EKSAMEN / EXAM	TTM4100	07	06	2013

LES REGLENE FØR DU STARTER!
READ THE RULES BEFORE YOU START!

Skriv kandidatenummeret ditt her ⇨⇨ Write your candidate's number here ⇨					

1.1

Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False
1.1.1...	☒	1.1.2...	☒	1.1.3 ..	☐	1.1.4...	☒	1.1.5 ..	☒
1.1.6...	☒	1.1.7...	☒	1.1.8 ..	☒	1.1.9...	☒	1.1.10	☐

1.2

Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False
1.2.1...	☒	1.2.2...	☒	1.2.3 ..	☒	1.2.4...	☐	1.2.5 ..	☐
1.2.6...	☒	1.2.7...	☒	1.2.8 ..	☒	1.2.9...	☒	1.2.10	☐

1.3

Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False
1.3.1...	☐	1.3.2...	☐	1.3.3 ..	☐	1.3.4...	☐	1.3.5 ..	☐
1.3.6...	☐	1.3.7...	☒	1.3.8 ..	☒	1.3.9...	☒	1.3.10	☒

1.4

Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False
1.4.1...	☐	1.4.2...	☐	1.4.3 ..	☒	1.4.4...	☒	1.4.5 ..	☒
1.4.6...	☒	1.4.7...	☒	1.4.8 ..	☒	1.4.9...	☐	1.4.10	☒

1.5

Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False	Riktig True	Galt False
1.5.1...	☒	1.5.2...	☒	1.5.3 ..	☒	1.5.4...	☒	1.5.5 ..	☐
1.5.6...	☒	1.5.7...	☒	1.5.8 ..	☒	1.5.9...	☐	1.5.10	☒

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

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2.
2.1
a), b)
2.2
c)
2.3
c)
Remark: 639 packets' (parallel over link 1 and link 2) transmission time over 5Kpbs + 2 packets' transmission time (pkt 1 on link 1 and pkt 0 on link 2 without parallel transmission on both links) + propagation delays of both links.
2.4
c)
Remark: 1 packet / two way delay (i.e. at least 2* propagation delay + 2* transmission delay)
≈ 1K Bytes / 200ms = 5K bytes/second = 40 Kbps

Summary of Comments on SPØRRESKJEMAMAL

Page: 2

Number: 1 Author: a Subject: Highlight Date: 22.05.2016 16:29:15
64 Kbps

Number: 2 Author: a Subject: Highlight Date: 23.05.2016 15:31:15
640

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4.
4.**1** **c)**
4.**2** **a)**
4.3 **d) and e)**

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5.

5.1

In intervals 1-4 and 9-12, is TPC slow start operating.

5.2

In intervals 4-8 and 12-15, is TCP congestion avoidance operating.

5.3

It is difficult to tell if this loss is due to a triple duplicate ACK or due to a timeout. This is because, in the case after the 8th round loss is detected, the congestion window has been set as 1. If the TCP protocol is TCP Reno, one could tell this loss is due to time out, since, with Reno, a triple duplicate ACK loss will only cause the window halved. However, if the TCP protocol is TCP Tahoe, both triple duplicate ACK loss and time out case the window reduced to 1.

5.4

At the 5th round, the slow start threshold (ssthresh) value is 8.
(Indeed, this ssthresh value keeps unchanged in interval [1, 8].)

At the 10th round, the slow start threshold (ssthresh) value is 6.
(It is decided when detecting the segment loss after the 8th round and is given to be half of the congestion window value at the 8th round.)

5.5

The 20th segment is send during the 5th transmission round.

(During the 1st transmission round, segment 1 is sent; segments 2-3 are sent in the 2nd transmission round; segments 4-7 are sent in the 3rd transmission round; segments 8-15 are sent in the 4th transmission round; segments 16-24 are sent in the 5th transmission round.)

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6.

6.1

In each round, each node can at most transmit 20Kb, so the total is 10*20Kb. Each round takes time of: 10*(1ms + 20Kb/54Mbps)=13.7ms. So, the maximum throughput is 10*20Kb/13.7ms=14.6Mbps.

6.2

For a given arbitrary node, its transmission is successful only when it transmits and the others do not. So, the probability is: $0.1*(1-0.1)^9 \approx 0.0387$.

Since every node has the above probability, the efficiency of the channel is $10*0.1*(1-0.1)^9 \approx 0.387$.

The efficiency of the channel means that in each slot, the successful transmission probability (no matter which node sends) is 0.387. Since each slot length is 1ms and the data frame size for transmission on the slot is 10 Kb, the through put is hence: 0.387*10Kb/1ms = 3.87 Mbps.

(Alternatively, one may think that, due to framing and time slotting, the actually utilized transmission rate of the channel is 10 Kbits / 1ms = 10Mbps. So, the maximum throughput of the channel is 10 Mbps * 0.387 = 3.87 Mbps.

Note: if the channel transmission rate had been fully utilized, the maximum throughput of the channel would have been 54 Mbps * 0.387 = 20.898 Mbps.)

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Remarks:
Q.1.2.6: The English version and the Norwegian version are inconsistent. Adjustment is made in the final grading.
Q.2.1.a): There is a minor translation error. While in the English version "bandwidth" is used, in the Norwegian version "forsinkelse" is used. Nevertheless, using either one does not affect the answer.

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3.
3.1 **b)**
3.2 **a)**
3.3 **d)**
3.4 **c)**
3.5 **d)**