

16.482 / 16.561: Computer Architecture and Design

Fall 2013

Homework #3

Due **Monday, 9/30/13**

Notes:

- While typed submissions are preferred, handwritten submissions are acceptable.
 - Any handwritten solutions that are scanned and submitted electronically must be clearly legible and combined into a single file—simply sending a picture of each scanned page is not an acceptable form of submission.
1. (50 points) For the examples below, show how binary multiplication would proceed using (i) the pencil and paper method (the most basic method discussed in class), (ii) the final refined hardware method we discussed in class, and (iii) Booth's Algorithm. For (ii) and (iii), for each step, show what operations are performed in that step, and what the state of the product/multiplier register is at the end of each step. Assume each operand uses four bits.
 - a. 5×7
 - b. $(-1) \times 6$
 - c. $(-3) \times (-7)$
 2. (25 points) Convert each of the following decimal values into single-precision IEEE floating-point format. Show all steps, including how you calculate the fraction and biased exponent stored in the number.
 - a. 2.25
 - b. -83
 - c. 0.65625
 - d. 118.625
 - e. -16.482 (determine the closest approximation you can)
 3. (25 points) Convert each of the following IEEE single-precision floating-point values into decimal values. Show all steps of your work.
 - a. 0xc4fba000
 - b. 0x42b9c000
 - c. 0xc0440000
 - d. 0x270f8000
 - e. 0xc394cccd