CSE340: Computer Architecture

Assignment 3

Chapters 3 & 4

Note: For the questions below, if necessary, Consider 5 digits while performing the decimal to binary conversion of the floating portion.

Question 01

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

Complete the multiplication following the optimized multiplication algorithm.

Question 02

Convert the following IEEE-754 number into a decimal number where 6 bits are allocated for the exponent field in the representation.

0x ABB9609

Question 03

Perform the arithmetic operations using the Floating point format

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

Question 04

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 5 digits while performing the decimal to binary conversion of the floating portion.

Question 05

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?

Question 06

	Instruction name
1	fadd.s
2	fsub.s
3	fmul.s
4	fdiv.s
5	fsqrt.s
6	feq.d
7	fle.d
8	flt.s

You **must** answer the following questions for the explanation of each of the instructions mentioned above:
(i) What do they do?
(ii) Explain their syntax.
(iii) How do they work?
(iv) Write an example for each of the instructions.

Question 07

Write the necessary RISC-V code to compare two floating point registers f1 and f2. If f1 and f2 are equal jump to a label called "**jumpEqual**" else jump to another label called "**jumpNotEqual**"

Note: both the numbers stored in f1 and f2 registers are double-precision floating point numbers.

Question 08

Draw a diagram of the ALU Control, clearly indicating all input and output pins.
a. Does the ALU control utilize Instruction bits 30 and 14-12 to generate the output for the LD instruction? Justify your answer.

b. **Identify** the cases in which the ALU control utilizes Instruction bits 30 and 14-12 to generate the output. **Additionally**, explain why only these four bits (Instruction bits 30 and 14-12) are used in such cases.

Question 09

Draw a simplified datapath with control unit that can process ADD X21, X22, X23.
Note: You must mention all the control signal values.