Subject: CS162, 2001
CS162, Fall, 2001
Midterm 2, November 7, 2001 (Note this is a closed book and closed notes examination)

1. Please show an implementation for P(S) and V(S), written as a monitor. (Such an implementation was shown in the Hoare article in the assigned readings. Please write something similar.) You may continue the answer on the back of the page. (14)

2. Assume a disk of 500 cylinders (numbered 0 to 449), the head currently at cylinder 50, having most recently read blocks at cylinders 40 and 50, and requests pending, in a queue in the following order, to read one block each from the following cylinders:

   85 123 48 275 15 480 306 22 5

   For each of the following disk arm scheduling algorithms, please give the sequence in which the blocks are read, and the total number of cylinders that the head moves. (Partial credit will be given only for obvious and trivial errors.) (12)

   FIFO, SSTF, SCAN, CSCAN

3. Define a "stack algorithm." For each of OPT, FIFO and LRU, prove which is or is not a stack algorithm. (14)

4. Describe and explain ALL of the complications and issues that arise if we are doing I/O in a computer system in which virtual memory is used.(12)

5. Given a standard Unix file system, such as was discussed in class, how many reads must be made to read all of a 64 Kbyte (65536 byte) file residing in /usr/home/cs162-aa/homework.txt? Assume a 1024 byte disk block, that only one block can be read at a time, that there are no symbolic links, and that all directories are their minimum size. Please explain your answer. Include ALL reads. Assume no blocks in the disk cache. Assume that each read only gets on "thing" at a time. (12)

6. For the following page reference string, please compute the number of pages faults when using FIFO, LRU, and OPT replacement, and for memory sizes of 3 and 4 page frames, and enter the results in the table. (18)

   8 7 6 5 8 7 9 8 7 6 5 9

	3	4
OPT		
LRU		
FIFO		

7. Please select an answer and enter in the indicated space. (No credit left if blank.) (18)
    i. Which of these is a reasonable rotational speed for a magnetic disk?
        a) 100000 rpm
        b) 10000 rps
        c) 7200 rpm
        d) 25000 rpm
        e) 3600 rps
    ii. Which of these is a reasonable price for a (cheap) 50 GB disk at today's prices?
        a) 500
        b) 1000
        c) 3000
        d) 10
        e) 30
        f) 150
    iii. Which of these is a reasonable media data rate for a modern high end magnetic disk?
        a) 50 MB/sec
        b) 500 MB/sec
        c) 500 KB/sec
        d) 3MB/sec
        e) 10MB/sec
    iv. Which of these would be a typical power consumption for a disk in a desktop computer?
        a) 1000W
        b) 10 KW
        c) 100 KW
        d) 1W
        e) 10W
        f) 100W
    v. Which of these is a typical claimed (advertised) MTBF for a modern disk?
        a) 5 years
        b) 100 years
        c) 1000 hours
        d) 80000 hours
        e) 300000 hours
    vi. What is the approximate areal bit density of a standard 9-track tape, using the highest density(bpsi = bits per square inch)?
        a) 100,000,000
        b) 1,000,000,000
        c) 100,000
        d) 1,000,000
        e) 10,000,000

vii. A typical average seek time for a modern disk would be?
   a) 500 ms
   b) 1 second
   c) 5 microseconds
   d) 500 microseconds
   e) 5 ms
   f) 50 ms

viii. The standard block or sector size on a modern disk is:
   a) 2048 B
   b) 4096 B
   c) 16384 B
   d) 64 B
   e) 128 B
   f) 256 B
   g) 512 B
   h) 1024 B

ix. The approximate areal bit density of the highest capacity IBM Microdrive is approximately: (mb = megabits, si = square inch)
   a) 15 mb/si
   b) 150 mb/si
   c) 1500 mb/si
   d) 15000 mb/si
   e) 0.5mb/si
   f) 1.5mb/si

---

solutions to the last problem:

c, f, d, e, e, c , e, g, o.