

Examination in TSKS03, Wireless Systems

Date:	Thursday, 2 June 2016
Room:	G36
Time:	8 - 12
Course code:	TSKS03
Exam code:	TEN1
Course name:	Wireless Systems
Department:	ISY
Number of questions:	9
Number of pages:	2 (including this page)
Responsible teacher:	Jerzy Dąbrowski
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Visiting the exam room:	9:30
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Allowed aid:	English dictionary
Instructions:	Answers should be given in English. Max. score 36p. Minimum to pass: 16p.
Solutions:	Posted on the course webpage http://www.commsys.isy.liu.se/TSKS03
Results:	Posted through LADOK by 16 June 2016
Display:	Time and place will be announced with the results

Exam in TSEK03 Wireless Systems, 2016-06-02

1. Consider an ideal radio communication channel.
 - a) Derive a formula for signal loss assuming an isotropic antenna model. Recall that the effective antenna area $A_e = \lambda^2/4\pi$ where λ is the carrier wavelength. (2p)
 - b) How can we estimate the received signal power for non-isotropic antennas that is a more realistic case? (2p)
2.
 - a) What is the coherence bandwidth and how does it limit the symbol rate of a wireless system. (2p)
 - b) What is the coherence time and how does it limit the symbol rate of a wireless system? (2p)
3.
 - a) What is the spectrum spreading and how can this technique be implemented? (2p)
 - b) In what way is a system with direct sequence spectrum spreading less sensitive to multipath propagation effects. (2p)
4.
 - a) What is the equalization technique that is exploited in wireless systems? (2p)
 - b) What is the power-delay profile and how it can be used to decide the need for equalization in a system? (2p)
5. SNR of a received signal in CDMA systems mostly depends on the mutual interference caused by the active users. Show that SNR can be improved by reducing the number of users rather than by increasing power of their transmitters. (4p)
6.
 - a) Plot a block diagram illustrating operation of the QPSK modulator. (2p)
 - b) What change is necessary to make it a 16-QAM modulator? (2p)
7. To protect transport blocks UMTS uses CRC codes and interleaving. Explain how these techniques work. (4p)
8. What is hand-off and how does it work in WCDMA/UMTS systems? (4p)
9.
 - a) What is the VDL-(M2) system and what is its application? (1p)
 - b) What access and duplexing methods are used by the system? (1p)
 - c) What is the structure of transmitted data frames? (1p)
 - d) What type of error coding is used by the system? (1p)