# Computer Networks II

Course 18/19 :: Test 1 (Retake)

## Escuela Superior de Informática

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*This exam has 12 questions with a value of 20 points. Three wrong answers substract a point. Only an answer is correct if otherwise not stated. Calculator use is forbidden. The maximum duration of this exam is 60 minutes.*
*Regarding the ANSWER SHEET:*

- *Fill in your personal data in the form above.*
- *Enter* Computer Networks II *in the field EVALUATION.*
- *Indicate your ID in the side box (also marking the corresponding cells).*
- *Check the box «**1**» in the TYPE OF EXAMINATION box.*

*Check your answers only when you are completely sure. The scanner does not support corrections or deletions of any kind. It will automatically cancel them. You must only deliver the answer sheet.*

Surname: _____ Firstname: _____ Group: _____

**1** [1p] A TCP server invokes the `listen(1)` method. Select the correct answer:

- ☐ **a**) The server can serve up to 2 clients simultaneously.
- ☐ **b**) The server can serve any number of clients simultaneously.
- ☐ **c**) The server queues up to 1 connection request while handling one or more connections simultaneously.
- ☐ **d**) The server loses at most one connection request while handling other connections simultaneously.

**2** [1p] What does it mean that a machine architecture uses the Big Endian order?

- ☐ **a**) The most significant byte (MSB) is stored at the highest memory address.
- ☐ **b**) The most significant byte (MSB) is stored in the lowest memory address.
- ☐ **c**) The least significant byte (LSB) is stored in any direction, depending on the `struct.pack()` format.
- ☐ **d**) Only networks can have Big Endian ordering.

**3** [1p] What method should you NOT use if you want to correctly send data over the network?

- ☐ **a**) `struct.pack()`
- ☐ **b**) `encode()`
- ☐ **c**) `htons()`
- ☐ **d**) `ntohs()`

**4** [1p] You want to implement an application that allows you to send files between two machines connected to the network using the UDP transport protocol. What strategy would you use to provide reliability to this application?

- ☐ **a**) None, UDP sends ACKs to ensure reliability.
- ☐ **b**) None, UDP uses checksums to ensure reliability.
- ☐ **c**) At the application level, it may implement a strategy based on timers, retransmissions and ACKs.
- ☐ **d**) It is not possible to implement reliability over UDP, so the application should be migrated to TCP.

**A** [3p] Given the following tshark capture, answer the following questions:

```
0.000000 10.10.10.1   -> 10.10.10.118 TCP 37804 > 80 [SYN] Seq=0 Win=5840 Len=0 MSS=1460
0.000304 10.10.10.118 -> 10.10.10.1 TCP 80 > 37804 [SYN, ACK] Seq=0 Ack=1 Win=5792 Len=0 MSS=1460
0.000314 10.10.10.1   -> 10.10.10.118 TCP 37804 > 80 [ACK] Seq=1 Ack=1 Win=5888 Len=0
0.000337 10.10.10.1   -> 10.10.10.118 HTTP GET http://img.systemadmin.es/images/web/logo.gif HTTP/1.0
0.000754 10.10.10.118 -> 10.10.10.1 TCP 80 > 37804 [ACK] Seq=1 Ack=154 Win=6912 Len=0
```

> **5** (1p) What are the TCP header values of the segments that allow establishing the connection?

- ☐ **a)** Segment 1 = (SYN, SEQ=0, WIN=5840)
  Segment 2 = (SYN, ACK, SEQ=0, ACK=1, WIN=5792)
  Segment 3 = (ACK, ACK=1, SEQ=1, WIN=5888)
- ☐ **b)** Segment 1 = (SYN, ACK, SEQ=0, ACK=1, WIN=5792)
  Segment 2 = (ACK, SEQ=1, ACK=1, WIN=5888)
  Segment 3 = (DATA)
- ☐ **c)** Segment 1 = (SYN, SEQ=0, WIN=5840, src IP=10.10.10.1, dst IP=10.10.10.118)
  Segment 2 = (SYN, ACK, SEQ=0, ACK=1, WIN=5792, src IP=10.10.10.118, dst IP=10.10.10.1)
  Segment 3 = (ACK, ACK=1,SEQ=1,WIN=5888, src IP=10.10.10.1, dst IP=10.10.10.118)
- ☐ **d)** None of the above is correct.

> **6** (1p) How many bytes can A=10.10.10.1 send without overflow to B=10.10.10.118 the first time you report your window size?

☐ **a)** 5840 ☐ **b)** 5792 ☐ **c)** 5888 ☐ **d)** 1460

> **7** (1p) How many bytes does B=10.10.10.118 of A=10.10.10.1 confirm when receiving its first data segment?

