CSE 452/M552
Problem Set #2
Due: 5pm, Tuesday, June 4, 2013

1. What is the maximum number of unique values that can be proposed to a group of k paxos acceptors? Briefly explain.

2. In Paxos, suppose that the acceptors are *A*, *B*, and *C*. *A* and *B* are also proposers, and there is a distinguished learner *L*. According to the Paxos paper, a value is chosen when a majority of acceptors accept it, and only a single value is chosen. How does Paxos ensure that the following sequence of events *cannot* happen? What actually happens, and which value is ultimately chosen?

   a) A proposes sequence number 1, and gets responses from *A*, *B*, and *C*.
   b) A sends accept(1, "foo") messages to *A* and *C* and gets responses from both. Because a majority accepted, *A* tells *L* that "foo" has been chosen. However, *A* crashes before sending an accept to *B*.
   c) B proposes sequence number 2, and gets responses from *B* and *C*.
   d) B sends accept(2, "bar") messages to *B* and *C* and gets responses from both, so *B* tells *L* that "bar" has been chosen.

3. Consider the following systems: Bayou, Facebook, Shark, Chubby, GFS, BigTable, Spanner, Dynamo, and BitTorrent. For each of the following, find one example of that feature in one of the systems, and sketch its role in the system. Note: 1-3 sentences are sufficient for each example, but use each system as an example at most once.

   a) RPC
   b) Caching
   c) Eventual consistency
   d) Serializability
   e) Logging
   f) State machine replication
   g) Failure recovery
   h) Hint

(A “hint” is the result of a computation that may no longer be valid, but where the validity can be easily detected on use. For examples, see the Lampson paper on the website.)