EE 382N Practice Questions

1. Assume that you have implemented Mattern's vector clock algorithm. However some application needs Lamport's time stamps. Write a function *convert ()* that takes as input Mattern's time stamp and outputs Lamport's time stamps.

2. Let s.v be the vector clock for the local state s. Given n vectors, one from each state, one can form a matrix to represent the cross product of the local states which can be viewed as the global state. Give a suitable condition on the matrix for this global state to be consistent.

3. A vector clock designer has come up with the idea that instead of process P_i sending the entire vector to P_j every time, it should only send those components of the vector that are different from the last time it sent a message to P_j. What are the advantages and disadvantages of this scheme ?

4. To totally order all the events in a distributed system (preserving happened-before relation), one can use Lamport's logical clock with process id. Two events e and f are then ordered as

$$e < f \equiv (e.c < f.c) \vee ((e.c = f.c) \wedge (e.p < f.p))$$

   This ordering favors the small numbered processes when two events have the same value for Lamport's clock. Modify the scheme so that this unfairness is removed.

5. The mutual exclusion algorithm by Lamport requires that any request message be acknowledged. Under what conditions does a process not need to send an *acknowledgement* message for a *request* message?

6. The centralized WCP detection algorithm requires an application process to send its vectors whenever its local predicate becomes true for the first time since the most recent send or the beginning of the execution. Will the algorithm still work if every process sent Mattern's vector whenever its local predicate became true for the first time since the most recent *receive* or the beginning of the execution ? Justify your answer.

7. Show how you will modify the centralized algorithm for mutual exclusion so that requests are granted in the order (happened-before order) they are made.

8. Prove or disprove concurrent with is a transitive relation.