CSC 180 midterm #2

21 November 2001

Last name:

First name(s):

Student number:

Circle tutorial section: 4:00, GB304 4:00, HA410

5:00, HA401 5:00, GB304

Aids permitted: One double-sided 8½x11" piece of paper, with any writing, but no attachments, no secret pockets, etc. **Calculators are not permitted.**

Answer *all* questions. Answer questions in the space provided.
Total: 40 marks.
Time allotted: 85 minutes (hopefully 4:30-5:55).

Note! Pay attention to whether the question asks for a complete program (with #include, for example) or only for a single function.

Note! Answers not in the correct space will not be graded unless a note in the correct space says "see page ..." and the answer on that page is clearly labelled with the question number.

Be careful not to get stuck on one question to the exclusion of others. Not everyone will necessarily be able to finish this test within the 85 minutes. The amount of marks or answer-space allotted does not necessarily indicate how long it will take you to complete the question, nor does the size of the answer-space indicate the size of the correct answer.

Do not open this booklet until you are instructed to.

Do not write anything in the following table:

	value	mark
1	7	
2	5	
3	10	
4	10	
5	8	
total	40	

1. [7 marks] The Towers of Hanoi solution takes a number of moves which is a function of n and can be defined recursively:

- $nmoves(1) = 1$
- For $n > 1$, $nmoves(n) = 1 + 2 * nmoves(n - 1)$

Use this recursive definition of *nmoves* to write a C function "nmoves" which takes one int parameter and returns an int which is the number of moves in the solution for n disks. You can assume that the parameter $n \geq 1$.

2. [5 marks] The following complete program gives the wrong answer for $\sqrt{2}$. "sqrt" is a function in the math library.

```
#include <stdio.h>

int main()
{
    double q = sqrt(2.0);
    printf("%g\n", q);
    return 0;
}
```

a) Why does it give the wrong answer?

(continued)

2, continued

b) If compiled with `gcc -Wall`, what error (warning) message would the compiler give? (Obviously, an exact answer is not required here; what you need to do is specify the approximate complaint it would make.)

3. [10 marks] Write a function called ‘‘maxarray’’ which takes two parameters, indicating an array of ints and its size, and returns the maximum (largest) int in the array.

4. [10 marks] The following function exchanges the first and last characters of a string of length 5 (not counting the \0). (Working only with strings of length 5 is a serious limitation, obviously.)

```
void reverse5part(char *s)
{
    char t = s[4];
    s[4] = s[0];
    s[0] = t;
}
```

Thus the following sequence:

```
char s[10];
strcpy(s, "squid");
reverse5part(s);
printf("%s\n", s);
```

will output "dquis".

Write a function "reverse" which takes any length string and reverses it completely.
For example, reversing "squid" will yield "diuqs", and reversing "supercalifragilisticexpialidocious" will yield "suoicodilaipxecitsiligarfilacrepus".
Your function takes only one parameter, just like reverse5part above.

You can find the length of the string with *strlen*, which is a library function which takes a string argument and returns an integer which is the length of the string (not including the \0). For example, strlen("squid") returns 5 and strlen("supercalifragilisticexpialidocious") returns 34.

5. [8 marks] Write a complete program which opens a file named ‘‘essay’’, reads all the lines of the file with fgets(), and displays the count of the number of lines in the file.

If the fopen() fails, you must call perror() to print an appropriate error message.

You can assume that no line in the file is longer than 123 characters (not including the \n at the end of the line).

The three parameters to fgets are, in order: space for the string (i.e. a pointer to the zeroth element of a char array), the size of the string space (including the \n and \0, i.e. the actual size of the array), and the FILE pointer.

Extra space if needed
(you must write ‘‘see page 6’’ in the usual answer space for the given question)