Computer Networks	Q1: 4-12-2017
First name:	Last name:

Test. 3 points.
Estimated time: **30 minutes**.
The questions can have one correct answer (RU) or multiple answers can be correct (MR). For the MR case, the number of correct answers can be between 1 and all.

- A correct RU question counts 0.3 points, 0 otherwise.
- A correct MR question counts 0.4 points, partially correct (one single error) 0.2 points, 0 otherwise.

1. **MR**. Regarding TCP, select the correct statement or statements

- ☐ When an application writes a data that cannot be encapsulated in a single segment, TCP segments the data in different parts with a maximum size of 1 MSS.
- ☐ A TCP connection can be aborted sending a segment with the flag R on.
- ☐ Each time an ack arrives acknowledging new data, the transmission window increases its value.
- ☐ While the connection establishment phase is always started by the client, the termination phase is started by the server.

2. **MR**. Regarding UDP, select the correct statement or statements

- ☐ It allows multiple applications running in the same host to transmit and receive using a network.
- ☐ It is an extreme-to-extreme protocol.
- ☐ It is usually employed by applications needed real-time transmissions.
- ☐ Before be able to transmit the first UDP datagram, an application needs to start the Three-Way Handshaking to establish the UDP connection

3. **RU**. The value of the congestion window cwnd in TCP depends on

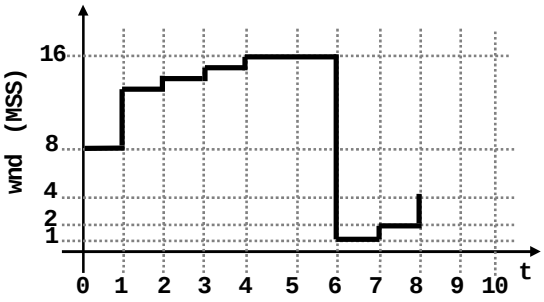
- ☐ The capacity of the reception buffer
- ☐ The capacity of the transmission buffer
- ☐ The available space in the transmission buffer
- ☐ The available space in the reception buffer
- ☐ The congestion of the network

4. **RU**. During the established phase, a client transmits a TCP segment of 576 bytes of data to a server with a sequence number of 56125. Determine the ack number acknowledging these data

- ☐ 56125
- ☐ 56126
- ☐ 56700
- ☐ 56701
- ☐ 56702

5. **MR**. A client and a server established a TCP connection. It is known that the MSS is 500 bytes, the RTT is 5 ms, the RTO is 10 ms and the advertised window awnd is 20000 bytes. In the figure on the right-hand side, the starting time 0 indicate an arbitrary moment during the connection. Select the correct statement or statements.

- ☐ The value of the cwnd at time 9 will be 4000 bytes
- ☐ The value of ssthresh between time 0 and 6 is 13 MSS
- ☐ Between time 1 and 6, TCP uses Slow Start
- ☐ The value of ssthresh at time 8 is 4000 bytes



6. **MR**. A switch …

- ☐ Divides a network in different collision domain, one per each interface.
- ☐ Implements a mechanism, called flow control, that allows to adjust the average bit-rate transmission of the stations.
- ☐ Has an IP address per interface.
- ☐ If it supports trunking, it can divide a network in different VLANs.
- ☐ Uses an ARP table with associations between @IP and @MAC

7. **MR**. Consider a switch 100baseTX with 3 interfaces connected respectively to a hub with 3 stations (A, B and C), to another hub with 2 stations (D and E) and to one station (F). If Si A, B and D transmit at their maximum possibility to F, select the correct statement or statements.

- ☐ F receives at 100 Mbit/s
- ☐ A transmits at 25 Mbit/s on average
- ☐ The switch applies flow control towards A
- ☐ The switch controls D in such a way that D transmits at a third part of its maximum transmission bit-rate
- ☐ The two hubs transmit to the switch at the same average transmission bit-rate

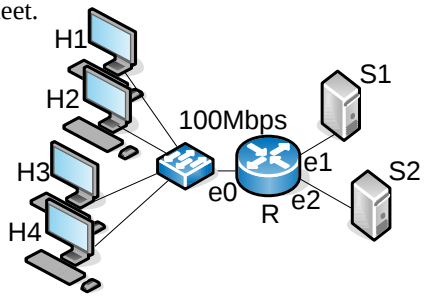
8. **MR**. In a LAN, a switch with 3 interfaces connects 3 hubs, each one connects 5 stations (for a total of 15 stations)

