Midterm #2
Fall 2000 15-712

Please write your name on the following line:

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This midterm is open book and open notes.

You should write brief, precise, and legible answers. Rambling brain-dump answers may be punished twice — you run out of time writing them and we run out of patience reading them. :–)

There are eight questions but we will only grade six. (We will also look at the two bonus questions, but those questions do not count towards the six you need to complete.) List the six questions we should grade:

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Name: ______________________________

1. Lamport gives an approach to defining a total order on events in a distributed system. Explain briefly how this total ordering could be agreed upon by all nodes in the system in the face of Byzantine failures.

Name: ____________________________________

2. A "barrier" in parallel programming is a synchronization point at which each thread waits until all threads have reached it. Explain how one could implement barrier synchronization in a distributed parallel program.

Name: ______________________________

3. When using locks, it's often possible to get into deadlock conditions. Explain how transactions can be used to detect and break deadlocks.

Name: ___________________________________

4. Many security researchers have assumed that criminals would focus their attacks on cryptanalysis. List at least 2 reasons why this is rarely true, explain their significance, and give an example that illustrates each.

Name: ______________________________

5. The X Window System uses something like Hauser's serializer thread to handle graphics commands from clients of the X server. These commands are essentially RPCs to the X server. The single server thread handles requests in a FIFO order. Given that different client threads may have different priorities (and CPU scheduling levels), explain what problem this could cause. How could it be fixed?

Name: ____________________________________

6. Consider a collection of distributed clients accessing records on a central server using optimistic concurrency control to ensure serializability. Occasionally, a client could resort to traditional locking during a transaction. What circumstance might cause this to happen?

Name: ____________________________________

7. With authenticated messages, Byzantine consensus is possible with any number of faulty nodes. Argue informally why this is true.

Name: ____________________________________

8. Streaming audio or video services are usually implemented over UDP instead of TCP. Assuming that both impose roughly the same computational burden on the processor, explain why this the case?

Name: ______________________________

- (Bonus, 1 point) Identify a typo in a math expression in the paper "Time, Clocks, and the Ordering of Events in a Distributed System." The typo we spotted is not in the appendix. (We're not cruel.)

Name: ____________________________________

- (Bonus, 1 point) What is this cute baby's name?