School of Computer Science and Information Technology
Computer Systems Architecture (G51CSA) Autumn 2008
Thorsten Altenkirch

Coursework 6 (cw id 122)
Monday, 10 November 2008
Deadline: 17 November 08, 12:00

Collaborating in small groups of up to three students is permitted, but you must implement your own programs (absolutely *do not* copy and paste from others) and provide your own answers where appropriate.

Part 1-3 have to be submitted on paper to the school office before the deadline. Use the coursework submission cover sheet and write CSA, coursework 6, *your name*, *your student id*, and the email address of your CSA tutor, i.e. either *asg* or *lyh* on the top of your submission. If your submission is more than one page then the pages have to be stapled together.

The remaining part 4 has to be submitted using the departmental coursework submission system, see

http://support.cs.nott.ac.uk/coursework/cwstud/.

Create a directory `ex06` and put all the files to be submitted (but nothing else) into this directory before submitting the directory.

Multiple submission before the deadline are allowed, only the last one will be taken into account.

1. Convert the following decimal numbers into single precision (32 bit) IEEE 754 floating point number? The answer should be a sequence of 32 bits, indicating which bits are sign, exponent and significant (or mantissa). Show how you calculated the number on paper.

$$a = 1000, b = -1.5, c = 1.875$$

2. Calculate in detail $a + b$ on paper and present your result as a normalized IEEE 745 floating point number.

3. Calculate in detail $a \times b$ on paper and present your result as a normalized IEEE 745 floating point number.

4. The following C program uses Heron's method to calculate the square root:

```
#include <stdio.h>
#include <math.h>

int main() {
  float x,y;
  printf("x=");
  scanf("%f",&x);
  /* calculation */
  y=x;
  while(fabs(x-y*y) > 1E-5)
    y=(y+x/y)/2;
  /* output */
  printf("y = %f\n",y);
}
```

Translate this program into MIPS assembly language (call it `sqrt.asm`) and test it on the inputs 2 and 9).