**Qualifying Exam: Network Architecture**
**Jan. 2012**
**Date:   Friday, 2012/1/6 (1 hour)**

Instruction:
- Put your name and student number on all your answer sheets.
- You have 60 minutes to complete the exam.
- **Show all your work.   Partial credit will be considered, if you show intermediate steps in obtaining the answer.**

Question #1 (20pt)   Why was packet switching chosen for internet applications such as file transfer rather than circuit switching? (10pt)   What kind of problems would you experience if you choose circuit switching for web applications? (10pt)

Question #2 (20pt)     The end to end principle of the Internet gives many advantages such as reduced complexity of core network, generality in the network, and reducing the temptation to implement more function than necessary at network layer etc., On the other hand, the end to end principle may have some drawback. What are the problems or drawbacks of the end to end principle of the Internet?

Question #3 (20pt)   The AIMD scheme of TCP protocol provides "fairness" among the multiple TCP flows. Can MIMD or AIAD also provide "fairness"?     Justify your answer.

Question #4 (20pt)   TCP Incast is a TCP throughput collapse that occurs when many storage servers send data to a client in cluster based storage systems of data center. In other words, N to 1 communication patterns causes packet drops at the packet buffer of Ethernet switch. Packet losses dramatically reduce the TCP throughput. How do you alleviate this problem modifying the RTO value of TCP?

Question #5 (20pt)   Structured P2P system such as DHT have structured pattern of overlay links. It provides guaranteed lookup and high scalability. But it is hard to support non-exact match search and complex intersection queries. Why is it hard? (15pt)   Suggest a solution that occurs to you if any. (5pt)