Computer Networks II

Course 24/25 :: Exam 1 (resit)

Escuela Superior de Informática

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This exam has a total of 20 points. For every 3 multiple-choice questions with 4 options or fewer answered incorrectly, 1 point will be deducted. Only one option is correct unless stated otherwise in the statement. When prompted, it's required to check all correct options. The use of a calculator is not allowed. The exam duration is 50 min. ***Follow answer sheet instructions.***

1 [1p] Can sockets be used as files in Python, using functions like write() instead of send()?

- ☐ **a)** No, because file are not sockets and vice versa.
- ☐ **b)** No, because files are random access and sockets are not.
- ☐ **c)** Yes. In fact, in Python socket and file are exactly the same.
- ■ **d)** Yes, even though there are some differences.

2 [1p] What are sockets raw used for?

- ☐ **a)** None, they are no longer used.
- ☐ **b)** They are essential because TCP and UDP are based on them.
- ☐ **c)** They are required for secure or encrypted transmissions.
- ■ **d)** They are necessary for lower OSI layers communications, protocol and utilities.

3 [1p] What for is SSL/TLS used?

- ☐ **a)** To enable a SSH connection to a server.
- ■ **b)** Is a protocol to secure a socket in the transport layer.
- ☐ **c)** Is a deprecated protocol replaced by SSH.
- ☐ **d)** Is a protocol used to provide mail services and remote access to networks.

4 [1p] Any TCP connection is identified by... (select the most accurate one)

- ☐ **a)** One socket.
- ■ **b)** Two sockets.
- ☐ **c)** Four sockets.
- ☐ **d)** Four sockets, two open from server (destination and source) and two from client.

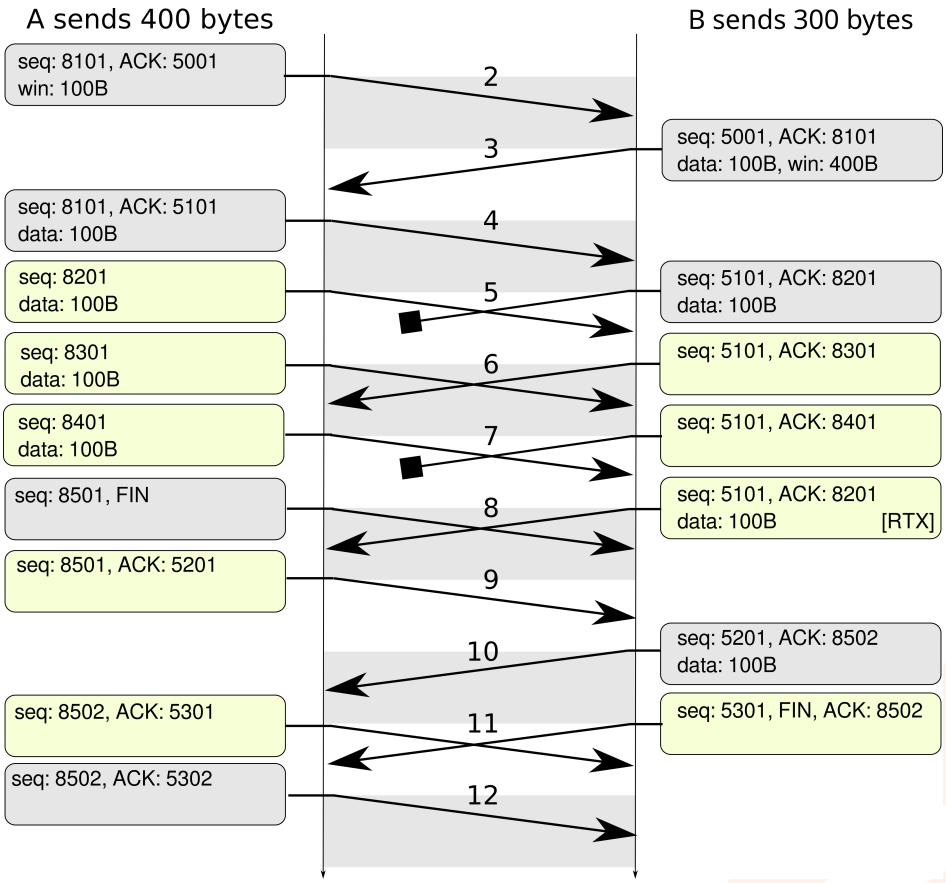
5 [1p] Which of the following socket API functions turns an unconnected active TCP socket into a passive socket?

☐ **a)** connect ☐ **b)** recv ■ **c)** listen ☐ **d)** accept

6 [1p] What is a port in computer networks?

- ☐ **a)** An interface to which a socket connects.
- ☐ **b)** A number that identifies a service and cannot ever be changed.
- ■ **c)** A number associated with a process. Can be changed if needed.
- ☐ **d)** A number associated with the IP address that helps to specify the destination host more precisely.

A [7p] Based on the TCP flow represented in the figure, answer the questions, considering: a) both will send data in sync with a clock tick, b) First two messages are not shown, c) RTO for both is 3 ticks, d) MSS=100 bytes for both peers.



