structure

Homework #3
Due: 2012/11/6

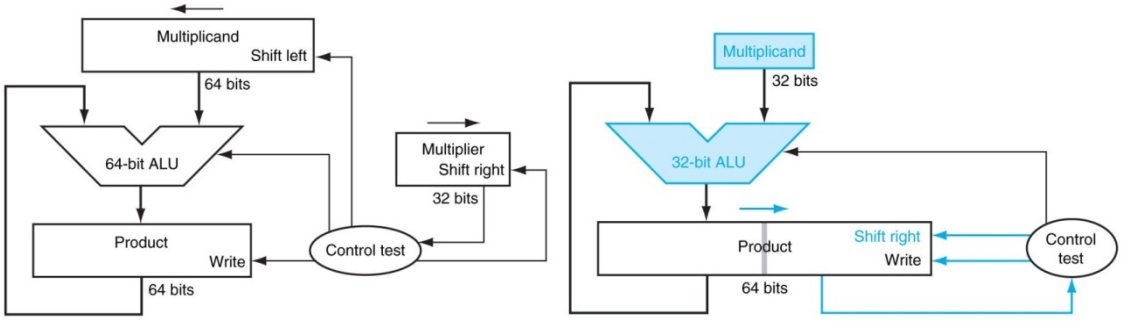
1. IEEE 754 is a floating-point standard which represents a floating-point number as $(-1)^S \times (1+F) \times 2^E$ and encodes the *S*, *F*, and *E* ordering using 1, 23, and 8 bits, respectively.

   a. Show the IEEE 754 binary representation in single precision for the floating-point numbers 10_{ten}, 10.5_{ten}, 0.1_{ten}, and $-2/3_{ten}$, respectively.
   b. Convert the following two IEEE 754 binary representations in single precision to the decimal numbers:

   $1011\ 1111\ 1100\ 0000\ 0000\ 0000\ 0000\ 0000_{two}$
   $0011\ 1111\ 1111\ 1111\ 1111\ 1111\ 0000\ 0110_{two}$.

2. Add 2.85_{ten} x 10^3 to 9.84_{ten} x 10^4 and add 3.63_{ten} x 10^4 to 6.87_{ten} x 10^3, respectively, assuming that you have only three significant digits, first with guard and round digits and then without them.

3. Given two versions of the functional block diagrams of multiply algorithm as below:

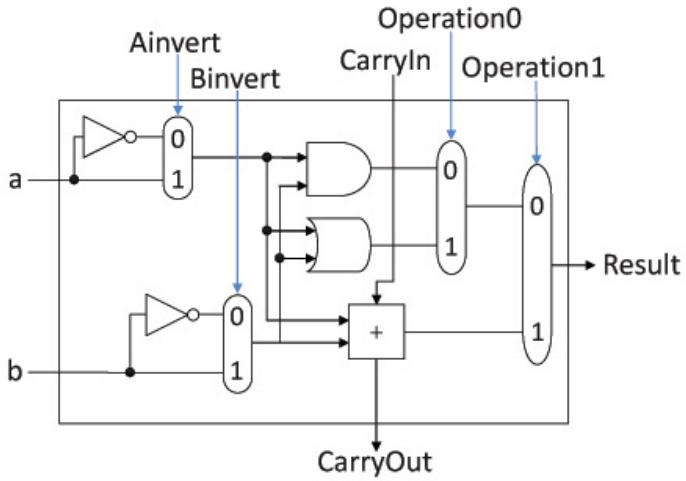


(a) (b)

   a. Please make a comparison and list the difference between these two versions. Please also explain which version is better and the reason.
   b. Calculate 0010_2 x 0011_2 using the version shown in (b), and list the contents of all the registers after each of four iterations (fill the table below).

Iteration	**Multiplicand**	**Product**
0 (initial)	0010	
1		
2		
3		
4		

4. The following diagram gives a 1-bit ALU. Complete the table by specifying the control signals for the desired operations. For a don't care signal, use '**X**'.



Operations	**Ainvert**	**Binvert**	**CarryIn**	**Operation0**	**Operation1**
a + b					
a – b					
a or b					
a and b					
a nor b					