

CSE 321b: Computer Organization (II)  
Third Year, Computer & Systems Engineering

## Assignment #3

Due date: **Thursday, May 19<sup>th</sup>, 2016**

1. Apply **Booth's** algorithm to multiply -12 (multiplicand) by +6 (multiplier). Represent the numbers using the least number of bits.
2. Show all the steps required to divide +14 (dividend) by -5 (divisor) using the **non-restoring division** algorithm. Represent the numbers using the least number of bits.
3. Consider the IEEE 754 **half-precision** format (which is also known as: **binary16**) in which floating point numbers are represented using 16 bits: 1 sign bit, 5-bit biased exponent, and 10-bit fraction. Convert the following numbers to their IEEE half-precision counterparts:  
(a)  $4.57763671875 \times 10^{-5}$   
(b) -217.375
4. Suppose the IEEE 754 Standard has a **binary14** format that uses: 1 sign bit, 6-bit biased exponent, and 7-bit fraction. Perform the following calculations while interpreting each of the given binary values as a binary16 floating-point number. Use two guard bits and round the result to the **nearest** binary16 number whenever is necessary.  
(a) 1 101001 1110000 + 0 100111 1000010  
(b) 1 111111 0000000 × 1 000000 0000000  
(c) 1 011101 0000001 ÷ 0 100010 1111101