2. Problem Sheet

Out	Due	Discussion
26. 04. 17	02. 05. 17	05. 05. 17 - 09. 05. 17

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> Please solve the problems in groups with two people and submit your solutions before the lecture. The discussion of the problem sheet is in the exercise course after the submission.

> Because Monday 01.05.17 is a legal holiday the members of the affected group should distribute on the other exercise courses.

Problem 1: Signal to Noise Ratio *4 points*

A binary signal is sent via a 3 kHz wide channel with a signal to noise ratio of 20 dB. Calculate the maximum data rate.

Problem 2: Maximum Data Rate *4 points*

A quaternary signal is sent via a 20 MHz wide channel. The medium experiences interference. We measure a signal to noise ratio of 30 dB. Calculate the maximum data rate that can be achieved over this channel.

Problem 3: Noiseless channel *4 points*

Specify the maximum data rate that can be achieved over a noiseless 4 kHz wide channel.

Problem 4: Multilevel Signals *3 points*

Represent the following sequence of bits as a quaternary signal with a baud rate of 5/s in a time-voltage-diagram: `00011011001110011010`. Determine the bitrate.

Problem 5: Units *2 points*

What is the difference between 1 kb, 1 kB, and 1 KiB?

Problem 6: Base- and Broadband *3 points*

Explain the term baseband and broadband. Why do we need broadband communication? Explain how broadband communication of baseband signals is achieved. Give example application scenarios.

a total of 20 points