CS 4760	**Operating Systems**	Test 3
Name:	Fall 2003	Max Pts: 47

Important: This is an open book test. You can use any books, notes, or paper. *Do not log into the computer, or use any communications device during the test.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [4 pt] What is the difference between a bus error and a segmentation fault in Unix?

2. [8 pt] I just bought a disk of 60GB capacity for my Unix box and decided to attach it to my system as a single partition. Each block in the disk is of size 1K bytes. Let us say that I have a boot block of size 1 block. Consider 1 block to be allocated for super block. Let each inode require 1024 bytes. What can be the maximum formatted capacity of the disk? What is the maximum file size that can be stored on this disk if the system uses 12 direct blocks, 1 single indirect block, 1 double indirect block, and 1 triple indirect block? Assume that the system is a 32-bit machine. What would happen if the system is a 16-bit machine?

3. [10 pt] In a virtual memory system, 1 in 90 references (on average) causes a page fault. When the page fault is to be serviced, 1 in 9 pages have their dirty bit set. Let the average seek time for the disk be 11 milliseconds. The disk rotates at 7200 rpm. The average wait time in device queue is 5 milliseconds. Each block is 2K and there are 128 blocks per track. Let the memory access time be 100 nanoseconds when there is no page fault. Compute the average memory access time in this system.

4. [5 pt] Swap area in the system is based on virtual file system. That is, the kernel accesses the pages directly without going through the file system calls. `mmap` on the other hand accesses the files though the file system calls. Do you think one of them will be more efficient than the other? Which one?

5. [2 pt] I have read permission for a given directory on my Unix box. However, when I try to `cd` into the directory, I get a message `Permission denied`. What could be wrong?

6. [18 pt] If FIFO page replacement is used with 4 page frames, how many page faults will occur with the reference string

0 4 2 3 5 1 5 0 1 4 6 2 8 4 2 0 8 3 1

if the frames are initially empty. Now repeat this problem for OPT, LRU, LFU, and second chance algorithm. How will it perform with a window size of 5 under the working-set algorithm (assume unlimited number of frames available for working set algorithm but working set window size is 5)?