CS 550 HW#1

Name (please print)_____

Instructions:

- *Due date: 11:25AM on Tuesday, 02/15/11*
- *This is individual written assignment; any information outside the lecture notes and text book should be cited.*
- *Both hardcopy and softcopy are required (India students and remote students only need to submit softcopy). Please drop your hardcopy to TA's mailbox (2nd floor of computer science department), and submit the softcopy to "Digital Drop Box" on the Blackboard.*
- *Name your file as this rule: "LastName_FirstName_[HW or PA number]". E.g. "John_Doe_HW1". (HW for Written Assignment, PA for Programming Assignment).*
- *For all programming assignments and projects, please submit the hardcopy of your documentation only. You don't need to submit the hardcopy of your source code. In the meantime, please zip all files (source code, documentation and etc.) and submit it to BB.*
- *Late submission will be penalized at 10% per day.*

1.1. Q: An alternative definition for a distributed system is that of a collection of independent computers providing the view of being a *single system*, that is, it is completely hidden from users that there even multiple computers. Give an example where this view would come in very handy.

1.5. Q: Why is it sometimes so hard to hide the occurrence and recovery from failures in a distributed system?

1.8. Q: Describe precisely what is meant by a scalable system.

1.14. Q: We already gave some examples of distributed pervasive systems: home systems, electronic health-care systems, and sensor networks. Extend this list with more examples.

2.4. Q: Consider a chain of processes *P*1, *P*2, ..., *Pn* implementing a multitiered client-server architecture. Process *Pi* is client of process *Pi*+1, and *Pi* will return a reply to *Pi*-1 only after receiving a reply from *Pi*+1. What are the main problems with this organization when taking a look at the request-reply performance at process *P*1?

2.8. Q: Consider an unstructured overlay network in which each node randomly chooses *c* neighbors. If *P* and *Q* are both neighbors of *R*, what is the probability that they are also neighbors of each other?

2.9. Q: Consider again an unstructured overlay network in which every node randomly chooses *c* neighbors. To search for a file, a node floods a request to its neighbors and requests those to flood the request once more. How many nodes will be reached?

4.12. Q: Suppose that you could make use of only transient asynchronous communication primitives, including only an asynchronous receive primitive. How would you implement primitives for transient *synchronous* communication?

4.18. Q: Explain why transient synchronous communication has inherent scalability problems, and how these could be solved.

4.22. Q: How could you guarantee a minimum end-to-end delay when a collection of computers is organized in a (logical or physical) ring?