CS 4760	**Operating Systems**	Test 3
Name:	Fall 2009	Max Pts: 52

Important: This is an open book test. You can use any books, notes, or paper but no electronic device. *Do not log into the computer during the test, or use any electronic or communications device. Switch off your cell phones*. Any calculations and rough work can be done on the back side of the test pages. If there is a syntax error in any program segment, just write it down and you will get full credit for the problem. You will lose five points for not writing your name.

1. [6 pt] Briefly describe a segmentation fault and a bus error. What is the underlying cause for each of them?

2. [6 pt] We have a machine that executes the following instruction as a single machine language atomic instruction.

   ```
   *a = *b + *c;
   ```

   `a`, `b`, and `c` are pointers to long words. On this machine, we have three processes of size 4KB, 10KB, and 60KB. Assume a block size of 1K and assume that our memory allocator is based on proportional allocation scheme. Total memory available is 32KB. Show the allocation of memory to each of the three processes.

3. [6 pt] What is a journaling file system? What is the advantage of journaling?

4. [6 pt] Consider a machine with disk blocks of 1K bytes. We just bought a new disk for this system with a capacity of 320GB. What is the maximum file size possible using the UFS scheme of 12 direct blocks, 1 single indirect block, 1 double indirect block, and 1 triple indirect block in the inode table?

5. [10 pt] A machine has memory access time of 100ns. On an average, 1 access in 13000 causes a page fault. The secondary storage attached to the system is a disk, with an average seek time – across requests – of 11ms and an average latency of 7ms. The transfer time per sector, including overheads, is 1ms. On an average, 1 in 6 frames in memory has its dirty bit set. Compute the effective memory access time for this system. Express the degradation in performance as a percentage.

6. [18 pt] Consider a disk with 256 cylinders, indexed from 0 to 255, with 0 being the innermost and 255 being the outermost cylinder. The system receives disk requests on the following tracks in the specified order

   243, 12, 83, 41, 50, 30, 143, 84, 32, 48, 8

   The head is currently on cylinder 249, and is moving towards outer cylinder. Give the total number of tracks traversed for the given requests using each of the following algorithms.

   (a) FCFS scheduling

   (b) SSTF scheduling

   (c) SCAN scheduling

   (d) C-SCAN scheduling, servicing requests as head moves outwards

   (e) LOOK scheduling

   (f) C-LOOK scheduling, servicing requests as head moves outwards