EKSAMEN / EXAM	TTM4100	08 05 2024

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Q1 Multiple Choice Questions (65 points. 45 correct choices)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.1.1	a) c)
Q1.1.2	b)
Q1.1.3	d)
Q1.1.4	e)
Q1.1.5	e)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.2.1	b)
Q1.2.2	c)
Q1.2.3	a) or d)
Q1.2.4	d) e)
Q1.2.5	d)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.3.1	b) c) d) [All will get 3 correct choices*]
Q1.3.2	b) d)
Q1.3.3	a) e)
Q1.3.4	b)
Q1.3.5	a) d)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.4.1	b) , d)
Q1.4.2	d) h)
Q1.4.3	a) d)
Q1.4.4	a) b) e)
Q.1.4.5	a) b) c)

Spørsmål Question Spørsmål	Dine svarvalg Your answer choice(s) Dine svarval
Q1.5.1	b) c) d)
Q1.5.2	d)
Q1.5.3	b) c) d)
Q1.5.4	d)
Q1.5.5	a) b) c) d)

Kontroller:	Eksamensvaktens signature / Invigilator's signature
• Kandidatenr. på alle sider • Samme kandidatenr. over alt	

*: Q1.3.1: due to a typo in the original exam, all of students will get 3 correct choices regardless of the answers.

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Q2. Congestion and Flow Control (6 Points)

This answer can be divided into two parts:
A. (3 points)
Introduce the general purpose of TCP flow control:

TCP flow control is a TCP's service to eliminate the possibility of the sender overflowing the receiver's buffer. Flow control is thus a speed matching service, matching the rate at which the sender is sending against the rate at which the receiving application is reading.

B. (3 points)
Then, answer dedicatedly to the questions (should emphasize the role and its value of the receiving window – ***rwnd*** in flow control):

Host A can send data to its socket buffer at a rate of 1 Gbps. This host is sending data into the receive buffer (at Host B) at a rate faster than Host B can remove them. When the buffer is full, Host B signals to Host A to stop sending data by setting the receiving window (***rwnd***) to 0.

Host A then stops sending file data, sending however probes of one byte, which are acknowledged with the ACK message containing a ***rwnd*** = 0, as long as the buffer is full.

When the Host A receives a TCP segment from Host B with rwnd > 0, then it will resume sending as a function of the ***rwnd*** values it receives from Host B.

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Q3 SSL and Wireshark (5 Points)

Q3.1 [1 points]

a) Packet 112 was sent by the Client

Q3.2 [1 points]

IP address and Port # at the Server:

IP: 216.75.194.220, port: 443

Q3.3 [1 points]

The sequence No. of the next TCP segment is: 283

Explain:
The current TCP segment has Seq. No. of 79 and its length of 204.
So the next TCP segment is 283.

Q3.4 [1 points]

3 SSL records

Q3.5 [1 points]

It contains an encrypted master secret / Neither.

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Q4 IP Addressing [8 points]

Q4.1 How to find out the subnet based on the IP address and the subnet mask? **[2 points]**

This is the best way to describe how to find the subnet address out from the IP address and the subnet mask address, two steps:

- Write the IP address and subnet mask in binary format.
- Execute an AND operator between IP address and the subnet mask.

BUT student can also answer in another way as long as it is correct and understandable.

Q4.2 [2 points]

Subnet address for 192.168.1.108 with subnet mask /30 (255.255.255.252)

192.168.1.108 /30 (or 192.168.1.108 255.255.255.252)

Q4.3 [2 points]

Subnet address for 192.168.2.108 with subnet mask /29 (255.255.255.248)

192.168.2.104 /29 (or 192.168.1.104 255.255.255.248)

Q.4.4 [2 points]

Subnet address for 192.168.3.108 with subnet mask /28 (255.255.255.240)

192.168.3.96 /28 (or 192.168.1.96 255.255.255.240)

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Q5 Multiple Access [12 points]

Q5.1 [3 points]

The combined maximum rate: **2L/T** (bps)

***Can use one of the following answers**:*

1) When A sends data/message to B, it causes no interference to the transmission from D to C. So these two transmission can be happened at the same timeslot. Therefore, the combined maximum rate is **2L/T.**

2) It can be explained by providing following message exchanges in any timeslot, as follows:

   Slot1: Message A → B
   Slot 1: Message D → C

This means that two messages (the combined length of 2L) could transmit successfully within only one time slot (T), so the combined maximal rate is **2L/T.**

Q.5.2 [3 points]

L/T (bps)

Can use one of the following answers:

1) When A sends data/message to B, it causes interference to the transmission from C to D and reversely. So, at one timeslot, only of these transmissions is successful. So, the combined maximum rate is L/T.

2) It can be explained by showing following transmissions in these two timeslots, as follows:

   Slot1: Message A → B
   Slot 2: Message D → C

This means that two messages (the combined length of 2L) could transmit successfully in two time slots, so the rate will be: 2L/2T = **L/T.**

Q5.3.1. (A→B and D→C with ACK) [3 points]

The combined maximum rate:
2L/3T (ACK is not counted as a data message)

It can be explained by providing following messaging exchanges and slots usage:

Slot 1: Message A→ B, message D → C
Slot 2: ACK B → A
Slot 3: ACK C → D

(B and C cannot send ACK to its transmitters (A and D) within one timeslot as it will be not successful. It needs at least 2 timeslots to transmit ACKs). This means that in order for transmitting two messages (the combined length of 2L), it requires at least 3 timeslots, so the combined maximum rate for the transmissions A→B and D→C with ACK is **2L/3T** (ACK was not counted as a data message).

Note: ACKs are usually a small message, and they do not constitute significantly to the combined rate. This question only asks about the combined rate for DATA messages.

Q.5.3.2 (A→B and C→D with ACK) [3 points]

The combined maximum rate: **2L/3T** (bps)

It can be explained by providing the following messaging exchanges and slots usage as in this case (the best):

Slot 1: Message C → D
Slot 2: ACK D → C, message A → B
Slot 3: ACK B → A

Similar to the case Q 5.3.1, this scenario requires at least 3 timeslots for transmitting two messages (2L) from A→B and from C→D with ACK. The combined maximal rate will therefore be:

2L/3T (ACK is not counted as a data message)

Note: ACKs are usually a small message, and they do not constitute significantly to the combined rate. This question only asks about the combined rate for DATA messages.

Q6 DNS [4 points]

Q6.1 [2 points]

Resource Record (RR) has the following format:

(Name, value, type, ttl)

- TTL is the time to live of the resource record; it determines when a resource should be removed from a cache.
- The meaning of Name and Value depend on Type.

(**Optional**):

Type	Name	Value
A	A Hostname	IP of the Hostname
NS	A Domain name	The hostname of an authoritative DNS server that knows how to obtain the IP addresses for hosts in the domain
CNAME	Name	A canonical hostname for the alias hostname Name
MX	Name	The canonical name of a mail server that has an alias hostname Name

Q.6.2 [2 points]

The following information can be communicated to a client when it sends for a DNS query:

- Hostname to IP address mapping
- hostname alias to IP address mapping
- Mailserver information for a specific domain
- Authoritative name server information