# BRAC UNIVERSITY
## Department of Computer Science and Engineering

Examination: Quiz - 3
Duration: 30minutes

Semester: Fall 2024
Full Marks: 15

CSE 340: Computer Architecture

| Name: Solution | ID: | Section: 07 |
|---|---|---|

**1.** Given the number A = 1.1011×2^232500; can this number be represented using a 23-bit IEEE-754 floating-point format, where the fraction field is 10 bits? You must provide a justification for your answer. [2+1]

Answer:

| S | E | F |
|---|---|---|
| 1 | (23-10-1) | 10 |

= 12 bits

Bias = $2^{12-1} - 1$
= 2047

Biased Exp
= 232500 + 2047
= 234547

Biased Exp. Range = 0 to $2^{12}-1$
= 0 to 4095
= 1 to 4094 [usable]

234547 > 4094
So, not possible to represent.

**2.** Suppose you have two floating point numbers 2.15 and 3.15 stored respectively in **f2** and **f3** registers. Now you run the following code:

**feq.d** X3, f2, f3

After running the code, what would be the value inside the X3 register?
**Note**: both values stored in f2 and f3 are in IEEE-754 double precision format. [1]

Answer: $f_2 \neq f_3$ ; So, $x_3 = 0$

**3.** Given two numbers $1190_{10}$ and $1370_{10}$. We want to multiply these two numbers using the **Optimized Multiplication** method. Answer the following questions: [4]

$(1190)_{10}$ = 100 1010 0110 (11 bits) ; $(1370)_{10}$ = 101 0101 1010 → 11 bits

a. How many iterations are necessary to complete this multiplication?
b. What would be the size of the product register?
c. What would be the size of the multiplicand register?
d. What would be the size of the inputs of ALU?

Answer:
a. 11 bits
b. 22 bits
c. 11 bits
d. 11 bits

4. Given a number, W = 0x100A05002 in 36-bit IEEE-754 representation, where the size of the fraction field is 18 bits. Find the equivalent decimal number of the given number W. [7]

100A05002

= 0 0001 0000 0000 1010 0000 0101 0000 0000 0010

S — exponent — fraction

=> Biased Exponent = 001 0000 0000 1010 00

= 16424

Bias = $2^{17-1} - 1$ = 65535

=> Actual Exponent = ~~655~~ 16424 - 65535

= -49111

=> Decimal number = $(-1)^0 \times (1 + 0.00\ 0101\ 0000\ 0000\ 0010) \times 2^{-49111}$

= $1.00\ 0101\ 0000\ 0000\ 0010 \times 2^{-49111}$

The exponent is too small. So, calculator won't be able to convert it.