## **UNIVERSITY OF DUBLIN**

TRINITY COLLEGE

FACULTY OF SCIENCE

SCHOOL OF MATHEMATICS

JF Maths/TSM

Trinity Term 2014

MATHEMATICAL COMPUTATION I

Saturday, May 10

RDS, Main Hall 09:30 - 11:30

Prof. Colm Ó Dúnlaing

Attempt 3 questions.

MA1261-1

- 1. (a) Convert 3141 and -595 to 2s complement short integers, and add them as short integers (little endian not required).
  - (b) Convert -56.0/5 to single-precision floating point, little endian.
- 2. (a) Explain the behaviour of the following program

```
#include <stdio.h>
main()
{ double x = 123;
    printf("x is %f. Enter new value for x.\n", x);
    scanf ("%f", &x );
    printf("x is %f\n", x);
}
%a.out
x is 123.000000. Enter new value for x.
45678
x is 123.000017
```

(b) Explain the mistakes in the following code fragments, saying what would happen, and correct them.

(i)	(ii)
<pre>int finished = 0;</pre>	<pre>int finished = 0;</pre>
while ( finished = 0 )	while ( finished == 0 );
<pre>printf("Hello\n");</pre>	<pre>printf("Hello\n");</pre>

```
(iii)
int finished = 0;
if ( finished == 0 )
{ printf("Hello\n"); };
else
{ printf("Goodbye\n"); };
```

- (a) Write a function char \* copy\_string ( char \* x ) which allocates memory for a copy of the string x, and copies the string to it, and returns the copy.
  - (b) Write a program which includes a function

int reverse ( int n )

which assumes n is a positive integer, and returns the result of reversing its digits. Your main program should read n off the command line, call reverse (n), and print n and its reversal. For example,

a.out 031415900 input 31415900 reversed 951413

Ignore the question of leading or trailing zeroes.

4. (a) Carefully simulate

```
#include <stdio.h>
main()
{
    int s,t,i;
    int n = 4;
    s=t=0;
    for (i=0; i<n; ++i)
    {
        t += 3*s + 3*i + 1;
        s += 2*i + 1;
    }
    printf("n %d\n", n);
    printf("s %d\n", s);
    printf("t %d\n", t);
}</pre>
```

(b) What does the above program calculate and print, for general  $n \ge 0$ ? (the program had n = 4).

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```
(c) Carefully simulate
```

```
#include <stdio.h>
int xxx ( int n )
{ int s,m,d,i;
  s = 0; m = 1;
  for ( i=0; i<3; ++i )</pre>
  \{ d = n\%10; \}
    s += m*d;
    m *= 2;
   n /= 10;
  }
  while ( s \ge 8 )
  { s -= 8; }
  return s;
}
main()
{ int n = 9355;
  printf("xxx ( %d ) is %d\n", n, xxx ( n ));
}
```

(d) What does xxx( n ) compute, in general, given  $n \ge 0$ ?

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