> **7** At which ticks does A send messages with data? Count both visible and hidden messages. Mark **all** that apply:

■ **a)** 4 ■ **b)** 5 ■ **c)** 6 ■ **d)** 7 ☐ **e)** 8 ☐ **f)** 9 ☐ **g)** 11

> **8** At which ticks does B send messages with data? Count both visible and hidden messages. Mark **all** that apply:

■ **a)** 3 ■ **b)** 5 ☐ **c)** 6 ☐ **d)** 7 ■ **e)** 8 ■ **f)** 10 ☐ **g)** 11

> **9** Mark **all** items that describe the message sent by B at tick 8:

■ **a)** seq: 5101 ☐ **c)** seq: 5301 ☐ **e)** ACK: 8301 ☐ **g)** ACK: 8501 ☐ **i)** win: 200B
☐ **b)** seq: 5201 ■ **d)** ACK: 8201 ☐ **f)** ACK: 8401 ■ **h)** data: 100B ☐ **j)** FIN

> **10** Mark **all** items that describe the message sent by B at tick 11:

☐ **a)** seq: 5201 ■ **c)** seq: 5301 ☐ **e)** ACK: 8401 ☐ **g)** ACK: 8501 ☐ **i)** data: 100B
☐ **b)** seq: 5202 ☐ **d)** seq: 5302 ☐ **f)** ACK: 8402 ■ **h)** ACK: 8502 ■ **j)** FIN

> **11** What are the ISNs of the client and the server? Mark one for A and one for B:

☐ **a)** A: 5000 ☐ **c)** A: 8000 ■ **e)** A: 8100 ■ **g)** B: 5000 ☐ **i)** B: 5100 ☐ **k)** B: 8000
☐ **b)** A: 5001 ☐ **d)** A: 8050 ☐ **f)** A: 8101 ☐ **h)** B: 5001 ☐ **j)** B: 5101 ☐ **l)** B: 8001

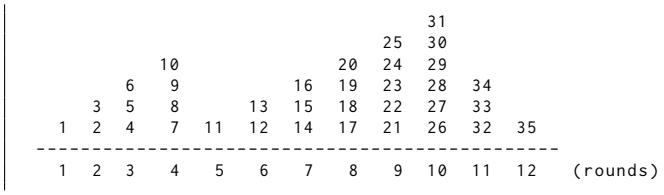
> **12** Select **all** items that describe the message sent by A at tick 11:

☐ **a)** seq: 8500 ■ **c)** seq: 8502 ☐ **e)** ACK: 5300 ☐ **g)** ACK: 5302
☐ **b)** seq: 8501 ☐ **d)** seq: 8503 ■ **f)** ACK: 5301 ☐ **h)** FIN

> **13** What is the value of *ssthresh* (in bytes) at tick 13 if the initial value was 64 KiB?

☐ **a)** 100 ☐ **b)** 200 ☐ **c)** 400 ■ **d)** Does not apply

B [4p] Consider the following diagram representing the congestion window of a TCP connection. The numbers indicate the order in which the segments are sent, regardless its content. Assume that *rwnd* > *cwnd* and that the initially *ssthresh* = *2 MSS*. Answer the following questions:



> **14** (1p) Indicate the rounds during which the Slow Start algorithm is applied (check **all** that apply):

- ■ **a)** 1
- ■ **b)** 2
- ☐ **c)** 3
- ☐ **d)** 4
- ■ **e)** 5
- ■ **f)** 6
- ☐ **g)** 7
- ☐ **h)** 8
- ☐ **i)** 9
- ☐ **j)** 10
- ☐ **k)** 11
- ■ **l)** 12

> **15** (1p) Indicate in which round(s) the value of *ssthresh* changes and what the new value that it takes (check **all** that apply):

- ☐ **a)** Round 2: 3 MSS
- ☐ **b)** Round 4: 1 MSS
- ■ **c)** Round 4: 2 MSS
- ☐ **d)** Round 10: 3 MSS
- ■ **e)** Round 11: 1.5 MSS
- ☐ **f)** Round 10: 4 MSS

> **16** (1p) Indicate the round(s) in which 3 duplicate ACKs are received (check **all** that apply):

- ☐ **a)** 1
- ☐ **b)** 2
- ☐ **c)** 3
- ☐ **d)** 4
- ☐ **e)** 5
- ☐ **f)** 6
- ☐ **g)** 7
- ☐ **h)** 8
- ■ **i)** 9
- ☐ **j)** 10
- ☐ **k)** 11
- ☐ **l)** 12

> **17** (1p) If the value of MSS=100 bytes, how many effective bytes (excluding RTX) are received?

- ☐ **a)** 3100
- ☐ **b)** 3200
- ■ **c)** 3300
- ☐ **d)** 3400
- ☐ **e)** 3500
- ☐ **f)** 3600

18 [1p] Why does TCP set $cwnd = swnd/2$ after receiving 3 duplicate ACKs, instead of $cwnd = cwnd/2$?

- ■ **a)** The sending rate is determined by swnd, not by cwnd.
- ☐ **b)** Because swnd is always greater than cwnd.
- ☐ **c)** False. It is $cwnd = ssthresh/2$.
- ☐ **d)** False. It is $cwnd = rwnd/2$.

19 [1p] What is the main goal of the fast recovery algorithm?

- ☐ **a)** To reduce the sending rate to alleviate congestion.
- ☐ **b)** To temporarily increase the retransmission timer.
- ■ **c)** To avoid a too abrupt drop in the sending rate.
- ☐ **d)** To recover lost segments.

20 [1p] What technique is commonly used in AQM (Advanced Queue Management)?

- ■ **a)** Drop packets before the input queue becomes full.
- ☐ **b)** Drop packets after the input queue becomes full.
- ☐ **c)** Forward excessive traffic to another router.
- ☐ **d)** Send excessive traffic back to the sender.