CS 4061, Spring 2001, Exam 2

Name:______________________ **ID#__________________________**

Question 1. Processes and Process Control (20 pts.)

Given the following pair of terms, explain the differences between the items to which these terms refer and explain why both are needed on the system:

A. Process ID (`pid`) and User ID (`uid`).

B. Process Group ID (`pgid`) and Group ID (`gid`).

C. Process Group ID (`pgid`) and Session ID (`sid`).

Question 2. Files and Abstraction. (20 pts.)

A. When we use the POSIX `open` function (system call) to create a new file, we can specify the access permission mode for the file. When we use the ANSI C `fopen` function to create a file, however, there is no way to specify this. Why?

The POSIX `close` function (system call) and the ANSI C `fclose` function seem to be doing approximately the same things.

B. Would it be possible to safely implement `fclose` using `close` (that is, by having `fclose` call `close`)? Explain your answer.

C. Would it be possible to safely implement `close` using `fclose` (that is, by having `close` call `fclose`)? Explain your answer.

Question 3. Advanced File Permissions. (20 pts.)

My wife and I want to share an email box on the ITLabs computers, so that we are both able to read email sent to the same address (mine, `hougen@itlabs.umn.edu`). We don't want to have two copies of the same email, we want to share a single copy. We each have our own account on the ITLabs machines, so one way to do this would be to have the ITLabs set up a special group for just the two of us, then make my email box readable and writable by this group. However, the ITLabs admin refuses to set up a special group for just us two. How can we do what we want anyway, using some combination of file permissions, possibly including User ID, Group ID, Effective User ID, Effective Group ID, or others, for our email box and mail program? Be sure that your method only lets the two of us read the email in this box; we don't want to allow access to others! Also, be sure that your method only has us sharing email; we want to have the rest of our accounts separate. (You don't need to write the code but you do need to explain the step the code would take and give all of the permissions of all files involved.)

Question 4. Atomic Operations. (20 pts.)

Do the following operations need to be atomic? For each, explain why or why not.

A. `open` with the `O_CREAT` flag set.

B. `open` without the `O_CREAT` flag set.

C. `fcntl` with the `F_SETLK` command.

D. `fcntl` with the `F_SETLKW` command.

Question 5. Directories. (20 pts.)

A. For most file types, POSIX treats them simply as a sequence of bytes and allows the application program to interpret those bytes in any way that the application programmer specifies. Since directories are themselves files, why doesn't POSIX just treat them as a sequence of bytes and let the application programs deal with directory files in any way that the application programmer specifies?

B. Directories in POSIX contain files names and i-node numbers and the i-nodes contain the actual information about each file. We could, instead, move the i-node information into the directories themselves and get rid of i-nodes. List and explain one advantage and one disadvantage of this alternate method over the method used in POSIX.