



FREIE UNIVERSITÄT BOZEN  
LIBERA UNIVERSITÀ DI BOLZANO  
FREE UNIVERSITY OF BOZEN · BOLZANO

Fakultät für Informatik

Facoltà di Scienze e tecnologie informatiche

Faculty of Computer Science

## MobileServices

Written Examination

July 1<sup>st</sup>, 2008

|                |  |           |  |
|----------------|--|-----------|--|
| FIRST NAME     |  | LAST NAME |  |
| STUDENT NUMBER |  | SIGNATURE |  |

### Instructions for students:

Write First Name, Last Name, Student Number and Signature where indicated. If not, the examination can not be marked.

Do not speak to any other student during the examination. If you speak to another student, your examination will be cancelled.

Use a pen, not a pencil.

Write neatly and clearly.

1. Enumerate the possible states of a MIDlet and write the two methods that when called by the application manager and the MIDlet will put the MIDlet in the “pause” state.
2. How a thread can obtain a lock on an object?
3. What is the difference between a ServerSocket and a Socket connection? What type of connection is opening this statement: `Connector.open("socket://:82");`?
4. In which format data are stored in a record of a RecordStore?
5. What is the difference between a *server* and *client* MessageConnection? When do you use a server and a client MessageConnection?
6. In which security/protection domain is placed a MIDlet when it is signed? How this domain is determined?
7. Make an example of sales force automation applications. List at least four functions of the system and explain the benefits for the clients and the service providers.
8. What are the main sources of error in GPS positioning? List at least four sources.
9. Explain how RFID technology could be used to implement a LocationProvider. Imagine a Hospital scenario, and assume that the user of the system has a mobile phone supporting J2Me. Explain where the RFID tags and the readers should be physically located, and explain the information flow (between the LocationProvider, the reader and the tag) occurring when a MIDlet will call the getLocation() methods of the LocationProvider.
10. Assume that you are using 4 symbols and you are using a bandwidth of 3MHz ( $3 \cdot 10^6$ Hz). Let further assume that there is no noise on the channel. What is the theoretical maximum data transfer available?
11. Considering the previous question and now assume that there is some noise in the channel with signal to noise ratio of 30dB. What is the maximum data transfer rate that can be achieved (use Shannon theorem)?
12. Why in the Shannon theorem the maximum data transfer rate does not depend on the number of symbols?
13. Explain the problem of exposed terminals. Draw a scenario where there are three terminals (A, B and C), B want to communicate with C and B is exposed to A. Draw a circle around a terminal to indicate the transmission range. Explain the consequence of B being exposed to A.
14. Imagine that three terminals (A, B, C) want to communicate with three peers (A', B', C') using CDMA (A with A', B with B' and C with C'). Write three 4-bits long

useful chip codes for enabling the communication of these three pairs if all of them are using the same frequency. Remember that chip codes are vectors with +1 or -1 entries. Explain what is the property that these three chip codes must have.

15. Explain how authentication is performed in GSM. Explain the role of the A3 and A8 algorithms.