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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.

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Signature or full name if no pen input available

Computer Networking and IT Security

Exam:	INHN0012 / Quiz 2	**Date:**	Thursday 9th February, 2023
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 yout 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 (9 credits)

The following subproblems are multiple chouce / 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 ✕■

Given an alphabet of *N* = 256 symbols that are uniformely and independently distributed:

a)* What is the **minimum** length of a codeword when a Huffman code is created for that alphabet.

☐ 10 ☐ 9 ☐ other

☐ 7 ☒ 8 ☐ 6

b)* What is the **maximum** length of a codeword when a Huffman code is created for that alphabet.

☐ 7 ☐ 9 ☐ other

☐ 6 ☐ 10 ☒ 8

c)* Convert 0xadfe1723 from big endian to network byte order.

☐ 0x3271efda ☒ 0xadfe1723 ☐ different value ☐ 0x2317fead

d) Which of the following IPv4 addresses in the subnet 192.168.255.255/18 are useable to address hosts?

☒ 192.168.254.254 ☐ 192.168.1.1 ☐ 192.168.186.1

☐ 192.168.255.255 ☒ 192.168.192.25

e)* What does the HTTP status code 404 mean?

☐ unauthorized ☒ not found ☐ forbidden

☐ moved permanently ☐ internal server error

f)* Which statements regarding resolvers and nameservers are correct?

☐ For each zone there is a secondary nameserver ☐ Resolvers are authoritative for one or more zones ☐ Answers by resolvers are authoritative

☒ Nameservers are authoritative for one or more zones ☐ Nameservers allow for revursive queries ☐ Nameservers resolve arbitrary FQDNs

☐ For each zone there is a primary resolver ☒ Resolvers allow for recursive queries

g)* What does "authentication" enable?

☐ limit resource access ☒ enable identity verification ☐ non-repudiation

☐ encryption ☐ confidentiality ☐ integrity

## Problem 2 Short problems (6 credits)

The following subproblems are independent of each other and can be solved without the solution of preceeding subproblems.

a)* Sketch the typical progression of the TCP congestion window over the time of a connection (starting at the beginning of the connection).
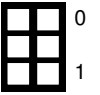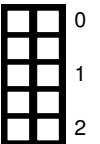
Exponential growth until first loss.
Sawtooth shaped curve afterwards.

b)* What is an *Autonomous System (AS)*?
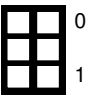
A network under unified administrative control.
("Cluster" of networks announcing routes for which it is willing to transfer traffic through its own networks.)

c)* Describe the difference between IPSec in transport and tunnel mode when using ESP.

In transport mode, only the payload of the original packet is protected (the original header remains unprotected).
In tunnel mode, a new IP header is added and the original header is also protected.

d)* Briefly describe the syscall `select()` in your own words.
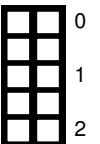
`select()` takes (multiple) sets of file descriptors that shall be watched for activity. When a file descriptor becomes ready, select modifies the respective set(s) and returns the number of active file descriptors.

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