☐ **a)** 5840 ☐ **b)** 153 ☐ **c)** 1 ☐ **d)** 1460

**8** [1p] A computer receives a UDP datagram directed to port 3200 and while it is being delivered to the corresponding process, it receives a TCP segment to port 3200. What will happen?

- ☐ **a)** The TCP segment will be delivered to the corresponding process.
- ☐ **b)** The process linked to port 3200 aborts immediately.
- ☐ **c)** The two messages collide and their contents are corrupted.
- ☐ **d)** The computer sends a RESET message to the source indicating that the port is busy.

**9** [1p] A computer receives a TCP segment with an incorrect checksum. Apart from discarding the segment, which of the following is an adequate behavior on the part of the operating system?

- ☐ **a)** Do nothing else.
- ☐ **b)** Send 3 duplicate ACKs to indicate congestion on the route.
- ☐ **c)** Request a retransmission indicating the sequence number of the segment.
- ☐ **d)** An ACK is sent indicating the sequence number immediately after.

**10** [1p] What does the size of the receiving window (rwnd) on a TCP connection depend on?

- ☐ **a)** Available space in the receiving queue.
- ☐ **b)** The number of jumps in the route between the ends of the connection.
- ☐ **c)** The minimum between the congestion window (cwnd) and the send window (swnd).
- ☐ **d)** It is half of the threshold (ssthresh) after the expiration of the last timeout.

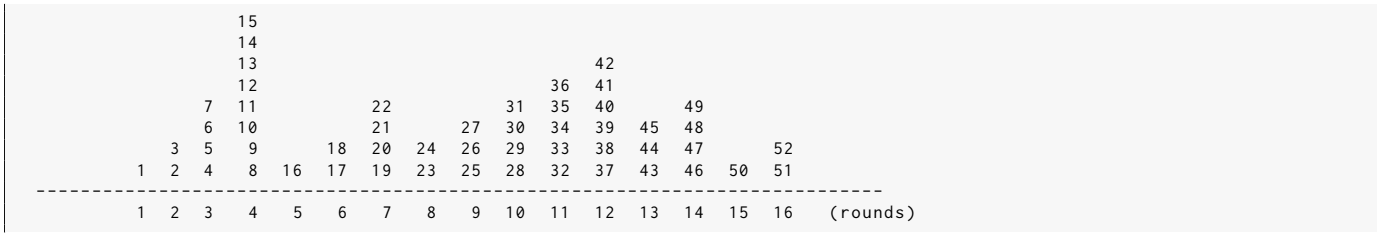
**11** [1p] In TCP, which primitive incorporates new data in the sending queue?

- ☐ **a)** `socket.recv()`
- ☐ **b)** `socket.send()`
- ☐ **c)** `socket.sendto()`
- ☐ **d)** New data for sending queue comes through the network.

**12** [1p] What happens if the segment in which a TCP receiver notifies the opening of its previously closed receiving window is lost?

- ☐ **a)** Communication is interrupted indefinitely.
- ☐ **b)** When the timer expires Keep Alive, the server closes the connection.
- ☐ **c)** When the persistence timer expires, the transmitter asks for the receiving window.
- ☐ **d)** When the retransmission timeout expires, the receiver sends a duplicate of the window opening message.

**B** [4p] Consider the following graph representing the sending of segments in a TCP application that uses congestion control. The initial threshold is known to be 10 MSS. The numbers indicate the order number of the sent segments. Answer the following questions:




> **13** (1p) In which rounds did timeouts occur?

- ☐ **a)** 4, 14
- ☐ **b)** 4, 7, 14
- ☐ **c)** 4
- ☐ **d)** 4, 7, 12, 14

> **14** (1p) In which rounds were 3 duplicate ACKs received?

