Name: _____

CS 6/73201 **Exam #2** **Advanced OS**

Wednesday 15 March 2000

1. Draw a diagram showing the 4 states that a Nachos thread can be in, with labels and a brief explanation of the allowable transitions between states. (15 points)

2. Consider the distinction between semaphores, locks, and condition variables. (5 points each = 15 points)

   a. Is it possible to use locks <u>without</u> condition variables? Explain.

   b. Is it possible to use condition variables <u>without</u> locks? Explain.

   c. Is it possible to use semaphores <u>with</u> locks? Explain.

Name: _____

3. Explain how each of the following two algorithms for synchronizing physical clocks accounts for network delay during the course of the algorithm. (Note that I am not asking you to summarize each algorithm for me, only how they account for network delay.) (20 points)

   a. Christian's algorithm

   b. The Berkeley algorithm

4. With Lamport's logical clocks, it would be desirable to be able to compare two timestamps, and if the timestamp on event A is less than the timestamp on event B, declare that A happened before B. Unfortunately, this is not the case. Explain why it is not, perhaps by drawing and explaining an example. (15 points)

Name: _____

5. A variety of algorithms have been designed to provide mutual exclusion in a distributed environment. For each of the following algorithms, how does a thread know when it can enter the critical section? (Don't explain the entire algorithm, just this part.) (5 points each = 20 points)

   a. Central coordinator algorithm

   b. Lamport's algorithm

   c. Ricart and Agrawala's algorithm

   d. Suzuki and Kasimi's broadcast algorithm

6. Suzuki and Kasimi's broadcast algorithm uses two vectors, LN and RN. Briefly explain what each of these vectors represents, and how it is updated. (15 points)