



Exam in TSKS03 Wireless Systems

- Exam code:** TEN1
- Date:** 2013-05-31 **Time:** 8:00–12:00
- Place:** G37
- Teacher:** Mikael Olofsson, tel: 281343
- Visiting exam:** 9 and 11
- Administrator:** Carina Lindström, 013-284423, carina.e.lindstrom@liu.se
- Department:** ISY
- Allowed aids:** None
- Number of tasks:** 9
- Solutions:** Will be published within three days after the exam at <http://www.commsys.isy.liu.se/TSKS03>
- Result:** You get a message about your result via an automatic email from Ladok. Note that we cannot file your result if you are not registered on the course. That also means that you will not get an automated email about your result if you are not registered on the course.
- Exam return:** 2013-06-12 and 2013-08-19, 12.15–13.00, Mikael Olofssons office, Building B, top floor, corridor A between entrances 27–29. After that in the student office of Dept. of EE. (ISY), Building B, Corridor D, between Entrances 27–29, right next to Café Java.
- Important:** **Solutions and answers must be given in English.**

Grading: This exam consists of nine questions. Each question can give you 2, 4 or 6 points. Totally, you can get 36 points. Grade limits:

- Grade three: 16 points,
- Grade four: 22 points,
- Grade five: 28 points.

Sloppy solutions and solutions that are hard to read are subject to hard judgement, as are unreasonable answers.

- 1 WCDMA is the access method of third generation mobile telephony. This is an example of *DS-CDMA*. In this method all users use the whole available bandwidth at the same time. Explain how it is possible for a receiver to separate the users. (2p)
- 2 Explain what *bonding and pairing* means in Bluetooth. What is the purpose of bonding and pairing? (2p)
- 3 LTE supports both *MISO* and *MIMO* communication. Give two examples of benefits that can be achieved by those methods that cannot be achieved with ordinary *SISO* communication. Explain in principle why those benefits can be achieved. (2p)
- 4 The demands on synchronization are high for DS-CDMA. Consider an access system based on M-sequences. How would the communication be affected, and why, if the spreading sequence would be delayed in the receiver? How much is a small and a large delay in this situation? (4p)
- 5 Explain the origin of *frequency-selective fading* in radio transmission. (4p)
- 6 Most wireless standards allow for different error control alternatives. (4p)
 - a. Some standards include BCH codes and/or RS codes. How are BCH codes related to RS codes?
 - b. Some standards include concatenated codes. What is concatenation in this context.
- 7 Describe the near-far effect. What problem does that phenomenon cause, and how is it normally solved? (6p)

- 8 Discuss frequency reuse in mobile telephony. (6p)
- 9 Are the following claims true or false? You do not need to explain your answer. (6p)
- a. SNR is a subjective measure of distortion.
 - b. Kasami sequences are source codes.
 - c. Convolutional codes are error control codes.
 - d. In soft handover, a mobile may communicate through more than one base station.
 - e. MSK is a low-power modulation technique.
 - f. CRC codes are normally used for error detection.

For each of the claims above, a correct answer gives you +1 point, while an incorrect answer gives you -1 point. No answer give you 0 points for that claim. You cannot get less than 0 points totally from this task.