

Student Name: _____ Student ID #: _____

UOSA Statement of Academic Integrity

On my honor I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.

Signature: _____ Date: _____

Question 1: Resource Management and Privileges (30 points)

There are two types of privileges present in many operating systems. One is the privilege type relating to system calls and “normal” function calls. Let us call this *call privilege type*. The other is the privilege type relating to system administrators and “normal” users. Let us call this *user privilege type*.

A. **Explain** why many operating systems have different privilege levels for call privilege type. That is, **explain** why many operating systems have different privilege levels for system calls than they do for “normal” function calls.

B. **Explain** why many operating systems have different privilege levels for user privilege type. That is, **explain** why many operating systems have different privilege levels for system administrators than they do for “normal” users.

C. **Explain** the relationship between call privilege type and user privilege type. That is, **explain** whether code run by the system administrator will ever run with the same privileges as system calls or the same privileges as “normal” function calls and whether code run by “normal” users will ever run with the same privileges as system calls or the same privileges as “normal” function calls.

Question 2: I/O (20 points)

Grant is given an existing program to upgrade. In the source code he finds that it uses I/O functions from the ANSI C Standard I/O library, rather than POSIX system calls. He has heard that buffer overflow problems can compromise security and knows that all ANSI C Standard I/O library functions use shared I/O buffers, so he is concerned that the program, as currently written, may be insecure. To address this concern, Grant proposes to replace all of the calls to these functions in the code with POSIX systems calls.

A. **Explain** whether Grant's concern is well founded.

B. **Explain** whether Grant's proposed solution is reasonable.

Question 3: Directories (20 points)

A. **Explain** what a “hard link” is.

B. **Explain** the purpose of the `link count` field in the i-node.

Question 4: Files, Directories, & Atomic Operations (30 points)

Give three system calls related to files and/or directories that require at least some of their steps to be carried out atomically. **Explain** what the steps are that need to be carried out atomically and **why** those steps need to be carried out atomically.

A. System Call One

B. System Call Two

C. System Call Three