CS 4760	**Operating Systems**	Test 3
Name:	Spring 2010	Max Pts: 50

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+6 pt] Suppose the page table for the process currently executing on the processor looks like the following. All numbers are decimal, everything is numbered starting from zero, and all addresses are memory byte addresses. The page size is 1024 bytes.

Virtual page #	Valid bit	Reference bit	Dirty bit	Page frame #
0	1	1	0	4
1	1	1	1	7
2	0	0	0	1
3	1	0	0	2
4	0	0	0	9
5	1	0	1	0

   (a) Describe exactly how, in general, a virtual address generated by the CPU is translated into a physical main memory address.

   (b) What physical address, if any, would each of the following virtual addresses correspond to? (Do not try to handle page faults, if any).

      i. 1052

      ii. 2221

      iii. 5499

2. [10+4pt] Consider a disk with c cylinders, h heads per cylinder, s sectors per track and a sector length l. A logical file L with fixed record length r is stored contiguously on this disk starting at location (c_L, h_L, s_L), where c_L, h_L, and s_L are the cylinder, head, and sector numbers, respectively.

   (a) Derive a formula to calculate the disk address (i.e., cylinder, head, sector) of a given logical record n, assuming that $r \leq l$.

   (b) How many seek operations are necessary to read an entire file of m logical records?

3. [6 pt] We know that Windows does not rely on files being contiguous on disk. Yet, we have automatic schedules to run `dfrag`. What is the purpose of `dfrag`ing when the OS does not require files to be contiguous?

4. [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

   27, 129, 110, 186, 147, 41, 10, 64, 120

   The head is currently on cylinder 100, and is moving towards inner 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