UNIVERSITY OF DUBLIN

TRINITY COLLEGE

FACULTY OF SCIENCE

SCHOOL OF MATHEMATICS

JF Maths SF TSM Trinity Term 2011

MATHEMATICS 1261, 1262: COMPUTATION

DAY PLACE 2 or 3 hours, depending

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Students should attempt three questions from each module. OR 3 questions.

Log tables are available from the invigilators, if required.

Non-programmable calculators are permitted for this examination,—please indicate the make and model of your calculator on each answer book used.

Module 1261

1. (a) Convert -1916 and 2011 into 2s-complement short integers. (in hexadecimal), and compute the sum as a short integer. 'Little endian' form is not needed.

Answer			
119 r 12 16) 1916	7 r 7 16) 119	:077c	ffff 077c f883 -> f884
125 r 11	7 r 13		
16) 2011	16) 125	:07db f884 005f	

XMA12621

(b) Calculate the single-precision floating point form of -68.0/15, little endian.

```
Answer
sign -1
68 = 4 * 17
true exponent 4 biased:
                               0111 1111
                                      100
                               1000 0011
17/15->2/15, 4, 8, 16/15->1/15, 2, 4, 8, 16/15->1/15, etcetera
1.00100010001...
Check:
              1 + 1/8(1 + 1/16 + 1/16^2 \dots) = 1 + \frac{1}{8}\frac{16}{15} = \frac{17}{15}
1
1000 0011
001 0001 0001 0001 0001 0001 0001 0001
1100 0001 1001 0001 0001 0001 0001 0 round down
                         1
                                 1
   С
        1
              9
                   1
                               1
                                          1
11 11 91 c0 little endian
```

2. (a) Simulate the following program

```
#include <stdio.h>
int xxx ( int n )
{
    if ( n < 10 ) /* A */
        return 0;
    else
        return 1 + xxx ( n/10 ); /* B */
}
main()
{
    printf ( "xxx(333)=%d\n", xxx(333) );
}</pre>
```

Answer

(b) In general (in terms of n), if n > 0, what gets printed?

Answer Integer part of $\log_{10} n$.

(c) In the above code, change 10 to 11 in statements /* A */ and /* B */. Then simulate the altered program.

xxx(333) xxx(30) xxx(2) return 0

Answer

Answer

return 1 return 2 prints same as before.

 (a) Write a C function double average (int n, double x[]) which returns the average of the first n entries in the array x.

double average (int n, double x[])
{
 int i;
 double s;
 s = 0;

```
for (i=0; i<n; ++i )
    s += x[i];
return s/n;
}</pre>
```

(b) Write a routine rev_print(char * s) which prints the string s in reverse. (The reversed string can be printed character by character, without making a copy of the reversed string.)

Answer

```
void rev_print ( char * s )
{
    int i;
    for (i=strlen(s) -1; i>=0; --i )
        printf("%c", s[i]);
    printf("\n");
}
```

4. (a) According to the rules of C, both arrays **a** and **b**, declared below, are treated as arrays of 3 pointers. What is the difference between the two declarations?

int a[3][4]; int * b[3];

Answer

48 bytes of storage are reserved for a, only 12 are reserved for b.

(b) Given the declaration

int c[5][4];

suppose c[0][0] begins at address 1000. What is the value of c[3]? What is the address of c[2][2]?

Answer

c[3] = 1048 &c[2][2] = 1000 + 32 + 8 = 1040

(c) Evaluate the following expressions (following the rules of C). Give 'double' values rounded to four decimal places.

Answer

1 + 0 - 20/6 = -2 1 + 0.6667 - 20/6 = -1.33331 + 0.6667 - 3.3333 = -1.6667

Module 1262

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