CS360 Midterm Exam - March 23, 2011 - Jim Plank

Answer all questions. Don't write answers on this exam, please.

**Question 1**

Write the jassem assembler for the following two procedures:

<table>
<thead>
<tr>
<th>int y(int **a)</th>
<th>char *read10()</th>
</tr>
</thead>
<tbody>
<tr>
<td>{</td>
<td></td>
</tr>
<tr>
<td>return a[0][1];</td>
<td>char *s;</td>
</tr>
<tr>
<td>}</td>
<td>s = (char *) malloc(10);</td>
</tr>
<tr>
<td></td>
<td>read(0, s, 10);</td>
</tr>
<tr>
<td></td>
<td>return s;</td>
</tr>
</tbody>
</table>

**Question 2**

The program q2.c is to the left.

The program `q2.c` is to the left.

Suppose we run this program as follows:

UNIX> q2 "Bombs Away"

The initial value of the frame pointer, when `main()` is first executed, is `0xffff4840`. The value of `argv` is `0xffff4860` and the value of `argv[1]` is `0xffff487c`. What I want you to do is to tell me the identity and value of every word on the stack that you can identify. If you know the identity, but not the value, state just the identity. You should include values that are above and below the current stack pointer.

**Question 3**

Explain buffering in the C Standard I/O library: How is buffering implemented? Why is buffering implemented? Give an example of a program where buffering helps. Give an example of a program where buffering doesn't really help.

**Question 4**

Write a program `findjim.c` that prints the relative pathname of all files reachable from the current directory that contain the substring "jim". Your program should only use one open file descriptor at a time.
Question 5

Behold the program `q5.c`:

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <fcntl.h>

main(int argc, char **argv)
{
    int p, u, f, m;
    
    if (argc != 4) {
        fprintf(stderr, "usage: q4 p m u\n");
        exit(1);
    }
    
    p = O_WRONLY;
    if (strchr(argv[1], 'a') != NULL) p |= O_APPEND;
    if (strchr(argv[1], 'c') != NULL) p |= O_CREAT;
    if (strchr(argv[1], 't') != NULL) p |= O_TRUNC;
    if (strchr(argv[1], 'x') != NULL) p |= O_EXCL;
    
    sscanf(argv[2], "%o", &m);
    if (sscanf(argv[3], "%o", &u) == 1) umask(u);
    
    f = open("f1.txt", p, m);
    write(f, "XXX\n", 4);
    close(f);
    system("ls -l f1.txt");
    chmod("f1.txt", 0644);
    system("cat f1.txt");
    exit(0);
}
```

I am going to give you twelve scenarios in which you execute two commands from the command line. The first does "`ls -l f1.txt`". The second calls `q5` with a variety of command line arguments. Your job is to tell me the output of the `q5` call. Don't bother differentiating standard output and standard error and don't worry about the dates in the files. Just to be clear, `ls -l` prints:

```
mode number-of-links owner-username owner-groupname size modification-date filename
```

If the program has a segmentation violation, let me know that. In all cases, if the file `f1.txt` exists, it contains the seven bytes: "Shaft!\n". For this problem, your username is `plank`, and your group name is `staff`.

The scenarios are on the answer sheet -- put your answers there.