

# CSE340: Computer Architecture

## Assignment 3

### Chapter 3 (Arithmetic for Computers)

#### Question 01

Multiplicand = 13 (Decimal) and multiplier = 17 (Decimal)

Complete the multiplication following the optimized multiplication algorithm.

#### Question 02

Convert the following precise number into a decimal number where in the representation 7 bits are allocated for the exponent field.

0x ABB9609

#### Question 03

Convert the number 70.78955 into a floating point format where total bit length would be 36 and 9 bits will be allocated for the biased exponent field.

#### Question 04

Perform the arithmetic operations using Floating point format

- a.  $50.7869 + 79.83 - 29.58$
- b.  $64.2486 * 49.1832$

#### Question 05

Subtract -4.0210 from 28.4810 using IEEE-754 single-precision floating point representation. Check if the result has overflow or underflow or none.

Note: Consider 10 decimal digits while converting from decimal to binary for the following questions.

#### Question 06

Multiply  $0.000101_2 \times 2^{-85}$  and  $10.1_2 \times 2^{-90}$  using an 18 bit IEEE-754 floating-point

representation where the size of the fraction field is 12 bits. Check if the result has overflow or underflow.

Note: Consider 10 decimal digits while converting from decimal to binary for the following questions.

### Question 07

Suppose four single precision floating point numbers **g**, **h**, **i** and **j** are stored in memory. The memory locations are directly stored in register **X<sub>10</sub>**, **X<sub>11</sub>**, **X<sub>12</sub>**, **X<sub>13</sub>**. Write necessary code to store the result of

$$(g + h) - (i + j)$$

in the memory address that is stored in **X<sub>14</sub>**.

### Question 08

- a. Why is a bias added to the actual exponent in the IEEE 754 floating-point representation, and how does this affect the encoding of both positive and negative exponents?
- b. How does optimized multiplication improve efficiency and performance compared to traditional long multiplication, especially in terms of speed and computational complexity.