| CS 4760 | **Operating Systems** | Test 3 |
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| Name: | Fall 2007 | Max Pts: 61 |

**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] Describe the properties of code that can be shared by multiple processes.

2. [6 pt] You can manage free space on disk by linking the free blocks one after the other, or by grouping, or by counting. Compare the three giving the advantages and disadvantages of each technique.

3. [15 pt] If FIFO page replacement is used with 5 page frames, how many page faults will occur with the reference string

2 9 8 3 7 1 5 4 2 8 1 5 9 6 0 3 1 5 7 9

if the frames are initially empty. Now repeat this problem for OPT, LRU and LFU algorithms. 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)?

4. [6 pt] I just bought a disk that runs at 7200 RPM. There are 256 sectors per track. The disk has 1024 cylinders and the head moves from one track to next in 0.02ms. What is its average latency?

5. [10pt] A machine has a memory of 64 frames, with each frame being 1K bytes. Current free-frame list is: 0x1C, 0x2C, 0x12, 0x01, 0x2D, 0x38, 0x3F, 0x35, 0x39, 0x26, 0x00, and 0x1B. You just scheduled a process that requires 8 frames. Show the resulting page table. Show the translation of logical address 0x0593 and 0x072E into physical addresses using your page table.

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

64 77 88 209 114 193 03 29 118 155 45

The head is currently on cylinder 117, and is moving towards outer cylinder. The head requires a total of 128ms to move from innermost to outermost track. Give the time required to service 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