EKSAMEN / EXAM	TTM4100	20	05	2009

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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
• Kandidatnr. på alle sider • Samme kandidatnr. over alt	

Summary of Comments on SPRRESKJEMAMAL

Page: 1

Number: 1 Author: a Subject: Sticky Note Date: 22.05.2016 16:23:12
Wrong, 1.2.1 is **FALSE**

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2.

2.1 In connection-oriented service, a connection is set up before information data transfer. All information data are transmitted along the same connection path to reach the destination. After the transmission, the connection is released.

2.2 In connectionless service, no connection is set up before the information data are transmitted. In addition, data are transferred as units, each with an address. Each unit is routed independently to the destination.

2.3 The principal difference is that the connection-oriented service needs to set up a connection before transmission and release it after transmission, while the connectionless service needs not.

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3.

3.1 The first end system requires L/R_1 to transmit the packet onto the first link; the packet propagates over the first link in d_1/s_1; the packet switch adds a processing delay of d_{proc}; after receiving the entire packet, the packet switch requires L/R_2 to transmit the packet onto the second link; the packet propagates over the second link in d_2/s_2. Adding these five delays gives

$$d_{end\text{-}end} = L/R_1 + L/R_2 + d_1/s_1 + d_2/s_2 + d_{proc}$$

With the values given in the question, we have:

L/R1 = (1000*8) / (1Mbps) = 8ms
L/R2 = (1000*8) / (1Mbps) = 8ms
d1/s1 = (6000km)/($2.5 \cdot 10^8$ m/s) = 24 ms
d2/s2 = (3000km)/($2.5 \cdot 10^8$ m/s) = 12 ms
d_{proc} = 2ms

So, the end-to-end delay is 8+8+24+12+2 = 54ms

3.2 The queuing delay is 0 for the first transmitted packet, L/R for the second transmitted packet, and generally, $(n-1)L/R$ for the n^{th} transmitted packet. Thus, the average delay for the N packets is

$$(L/R + 2L/R + ... + (N-1)L/R)/N = L/RN(1 + 2 + ... + (N-1)) = LN(N-1)/(2RN)$$
$$= (N-1)L/(2R)$$

Note that here we used the well-known fact that

$$1 + 2 + ... + N = N(N+1)/2$$

Plugging N=100, L=1000 bytes and R=1 Mbps into the above form, we get:

99 * (1000*8) / (2 * 1Mbps) = 396ms

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4.

4.1 Flow control is the receiver controls the data flow (sending rate) from the sender.

4.2 Flow control is commonly used in **Transport Layer** and **Data Link Layer**. It may also be used in **Application Layer**.

The reason of having flow control in these layers is that, due to limited processing capacity, limited storage space and/or other reasons, the receiver may not be able to handle the incoming data as they arrive and will lose them, if the sender sends the data too fast. This scenario can happen in Transport Layer, Data Link Layer and Application Layer.

4.3 In stop-and-wait flow control, the sender sends one packet and then waits for an acknowledgment from the receiver before proceeding to send the next packet.

In particular, after sending a packet, the sender keeps waiting and checking if there is an acknowledgement for this packet. If a pre-defined **timeout** time has passed for the waiting, the sender re-sends the packet. If the acknowledgement is received, the sender sends the next packet. At the receiver side, it sends back to the sender an acknowledgement for the packet it receives correctly

4.4 One problem/disadvantage is that the stop-and-wait flow control is inefficient in utilizing the communication channel between the sender and the receiver:

The following equation shows the channel utilization of stop-and-wait flow control:

$U = (X/C)/[(X/C)+2\tau]$

Where U denotes the maximum channel utilization: X packet size; C the channel capacity; τ one way propagation delay. This equation implies that, if the propagation cannot be ignored, the stop-and-wait flow control can never fully utilize the channel capacity.

Another problem is that duplicate packets may be sent and received. If packets are not associated with some sequence number, the receiver side will not notice such duplication, and this will cause problem.

4.5 Under stop-and-wait flow control, it takes at least one round-trip time to send one data packet. This round trip time, in this question, is at least twice the one way propagation delay. In other words, at most one packet (of size 1500 bytes) is sent every 200ms. So, the maximum achievable rate is 1500*8bits/200ms=60kbps.

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5.

5.1 The router will forward the packet according to the following:

5.1.1 to Interface 1

5.1.2 to Interface 0

5.1.3 to Interface 0 1

5.1.4 to Router 1

5.1.5 to Router 2

5.2 (Any of the following two options is correct.)

For Subnet 1, two practical options are: 192.53.40.0/25 or 192.53.40.128/25.

If Subnet 1 takes192.53.40.0/25, Subnets 2 and 3 can take 192.53.40.128/26 and 192.53.40.192/26.

If Subnet 2 takes192.53.40.128/25, Subnets 2 and 3 can take192.53.40.0/26 and192.53.40.64/26.

Page: 5

Number: 1 Author: a Subject: Sticky Note Date: 22.05.2016 16:26:00

Wrong.
Correct is to **Router 2**

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KOMMENTARER COMMENTS

Adjustment has been made in the final grading, corresponding to questions explained below:

Q.1.5.7: In the assignment and a previous exam, the answer to this True/False question is contradicting.

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6.

6.1 In the Internet, textual domain names are used. However, the Internet protocol is based on numerical IP addresses. Hence, DNS is needed to map textual domain names and e-mail destinations/addresses to numerical IP-addresses.

WWW and E-mail are two sample Internet applications that use DNS.

6.2 DNS is generally unchanged over short time. So, operations can be repeated without harm. When a process makes a DNS request, it typically starts a timer. If the timer expires, it just makes the request again. So, no harm is done.

6.3 Normally, each zone has a primary DNS name server and one or several secondary DNS name servers. Secondary name servers are used to increase the reliability of the system in cases where some name server(s) are down.