Eksamen / Exam TTM4100 sommer/summer 2020

Department of Information Security and Communication technology

Examination paper for TTM4100 Communication, Services and Networks

Examination date: 5. August 2020

Examination time (from-to): 9:00 - 13:00

Permitted examination support material: A / All support material is allowed.

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OTHER INFORMATION

If a question is unclear/vague – make your own assumptions and specify in your answer the premises you have made. **Only contact academic contact in case of errors or insufficiencies in the question set.**

Note that the **Bokmål version of the exam set is the original and valid one**, in case there are inconsistencies (or bad translations) to English or Nynorsk.

Saving: Answers written in Inspera are automatically saved every 15 seconds. If you are working in another program remember to save your answer regularly.

Cheating/Plagiarism: The exam is an individual, independent work. Examination aids are permitted. All submitted answers will be subject to plagiarism control.

Citations: Not relevant for this exam. It is expected that all questions are answered in your own words and sentences. Cut and paste or copying is not allowed, from any source.

Notifications: If there is a need to send a message to the candidates during the exam (e.g. if there is an error in the question set), this will be done by sending a notification in Inspera. A dialogue box will appear. You can re-read the notification by clicking the bell icon in the top right-hand corner of the screen. All candidates will also receive an SMS to ensure that nobody misses out on important information. Please keep your phone available during the exam.

Weighting: The number of achievable points (out of 100) is given directly for each subtask in the exam set.

Upload of files: Not used on this exam. All questions are to be answerred directly in Inspera.

ABOUT SUBMISSION

Your answer will be submitted automatically when the examination time expires and the test closes, if you have answered at least one question. This will happen even if you do not click “Submit and return to dashboard” on the last page of the question set. You can reopen and edit your answer as long as the test is open. If no questions are answered by the time the examination time expires, your answer will not be submitted.

Withdrawing from the exam: If you wish to submit a blank test/withdraw from the exam, go to the menu in the top right-hand corner and click “Submit blank”. This can not be undone, even if the test is still open.

Accessing your answer post-submission: You will find your answer in Archive when the examination time has expired.

1.1 Type tjenester / Service types

Explain what we mean by "connection oriented" and "connectionless" services in a communication networking context. Can a service be both at the same time?

Fill in your answer here

Maximum marks: 5

1.2 Svitsjeprinsipp / Switching principle

Explain circuit switching and packet switching and give at least three differences between them.

Fill in your answer here

Maximum marks: 5

1.3 Protokoll lag / Protocol layers

Explain the protocol stack as it is defined and used for the Internet. (Keywords: purpose of the model, terminology, services, encapsulation).

Fill in your answer here

Maximum marks: 5

1.4 HTTP

Explain what HTTP is and explain (at a high level) the behavior of the protocol (Keywords: what is it used for; stateless or stateful (why?); persistent or not persistent and what it means; caching).

Fill in your answer here

Maximum marks: 5

2.1 Pålitelig dataoverføring / Reliable data transfer

Explain the most important challenges of creating a reliable data transfer service based on an unreliable (datagram) service, e.g. IP. (Keywords: packet loss; delay; required functionality).

Fill in your answer here

Maximum marks: 5

2.2 Oppsett av TCP forbindelse / Set-up of TCP connection

Explain how a TCP connection is established.

Fill in your answer here

Maximum marks: 5

2.3 Sekvensnummer og kvitteringer / Sequence numbers and ACKs

Explain how sequence numbers and acknowledgments are used for flow control in the TCP protocol.

Fill in your answer here

Maximum marks: 5

2.4 Stop-and-wait flytkontroll

Given two hosts that are directly connected via a channel. The channel has a transmission rate of 250 Mbit / s. The maximum packet size in the network is 10,000 bytes. Assume that the propagation delay between the two hosts is 600 ms. What is the maximum data rate that can be achieved when using "stop-and-wait" flow control?

Write mathematical expressions as plain text. Use "*" for multiplication and "/" for division, in addition to enough parentheses (and possibly "+" and "-") for it to be correct.

NB! Explain what you are doing and why the result is as shown; putting numbers into a formula taken from the book is not a good enough answer.

Fill in your answer here

Maximum marks: 5

3.1 Nettlaget generelt / Networking layer in general

Provide an overview of the network layer. (Keywords: main tasks/functions; protocol(s) used; where in the network it is present).

Fill in your answer here

Maximum marks: 5

3.2 Fragmentering / Fragmenting

Explain the use of fragmentation when transmitting with the IP protocol. (Keywords: why is it used; reassembly (where and how); differences between IPv4 and IPv6?).

Fill in your answer here

Maximum marks: 5

3.3 IPv4 CIDR

Assume (CIDR) IPv4 address 223.1.2.0/xx. If we need about 500 IP addresses available for hosts and router interfaces in our network, what is the maximum value we can use for xx? Explain why.

Fill in your answer here

Maximum marks: 5

3.4 IPv6

Explain the most important changes/improvements in the transition from IPv4 to IPv6. Also include arguments used for why the changes are necessary or desired. (Keywords: address space; fragmentation; checksums; protocol header structure).

Fill in your answer here

Maximum marks: 5

4.1 Linklaget generelt / Link layer in general

Give an overview of the link layer. (Keywords: main tasks/functions; protocols used; where in the network it is present).

Fill in your answer here

Maximum marks: 5

4.2 CRC

Explain the procedure for finding the CRC code of a given data string D with a given generator G at a transmitter of data. (Keywords: which mathematical operations are included; what is sent to the recipient).

Fill in your answer here

Maximum marks: 5

4.3 Linklag svitsjing / Link layer switching

Explain how a link layer switch works. In what ways is it different from a router?

Fill in your answer here

Maximum marks: 5

4.4 Tjenestekvalitet / QoS

When using the public Internet for interactive voice communication, what are the main challenges to achieve good quality?

Fill in your answer here

Maximum marks: 5

5.1 Cæsar cipher

Use Cæsar cipher with key k = 5 to encrypt the text "Koronaviruset er skummelt".
(Use the Norwegian alphabet a to å).

Fill in your answer here

Maximum marks: 5

5.2 Digitalt sertifikat / Digital certificate

What is a digital certificate and how is it validated?

Fill in your answer here

Maximum marks: 5

5.3 RTS /CTS

802.11 W-LAN defines an additional option based on the use of "Request-To-Send (RTS)" and "Clear-To-Send (CTS)" control frames. Explain how it works and when it (potentially) is used.

Fill in your answer here

Maximum marks: 5

5.4 HOL sperr / blocking

What is the "Head-Of-Line (HOL)" blocking?

Fill in your answer here

Maximum marks: 5