

Compliance to the code of conduct

I hereby assure that I solve and submit this exam myself under my own name by only using the allowed tools listed below.

Signature or full name if no pen input available

Computer Networking and IT Security

Exam: INHN0012 / Quiz 1

Date: Friday 2nd December, 2022

Examiner: Prof. Dr.-Ing. Stephan Günther

Time: 19:30 – 19:45

Working instructions

- **Do not forget to sign the rules of conduct at the top of this page (or to enter your name in the field in case you do not use a tablet device).**
- This exam consists of **4 pages** with a total of **2 problems**.
Please make sure now that you received a complete copy of the exam.
- The total amount of achievable credits in this exam is 15 credits.
- Detaching pages from the exam is prohibited.
- Allowed resources:
 - everything **except the help of others and plagiarism**
- Subproblems marked by * can be solved without results of previous subproblems.
- **Answers are only accepted if the solution approach is documented.** Give a reason for each answer unless explicitly stated otherwise in the respective subproblem.
- Do not write with red or green colors nor use pencils.
- Physically turn off all electronic devices, put them into your bag and close the bag.

Problem 1 Multiple Choice (8 credits)

The following subproblems are multiple choice / multiple answer, i. e. at least one answer per subproblem is correct. Subproblems with a single correct answer are graded with 1 credit if correct. Those with more than one correct answers are graded with 1 credit per correct answer and -1 credit per wrong answer. Missing crosses have no influence. The minimal amount of credits per subproblem is 0 credits.

Mark correct answers with a cross



To undo a cross, completely fill out the answer option



To re-mark an option, use a human-readable marking



a)* Let be given a signal with power 8 mW and noise power of 5 mW. Determine the SNR.

- 2.04 dB 6.78 dB 0.20 dB 4.70 dB 1.36 dB 1.60

b)* Given a packet of length 1200 B to be transmitted in a wired network over a distance of 200 km at a data rate of 1000 Mbit/s. Determine the time until the packet is fully received at the destination.

- 0.67 ms 0.68 ms 1.00 ms 1.01 ms different value

c)* Which statements about token passing are true?

- It resembles a logical ring
- It is deterministic
- Collisions may occur
- A station may only transmit after it has forwarded the token

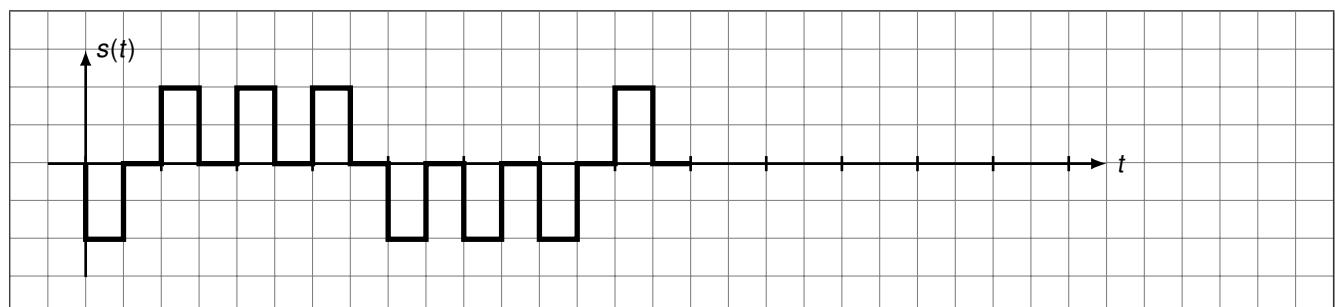
d)* Which of the following factors can affect a signal in a transmission channel?

- | | | |
|---|--|---------------------------------------|
| <input type="checkbox"/> Interference | <input type="checkbox"/> Gaussian sum factor | <input type="checkbox"/> Sieve filter |
| <input type="checkbox"/> Binomial factors | <input type="checkbox"/> Noise | <input type="checkbox"/> Antifactor |

e)* Given is a channel with independent and equally distributed bit error probability $p_e = 0.6\%$. Determine the probability that a codeword of length 4 bit is transmitted without error.

- 12.96 % different value 97.62 % 0.00 % 2.56 %

f)* Given is the baseband signal shown below, which encodes the bit sequence 0111 0001. What is the line code presented in the lecture?



- RZ Manchester NRZ MLT-3 PAM-4

Problem 2 CRC (7 credits)

In the following, we consider CRC as introduced in the lecture with the reduction polynomial $r(x) = x^2 + 1$. Give answers in **your own words**, i.e., copy & paste from the internet, lecture slides, tutorials, and old exams is prohibited.

a)* For what purpose is $r(x)$ needed?

0
1

b)* Under which condition is $r(x)$ irreducible?

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c) Show whether or not $r(x)$ is irreducible.

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d)* Explain briefly why one often chooses a polynomial that is **not** irreducible as reduction polynomial for CRC.

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Let be given the binary message 00100101 and the reduction polynomial $r(x) = x^2 + 1$.

e)* Derive the CRC checksum.

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f)* Explicitly state the message that is transmitted.

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Additional space for solutions—clearly mark the (sub)problem your answers are related to and strike out invalid solutions.

A large grid of squares, approximately 20 columns by 30 rows, intended for students to write their additional solutions. The grid is composed of thin black lines on a white background.