Name: _____

| CS 4/53201 | **Final Exam** | **Operating Systems** |

Wednesday 13 December 2000

1. At the beginning of the semester, I talked about how the operating system hides many of the details of the underlying hardware from the user.

    a. The operating system makes use of (and can inspire) features of the CPU architecture. Briefly describe <u>two</u> specific features that a CPU architecture can provide, and explain how the operating system takes advantage of those features. (10 points)

    b. The operating system can also hide limitations of the underlying hardware. Give <u>one</u> example of a limitation that is built into a machine, and how the operating system makes the user unaware that the limitation exists. (5 points)

2. One of the most important concepts examined in this class is the process.

    a. Draw the five-state process model, and clearly label all states and transitions (a detailed explanation is not needed, just simple labels). (15 points)

b. Explain the "blocked" state — what it means for a process to be blocked, why it would be blocked, and how it would get unblocked. (10 points)

3. One of the algorithms that can be used for memory management, partitioning in particular, is Best Fit.

a. Briefly explain this algorithm. (10 points)

b. Explain why this algorithm may not be the best choice for memory management. (5 points)

4. A central component of any file system is the file descriptor (which is called the "inode" in UNIX).

a. Circle those items in the following list that are typically stored in the file descriptor: (12 points)

file name   access permission   file owner

file size   read/write position in file   pointer to blocks on disk

b. Where are the inodes stored in UNIX? Be specific. (Hint: memory, disk) (8 points)

c. How does a UNIX inode point to the disk blocks where the corresponding file is stored? Don't worry about specific numbers, but describe enough of the concept to convince me that you understand it.. (10 points)

5. Suppose a given disk has 200 tracks, numbered 0 to 199. The head has just finished accessing track 125, and is now accessing track 143. The queue of requests, in FIFO order is as follows (86 appeared first): 86, 147, 91, 177, 94, 150, 102, 175, 130.

a. List *all* the head movements needed to satisfy the requests, using *FCFS* disk head scheduling. (5 points)

b. List *all* the head movements needed to satisfy the requests, using *SSTF* disk head scheduling. (5 points)

c. List *all* the head movements needed to satisfy the requests, using *LOOK* disk head scheduling. (5 points)

6. TCP is a popular protocol used on the internet at the transport layer.

    a. What are the responsibilities of the transport layer / TCP? (10 points)

    b. How can TCP be said to be "reliable"? (5 points)

7. Define and distinguish between these three concepts: SIMD, MIMD, distributed system. (15 points)

8. Sun's NFS supports mounting of remote file systems by client machines.

    a. Draw and explain a diagram illustrating this. (15 points)

    b. What information must the client OS maintain? (5 points)