Assignment 3 - Handwritten Part (50%)

Question 1

When we execute following Python code

```
1 | print(0.1 + 0.2 == 0.3)
```

Python will return with false. Please explain why this happend.

Question 2

2.1

IEEE 754 32-bits floating point 0xC3336000 + 0x42E27400 = ?
Please write down all the calculation process in binary and answer in hexadecimal form.

2.2

How about signed integer 0xC3336000 + 0x42E27400 = ?
Please write down all the calculation process in binary and answer in hexadecimal form.

Question 3

Based on IEEE 754, we use sign S, exponent E, fraction F to represent a floating point number, and its value is $(-1)^{Sign} * (1 + Fraction) * 2^{Exponent - Bias}$.

Now, suppose we have a 10 bit floating number, and we want you to find the best format of it to represent 1.3 with smallest error by adjusting how many bits to use for the S, E, F fields. Please (1) find out the number of bits you give to S, E, F, and (2) the value of S, E, F (in decimal) to represent 1.3.

Each field must not be zero. Also remember to use exponent bias defined in IEEE 754.

Question 4

In RISC-V, division instructions run slower than the multiplication instructions (CPI of div > CPI of mul). Please explain why by considering the hardware design.