- ☐ **a)** 6, 10, 12
- ☐ **b)** 12, 14
- ☐ **c)** 7, 10, 12
- ☐ **d)** 7, 12

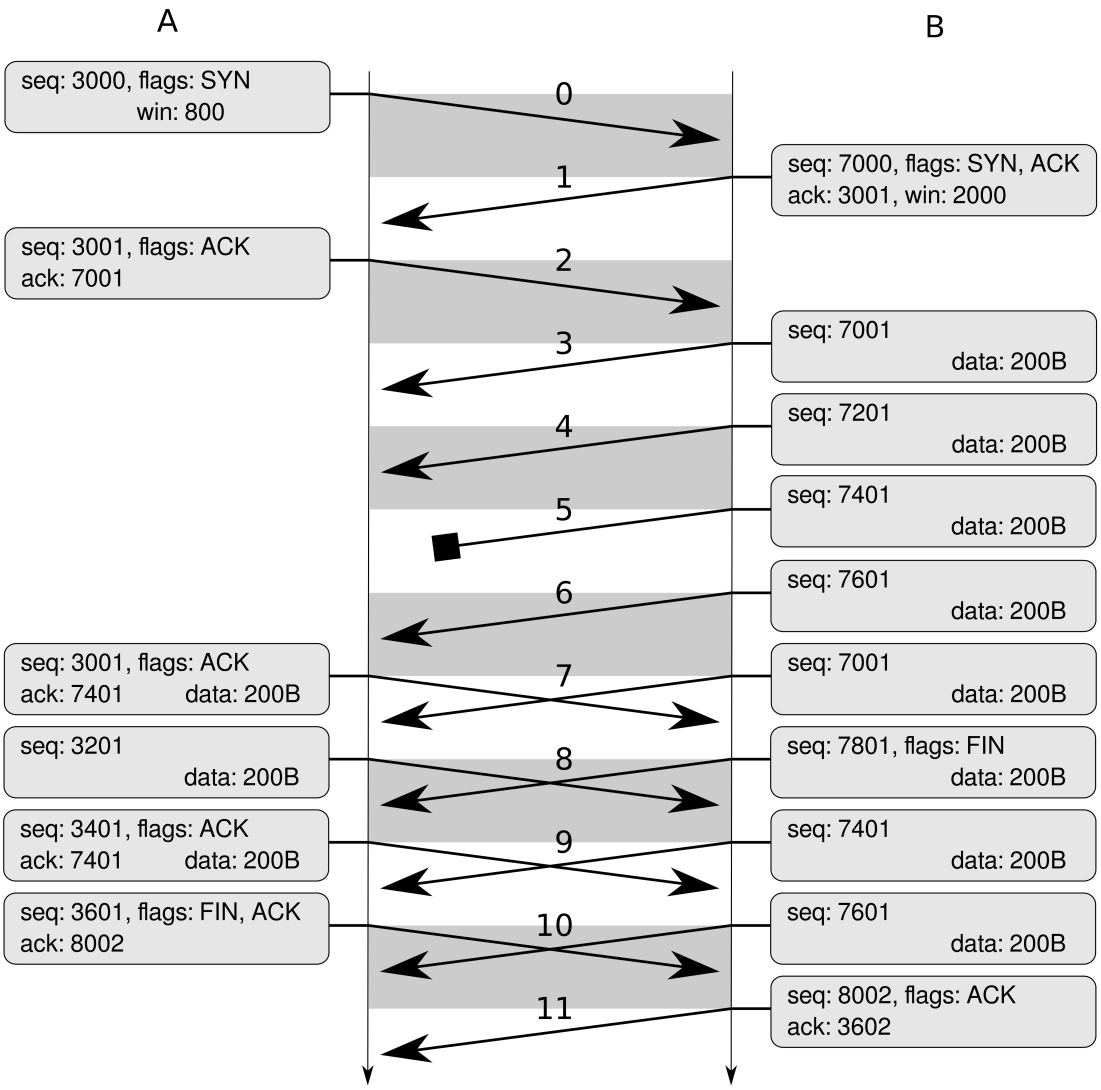
> **15** (1p) In which rounds is Slow Start (SS) and Congestion Avoidance (CA) executed?

- ☐ **a)** SS = 1-4, 7, 13-14; CA = 5-6, 8-12
- ☐ **b)** SS = 1-4, 13; CA = 5-12
- ☐ **c)** SS = 1-7, CA = 8-16
- ☐ **d)** SS = 1-7, 15-16; CA = 8-14

> **16** (1p) What is the value of cwnd and ssthresh in round 17?

- ☐ **a)** cwnd=2 MSS; ssthresh=2 MSS.
- ☐ **b)** cwnd=3 MSS; ssthresh=2 MSS.
- ☐ **c)** cwnd=3 MSS; ssthresh=4 MSS.
- ☐ **d)** cwnd=1 MSS; ssthresh=2 MSS.

**C** [4p] According to the following figure, which shows a TCP communication flow, answer the following questions:




> **17** Which of the following is the only possible option for the periods of retransmission of A and B (expressed in ticks)?

☐ **a)** A=3, B=3 ☐ **b)** A=4, B=4 ☐ **c)** A=5, B=4 ☐ **d)** A=4, B=5

> **18** How many bytes does A send to B?

☐ **a)** 200 ☐ **b)** 600 ☐ **c)** 3601 ☐ **d)** 8002

> **19** How many bytes does B send to A?

☐ **a)** 400 ☐ **b)** 800 ☐ **c)** 1000 ☐ **d)** 1200

> **20** Which is the last value of the congestion window of B (cwnd)?

☐ **a)** 600

☐ **b)** 800

☐ **c)** 1000

☐ **d)** It's not doing congestion control.