ECE 750 Final Exam
Fall 2002

© 2002 University of Waterloo, Electrical and Computer Engineering

ECE 750 – Protocols, Software and Issues in Mobile Computing

Instructor: Sagar Naik

December 12, 2002, 9:45 AM—12:45 PM

Notes

- **You have THREE hours to complete the exam.**
- **This is a closed book exam. You may use a calculator.**
- **Continue your answers on the back of the facing page, if necessary.**
- **Answer all questions, and hand in all pages.**

GSM + Frequency Assignment	**/30**
GPRS + Bluetooth	**/30**
Ad hoc Networks	**/30**
Mobile TCP	**/30**
Environment Awareness	**/30**
Total	**/150**

Student signature **Student name** **Student number**

1. GSM + Frequency Assignment 30

a. [5] Explain the inter-BSC, intra-MSC handover process in the GSM system using typical signals and a message sequence chart. Explain the decision points and the resource allocation steps, if they exist.

b. [5] Explain the geometric dynamic channel assignment algorithm.

c. [10] Consider a wrapped-around cell grid of size 15 x 15 in a cellular network. Assume that there is a base station at the center of each cell. The reuse distance is 3*sqrt(3)*R, where R is the cell radius. The base stations share a pool of 72 carriers (frequencies), and you want to dynamically allocate frequencies to mobile hosts using the Geometric strategy. For optimal allocation, you have decided to divide the cells into 9 groups (equivalence classes).

1. [5] Compute the maximum reuse factor. That is, in how many cells can the same frequency be used at the same time?

2. [5] Assuming that mobile hosts generate calls in a random fashion, is it possible to achieve the maximum reuse factor? Justify your yes/no answer.

d. [10] Explain two ways, excluding the geometric dynamic channel assignment algorithm, of improving channel reuse in a cellular network.

1. GSM + Frequency Assignment

2. GPRS + Bluetooth 30

a. [5] What is the main objective of the GPRS network?

b. [10] Explain how the main objective of the GPRS network is realized using the GSM technology.

c. [15] Explain the *inquiry* protocol in Bluetooth.

2. GPRS + Bluetooth

3. Ad hoc networks 30

a. [10] Explain the *source routing* protocol for constructing an ad hoc network.

b. [20] Explain a routing protocol for ad hoc networks that uses position information. Discuss the limitations of the protocol.

3. Ad hoc networks

4. Wireless TCP 30

a. [5] Explain the main characteristics of the standard TCP.
b. [5] What are the problems an application may encounter if the standard TCP is used between two end-users with the Internet and a wireless link them?
c. [10] Explain the **I-TCP**.
d. [10] Explain the **snooping TCP**.

4. Wireless TCP

5. Environment Awareness 30

Assume that your have been hired by a major software development company located in Seattle with the responsibility of redesigning their operating system such that an application provides the "best" service to the user depending on the quantity of available resources on a modern-day laptop. Explain the necessary updates to be made to a standard OS, the need for any middleware, and the required structuring of application programs to take advantage of the new functionalities provided by the OS and the new middleware.

5. Environment Awareness