

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

Examiner: Prof. Dr.-Ing. Stephan Günther

Date: Thursday 21st November, 2024

Time: 16:30 – 16:45

Working instructions

- 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:
 - **open book**
 - **any teamwork, copy & paste, or AI-based assistance forbidden**
- **Answers are only accepted if the solution approach is documented.**
- Subproblems marked by * can be solved without results of previous subproblems. 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.

Problem 1 Multiple Choice (4 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

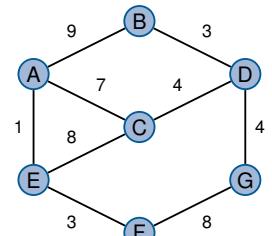


To re-mark an option, use a human-readable marking



- a)* Which edges are contained in a *Minimum Spanning Tree* of the graph shown on the right side?

(F, G) (C, D) (B, D) (A, E) (A, B) (G, D)



- b)* Which edges are contained in a *Shortest Path Tree* of the graph shown on the right side with root note G?

(B, D) (E, C) (A, C) (E, A) (B, A)

- c)* Mark all codewords that have a Hamming distance of three or more from the codeword 0011.

0000 1100 1111 0001 1001 1110

Problem 2 Short questions (11 credits)

0
1

- a)* What is a low-pass filter?

0
1

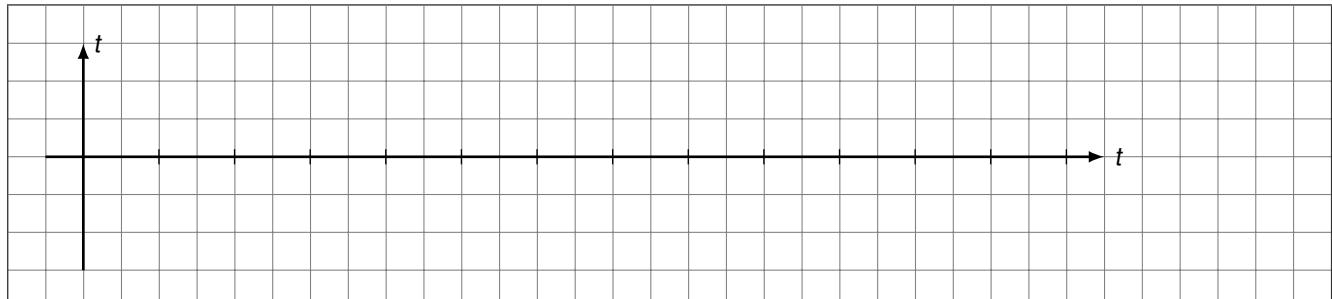
- b)* What is source coding?

0
1

- c)* Explain an advantage of STP over UTP Ethernet cables.

0
1
2

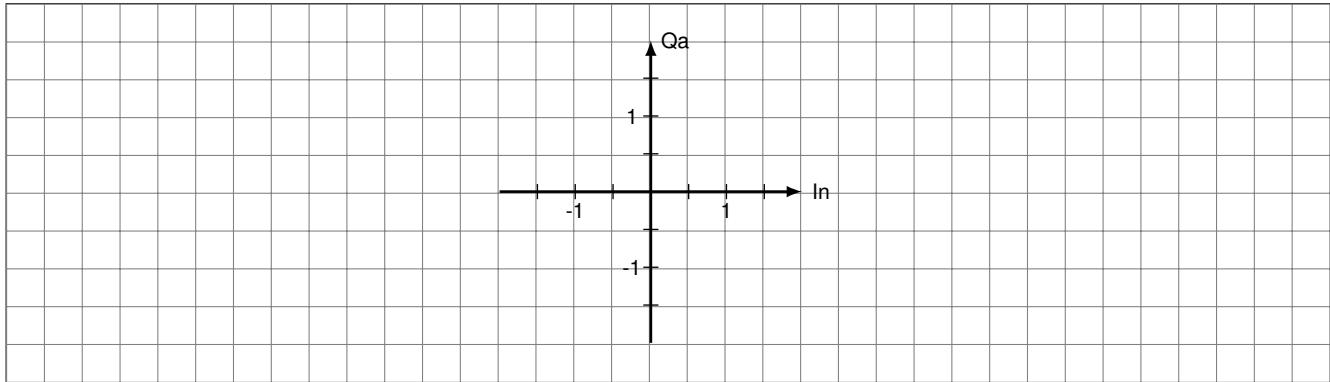
- d)* Given the binary message 0111 0001. Draw the resulting signal if MLT-3 is being used as line code.



e)* Given a copper cable based medium of length 36 m. Determine the propagation delay.

0
1

f)* Give an example of a constellation diagram that is **uniquely** ASK and **cannot** be misunderstood as another one.



0
1

g)* Given a channel of bandwidth 25 MHz. Determine the SNR in dB such that a data rate of 62 Mbit/s is possible.

0
1
2

h)* What is the difference between Space- and Frequencymultiplex?

0
1

i)* Determine the entropy of the source Q that always repeats the sequence printed below. Reason by words or calculation.



0
1

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.