Name: Id#

COE 301/ICS 233, Term 172

Computer Architecture & Assembly Language

Quiz# 5 Solution

Date: Tuesday, March 20, 2018

1. [3 Points] What is the decimal value of following single precision float:

[1, 0111 1000, 0111 0000 0000 0000 0000 000]

= - (1.0111000000000000...0)2 \* 2(120-127) = - (1.0111000000000000...0)2\* 2-7

= -0.011230469

1. [4 Points] Find the normalized single precision representation of –21.625.

21.625=(10101.101)2 = (1.0101101)2 \* 24

Exp. = 4 +127=131

Single precision binary representation:

## **1100 0001 1010 1101 0000 0000 0000 0000**

1. [2 Points] Find the smallest positive normalized float for single precision.
   * Exponent – bias = 1 – 127 = –126 (smallest exponent for SP)
   * Significand = (1**.**000 … 0)2 = 1
   * Value in decimal = 1 × 2–126 = 1.17549 … × 10–38
2. [3 Points] Give the representation of Zero, -infinity, and NAN for single precision:

+Zero: [ 0 , 00000000 , 000 0000 0000 0000 0000 0000 ]

-infinity: [ 1 , 11111111 , 000 0000 0000 0000 0000 0000 ]

NAN: [ 0 or 1, 11111111, any non-zero value ]

1. [6 Points] Find the normalized difference between A and B by using rounding to nearest even. Perform the operation using **guard**, **round** and **sticky** bits

A= + 1.00000010000111110000001 × 24

B = +1.00001111100000010100000 × 2-3

**1.000 0001 0000 1111 1000 0001 000 x 24**

**- 1.000 0111 1100 0000 1010 0000 000 x 2-3**

**01.000 0001 0000 1111 1000 0001 000 x 24**

**- 00.000 0001 0000 1111 1000 0001 010 x 24 (align)**

**01.000 0001 0000 1111 1000 0001 000 x 24**

**+ 11.111 1110 1111 0000 0111 1110 110 x 24 (2's complement)**

**00.111 1111 1111 1111 1111 1111 110 x 24**

**= +** **0.111 1111 1111 1111 1111 1111 110 x 24**

**= + 1.111 1111 1111 1111 1111 1111 100 x 23 (normalize)**

**= + 10.000 0000 0000 0000 0000 0000 x 23**  **(round)**

**= + 1.000 0000 0000 0000 0000 0000 x 24**  **(renormalize)**