- ☐ In this scenario, the 15 stations can transmit at the same time without having a collision
- ☐ There are 3 collision domains
- ☐ A frame transmitted in broadcast from a station is received exclusively by all stations belonging to the same domain of the sender
- ☐ If a station H1 of a collision domain transmits at 100 Mbit/s to another station H2 of the same domain but H2 can only receive at 10 Mbit/s, the hub must use a flow control to reduce the transmission bit-rate of H1 to 10 Mbit/s
- ☐ The hosts belonging to different collision domains use different netID

Segon Control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		4/12/2017	Autumn 2017
Name:	**Surname:**	**Group**	**DNI**

Duration: 1h30m. The quiz will be collected in 30 minutes. Answer in the same questions sheet.

Problem 1 (4 points)



In the network of the figure all links are 100 Mbps full duplex. Each H1 and H2 receive data with a TCP connection from the S1 server at the maximum throughput left by the network, and H3, H4 the same from S2. Suppose that the router R has a memory of 1 MB (10^6 bytes) for each interface. Suppose that the TCP sockets in H1 and H2 have a reception buffer of 50 kB (1kB = 10^3 bytes), while in H3 and H4 they have 100 kB. Suppose for simplicity that delays in the links are 0; TCP acks are never lost and arrive immediately at the destination. In order to answer the following questions, assume that the connections are in permanent regime (they have been started for some time). Justify your answers

1.1 (0,5 points) Say if the window scale option is needed given that we want the advertised window (awnd) to be as large as the one allowed by the reception buffer of the sockets. Say what value will be needed for each connection.

1.2 (0,5 points) Discuss whether TCP connections will have losses.

1.3 (0.75 punts) Compute how many bytes there will be approximately in the buffer of the interfaces e0, e1, e2 of the router R.

1.4 (0.75 points) Compute approximately the RTT (Round Trip Time) that on average each TCP connection will have (say if it will be the same for all connections).

1.5 (0.75 points) Compute approximately what will be the throughput of each TCP connection (say if it will be the same for all connections).

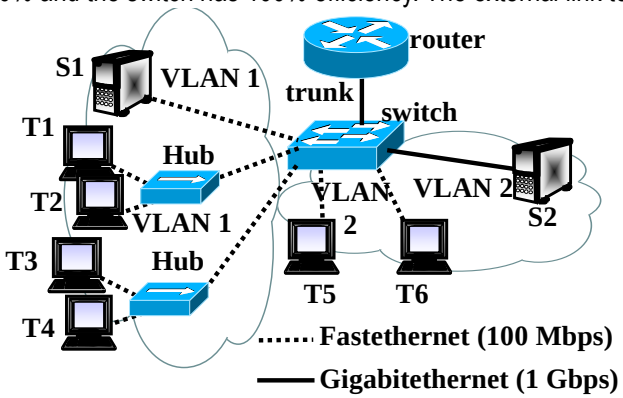
1.6 (0.75 points) Suppose all PCs start downloading a 10 MB file (1 MB = 10^6 bytes) at the same instant. Compute approximately how long each connection will take when downloading the file.

Second Midterm. Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		04/12/2017	Fall 2017
NAME (in CAPITAL LETTERS):	FAMILY NAME (in CAPITAL LETTERS):	GROUP:	DNI/NIE:

Time: 1hour and 30 minutes. The quiz will be collected in 25 minutes.

Problem 2 (3 points).

The figure shows a network with two VLAN. All links are Fast Ethernet (100Mbps) except SW-S2 and SW-R links, which are 1Gbps links. The efficiency of the hubs is 80% and the switch has 100% efficiency. The external link to Internet is of 40 Mbps.



For each one of the following scenarios determine the transmission rate of each terminal can achieve and whether flow control applies or not and how it does.

a) (0.5 points) Terminal T4 downloads a file from server S1. What transmission rate can it achieve?

b) (0.5 points) Terminals T1, T2, T3 and T4 send traffic to S1 simultaneously.

c) (0.5 points) Terminals T1 and T2 send traffic to S1 while terminals T3 and T4 download traffic from S1.

d) (0.5 points) Terminals T1, T2, T3 and T4 download data from S2 simultaneously.

e) (0.5 points) All six terminals download data from S2 simultaneously.

f) (0.5 points) All six terminals send a large file to an external server simultaneously.