CSE340: Computer Architecture

Assignment 3

Chapter 3 (Arithmetic for Computers)

Question 01

Multiplicand = 13 (Decimal) and multiplier = 17 (Decimal)
Complete the multiplication following the advanced 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 $0.000101_2 x 2^{-85}$ and $10.1_2 x 2^{-90}$ 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 $\mathbf{X_{10}}$, $\mathbf{X_{11}}$, $\mathbf{X_{12}}$, $\mathbf{X_{13}}$. Write necessary code to store the result of

$$\mathbf{(g + h) - (i + j)}$$

in the memory address that is stored in $\mathbf{X_{14}}$**.**

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.