CS 417- Homework #1- Due date 09-08-2014- 3 p.m.

1) (25 points) Consider a miniature binary computer whose floating-point words consists of a 4 binary digits for the mantisa (fraction) and 3 binary digits for the exponent (plus two sign bits-results in a 9 bit binary system).

Let $x = (0.1011)_2 \cdot 2^0$ and $y = (0.1100)_2 \cdot 2^0$.

Compute $z = fl(x - y)$, $z = fl((x - y)^{10})$, $z = fl(x + y)$, $z = fl(x + y/4)$, $z = fl(x/4 + y)$ and only report whether the machine operation indicated is *exact*, *rounded*, *overflows* or *underflows*.

2) (15 points)Let $a = 0.2337123 \cdot 10^{-4}$ $b = 0.3368678 \cdot 10^2$ and $c = -0.3395375 \cdot 10^2$. Assuming a 6 digits after decimal computer. Compute
(a) $s = fl(fl(a + b) + c)$
(b) $s = fl(a + fl(b + c))$

Is (a) equal (b)? If not, explain why.

3) (40 points) Write a program that receives an integer number in binary format and convert it to decimal. You MUST use the algorithm described in the class.

4) (5 points) This line of code is written in C++.

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std::cout << 1/6 << "\n" ;
```

What is the output and why?

5) (15 points) The following algorithm (attributed to Cleve Moler) estimates machine precision (eps):

$$a = 4.0/3.0;$$
$$b = a - 1.0;$$
$$c = b + b + b;$$
$$eps = abs(c - 1.0);$$

Implement the program twice with *single* and *double* precision variable types and report the value of eps for both *single* and *double* precision.