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| CS 376 | **Operating Systems** | Test 3 |
| Name: | Fall 1999 | Max Pts: 38 |

**Important**: This is an open book test. You can use any books, notes, or paper. *Do not log into the computer during the test.* Any calculations and rough work can be done on the back side of the test pages.

1. [5 pt] Sketch the organization of a Unix disk partition. Is there a section in the partition that is unnecessary?

2. [15 pt] If FIFO page replacement is used with 3 page frames, how many page faults will occur with the reference string

$$2\ 6\ 5\ 5\ 2\ 1\ 4\ 1\ 9\ 2\ 2\ 8\ 4\ 9\ 1\ 2\ 2\ 3\ 3\ 2$$

if the frames are initially empty. Now repeat this problem for OPT, LRU and second chance algorithm. How will it perform with a window size of 6 under the working-set algorithm?

3. [18 pt] Disk requests come in to the disk driver for cylinders 178, 119, 19, 194, 192, 48, 163, 151, 3, 8, and 83 in that order. A seek takes 8 msec per cylinder moved. The arm is currently at cylinder 194. The cylinders are numbered from 0 to 199. How much seek time is needed for

(a) FCFS scheduling

(b) SSTF scheduling

(c) Elevator algorithm (initially moving away from cylinder 0)

(d) C-SCAN scheduling (initially moving away from cylinder 0) satisfying requests as the head moves away from cylinder 0

(e) LOOK scheduling (initially moving towards cylinder 0)

(f) C-LOOK scheduling (initially moving towards cylinder 0) satisfying requests as the head moves away from cylinder 0