CSc 317 Spring 2023

Assignment #3

Due: 3-18-24

From the textbook (ARM edition) do the following problems that start on page 250.

1. Exercise 3.22 (5 points)
2. Exercise 3.23 (5 points)
3. Exercise 3.24 (5 points)
4. Exercise 3.27 (5 points)
5. Exercise 3.29 (5 points)

You must show your work in order to receive full credit.

Assignments are to be submitted to D2L by 2:00pm on the due date.

3.22 0x0C000000 = 0000 1100 0000 0000 0000 0000 0000 0000

Sign = 0, so positive number

Exponent = 0001 1000 = 16 + 8 = 24, next subtract the bias of 127, 24-127 = -103

Fraction = 000 0000 0000 … 0000 = 1.000 … 0000

1.0x2-103

3.23 Convert 63.25 to IEEE single precision format

Sign = 0

63.25 = 11 1111.01 (Remember that 0100 00002 is 64)

Normalize 11 1111.01 to 1.1111101 x 25, fraction is now 1111 1010

Exponent is 127+5 = 132 = 100 0010 0

Final answer is 0100 0010 0111 1101 0000 0000 0000 0000 = 0x427D0000

Let’s go the other way: 427D0000 = 0 100 0010 0 111 1101 0000 …0000

Sign is positive  
Exponent is 128+4 = 132, now subtract the bias 132-127 = 5

Fraction is 1. 111 1101, so we now have 1.1111101 x 25 or 111111.012 = 63.2510

3.24 Convert 63.25 to IEEE double precision.

Sign = 0

Fraction = 1111 1010 … 0000

Exponent is 1023+5 = 1028 = 1000 0000 100

Final number is 0100 0000 0100 1111 1010 … 0000 or 0x404F A000 0000 0000

3.27 Convert -1.5265 x 10-1 to IEEE half precision

Sign = 1, 0.15265 in binary is .001012 or 1.01x2-3 normalize to .0100

Bias is 15, so we need 15+(-3) = 12 0 1100

Now we get 1011 0001 0000 0000 or 0x**100**

3.29 Calculate the sum of 2.6125 x 101 and 4.150390625 x 10-1 if stores as IEEE half precision numbers

26.125 = 1 1010. 0012

0.4150390625 = 0.01101010012

GR

1.1010 0010 00 00

+0.0000 0110 10 10 001 Since there are bits to the right of the Guard and Round, Sticky bit is 1

1.1010 1000 10 10

Normally, with GR of 10 we would round down to the nearest even, but since we used the S bit and it is 1, we round this up.

1.1010 1000 11 x 24

Or

11010.100011 => 26.546875 0r 2.6546875x101

½ + 1/32 = 1/64 = 0.5 + 0.03125 + 0.05625 = 0.545875