University of Rochester **Mobile Computing (CSC290e)**

Midterm Exam

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Read before beginning: Please write clearly. Illegible answers cannot be graded. Be sure to identify all of your answers in your blue book (e.g., 1a, 2b, etc). All questions are worth 10 points, numbers in parenthesis indicate relative point values. Answer all questions.

While I have tried to make the questions as unambiguous as possible, if you need to make any assumptions in order to continue, state these as clearly as possible as part of your answer. In the name of fairness, I would like to avoid answering questions during the exam.

1. **Distributed and Mobile Computing**: your responses should be around 2 lines of text:
   (a) (4) Name and briefly explain two advantages to distributed computing.
   (b) (3) Name and briefly explain one disadvantage in designing and building distributed computing systems.
   (c) (3) Mobile computing applications are also distributed applications. Name one more complication that mobility adds that is not typically present in distributed computing.

2. **Networking.**
   (a) What is the difference between a point to point TCP socket and a point to point UDP socket?
   (b) Why does video use UDP?
   (c) Why does FTP use TCP?
   (d) Give one reason why multicast on the mbone is closer to UDP than to TCP.

3. **Medium Multiplexing.**
   Figure 1 shows two different multiplexing schemes: FDM and TDM. For each scheme, identify which figure illustrates it, spell out the acronym, and briefly describe each scheme. *Briefly* means give the intuition about how multiple stations share the medium over time, describe a station's communication behavior through time.

4. **Medium Access Control.**
   Assume all stations are within range of all other stations (i.e., everyone can hear everyone else). One station wants to transmit and senses the carrier idle. Why can a collision still occur after the start of transmission? In class, we mentioned the hidden terminal problem as one reason not to use ethernet-like mechanisms such as CSMA-CD. When all stations can hear all others, does this the hidden terminal still exist and does this reasoning still hold? Briefly explain.

5. **Cellular Communication.**
   What are the main problems when transmitting data using wireless systems that were made for voice transmission?

6. **Ad hoc Networks.**
   In ad hoc networks, there is no infrastructure to support unicast routing. Similarly, there is no infrastructure to support a controlled broadcast (sending a messages to all connected hosts). Explain the problem of broadcast storms, and give one simple solution to help alleviate them. Remember, we talked about this issue when discussing the spreading of route requests in DSR.

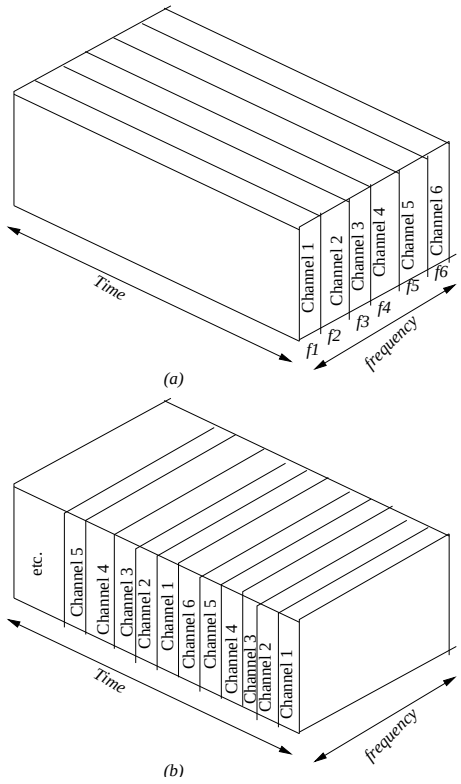

Figure 1: For question 3.

7. **Lime.**

   The code on the last page of this exam shows two LIME agents A0 and A1. All exception handling has been removed for readability, so you should assume that it will compile and there are no syntax errors. Assume you have two shells that you are typing in. What is the output of the programs if you start them with the following command lines (specify which shell has the output):

   - (shell 1) java lime.util.Launcher -load A0
     (wait a couple of seconds)
     (shell 2) java lime.util.Launcher -quit -load A1

   - (shell 1) java lime.util.Launcher -load A0
     (wait a couple of seconds)
     (shell 2) java lime.util.Launcher -port 1900 -load A1