QUIZ 1

Introduction to Computer Systems COMP 273

Mon. Jan. 18, 2016

Professor Michael Langer

STUDENT NAME: _____ ID: _____ GRADE: _____/4

Instructions:

This is a closed book exam. You are allowed one crib sheet. You are *not* allowed a calculator. Once you finish, turn your paper over and wait for the end of the quiz.

1. Write -178 as signed binary number with 10 bits. *Show your work.*

```
ANSWER:   178
           89    0
           44    1
           22    0
           11    0
           5     1
           2     1
           1     0
           0     1   Thus (178)_10 = (10110010)_2, and then tack on two 0 bits (0010110010)_2.

To get -178, we invert the bits (1101001101), and add 1 so (-178)_10 =  (1101001110)_2
```

GRADING: 0.5 points for 178, and 0.5 for -178.

2. Write 178.3 as an IEEE single precision float. Represent your answer in hexadecimal. *Show your work.*

   Hints: Use 1 sign bit, 8 bits for exponent (bias is 127), 23 bits significand. If you answer is not exact, then truncate (round down).

```
ANSWER:
Now we need to write .3 in binary.    The part of the left of the point
below is in binary and the part to the right is in decimal

              .3
  =          0.6 x 2^-1
  =         01.2 x 2^-2
  =        010.4 x 2^-3
  =       0100.8 x 2^-4
  =      01001.6 x 2^-5   and now we've cycled around where the cycle is 1001
  =           .01001 1001 1001 etc

Since  178 is 10110010 (unsigned),  we have

so (178.3)_10 =  (10110010.0 1001 1001 1001 etc)_2
              =  (1. 0110010  0 1001 1001 1001 etc)_2  *  2^7
              ~  (1.0110010  0 1001 1001 1001 etc)_2 * 2^7

The significand is  0110010  0 1001 1001 1001 100  (23 bits)
The sign bit is 0,  and the exponent is 127 + 7 = 134 =  (10000110)_2

0     100,0011,0  011,0010,0100,1100,1100,1100  where the commas are used for hex conversion
[sign   exponent        significand]
which in hex is  0x43324ccc   (note that if we round up, the last digit is d, not c)
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GRADING: 0.5 pts for binary representation of 0.3, 0.5 pts for exponent value of 7, 0.5 pts for sign bit, 0.5 pts for exponent code of 134, 0.5 pts for significand, 0.5 pts for hex conversion.

NOTE: I instructed the TAs to grade for understanding more than correctness, and not to take points off for trivial errors. e.g. If you computed the hex from an incorrect 32 bit code, you should get the 0.5 pt, whereas if you truncated after the first repetition of 1001 then you should not get the 0.5 pt for the significand.