HOMEWORK 6 - LEONARDO SERILLI

1. Summarize in a few lines what is the principle about "State Machine Replication" (document yourself elsewhere)

STATE MACHINE REPLICATION IS AN APPROACH TO ENANCHE FAULT TOLERANCE IN DISTRIBUTED SYSTEMS. IT CONSIST OF REDUNTANT SERVICES TO AVOID THAT ONE FAIWRE PREVENTS THE EXECUTION OF THE SERVICE. IT RELIES ON TOTAL-ORDER BROADCAS: ALL REPLICAS MUST RECEIVE ALL REQUESTS AND IN THE SAME ORDER.

2. Exhibit a scenario of the ad-hoc Paxos algorithm summarized in the section 3, in order to show how it executes in case of no failure. In this version of Paxos, it is assumed that there is a coordinator, to which any proposer sends its proposition. Assuming the coordinator is the process with ID1. Let the process with ID2 be the proposer. Redo the same, this time by assuming two proposers concurrently propose a (different) value to the coordinator. More precisely, propose two scenarios: one where the second proposer proposes before any process has yet accepted any offer from the coordinator, and a second, where the second proposer value is proposed alas an acceptor has already entered phase2.

3. What if that PAXOS algorithm coordinator fails ? Assuming a leader election runs in the background and succeeds to elect a new and single coordinator, continue one of the scenario of question 2, so to exhibit how the consensus continues to execute. To make things interesting, assume the new coordinator will pick a c-rnd that is higher than the preceding c-rnd the former coordinator used.

4. In the conventional PAXOS, there is no coordinator. Given the rest of the proposition made by this research paper about using a ring to solve the consensus, and given the comparison the authors do with alternate Atomic Broadcast proposals, give a few arguments in favor of the choice they have made to consider that there is a dedicated process playing the role of a coordinator.

5. In this version of PAXOS (as in other classic versions) as in the hierarchical version we have studied in class, the key element is how to sort proposals. For this, the PAXOS assumes the highest ranked proposal is the one to keep. On the contrary, in our studied hierarchical algorithm, the lower the rank, the better the proposal conveyed by messages tagged with this rank has a chance to get the one adopted at the end. Give your personal understanding why there is this difference, and how it is the case that such a difference can exist in algorithm relying on lower rank values, whereas in traditional PAXOS, the higher the values, the best it is for them to be accepted.