CPS 536: Final Exam **Name:**_____

Instructor: Dr. Clark May 1, 1996

This test is closed book and closed notes. You may use a calculator. Answer the questions in the space provided. When answering questions, please state any and all assumptions you are making.

Part 1 (35 points)

1. What is the difference between a process and a thread?

2. In several of the later NACHOS projects we needed to use synchronization primitives to control access to critical sections of the code we developed within the operating system. **Describe 2 such critical sections** and discuss which synchronization primitive(s) were used.

Part 2 (30 points)

Compare the use of the Least Recently Used (LRU) page replacement algorithm for a virtual memory system to the LRU replacement algorithm in a file system cache. Consider both the optimality of LRU for choosing replacement victims and the cost of implementing LRU. Also discuss whether or not LRU is used in real operating systems.

Part 3 (35 points)

1. How do caches help improve file system performance?

2. Your boss just gave you 32MB of memory that won't be used for virtual memory. Your boss says you should use the memory to "make file I/O faster". You have two choices for how to use the memory: 1) you can implement filesystem caching or 2) you can implement a virtual disk.

   How do you decide which one to use? Describe a scenario when you would choose option (1) then another for choosing (2).

Part 4 (40 points)

Compare the *linked allocation* and *indexed allocation* techniques for file allocation in a disk file system. Be sure to include at least the following points in your discussion:

- directory structure
- data structure overhead
- the cost to access/search the file
- the cost to append data to the file

Part 5 (30 points)

1. What is the purpose of a disk scheduling algorithm (e.g. SSTF, SCAN)?

2. Why do we choose **not** to implement disk scheduling in many modern operating systems?

Part 6 (30 points)

1. Why might Remote Procedure Calls (RPC) be preferred for inter-process communication over other mechanisms like sockets or pipes?

2. What are some drawbacks to using RPC that limit its use?