

This exam consists of 15 question totalling 20 points. The maximum duration is 40 minutes. Three wrong answers subtract a point. Only an answer if correct if otherwise not stated. Calculator use is forbidden. Write legibly using only the reserved area.

Apellidos: _____ Nombre: _____ Grupo: _____

1. (1p) Which of the following code fragments is the most similar to a basic web client?

```
1 // a)
2 s = socket(AF_INET, SOCK_STREAM)
3 s.sendto('GET /index.html HTTP/1.0\n\n', ('www.example.net', 80))
4 s.recvfrom(32)
```

```
1 // b)
2 s = socket(AF_INET, SOCK_DGRAM)
3 s.connect('http://www.google.com')
4 s.recvfrom('GET /index.html HTTP/1.0\n\n', 80)
```

```
1 // c)
2 s = socket()
3 s.connect(('1.2.3.4', 2000))
4 s.send('GET / HTTP/1.0\n\n')
5 s.recv(32)
```

☐ a) .
☐ b) .

☐ c) .

2. (1p) The following listing, corresponding to a basic TCP server, contains an error. In what line?

```
1 sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
2 sock.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
3 sock.bind(('', int(sys.argv[1])))
4 sock.listen(30)
5
6 while 1:
7     child_sock, client = sock.recv()
8     start_new_process(handle, (child_sock, client))
```

☐ a) line 1
☐ b) line 3

☐ c) line 4
☐ d) line 7

3. (1p) What does this listing do?

```
1 server = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
2 server.bind(('', 3000))
3
4 while 1:
5     message, endpoint = server.recvfrom(1024)
6     client = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
7     client.connect(endpoint)
8     client.send(message)
9     client.close()
```

- ☐ a) It's a TCP server that sends itself the same requests that it receives from a remote client.
☐ b) It's a TCP client that creates a new server each time it receives a response.
☐ c) It's a kind of proxy that returns the message to the client, but using a different protocol.
☐ d) It's an HTTP proxy that allows the client to decide the remote port to send the subsequent requests.

4. (1p) Which of the following applications is best suited to be implemented with a CL-mode service?
- ☐ a) A documentary database for a corporate intranet.
 - ☐ b) A FPS (First Person Shooter) multiplayer video game.
 - ☐ c) A cloud storage service with automatic synchronization.
 - ☐ d) An instant messaging application for groups.
5. (1p) Choose the correct statement regarding *packet switching*:
- ☐ a) All packages with the same identifier follow the same path.
 - ☐ b) All packets belonging to the same flow are routed through the same virtual circuit.
 - ☐ c) Each packet is routed independently to its destination.
 - ☐ d) The end-to-end transfer rate is guaranteed.
6. (1p) The "silly window" syndrome can be avoided...
- ☐ a) With the Nagle algorithm.
 - ☐ b) With dynamic routing algorithms.
 - ☐ c) Sliding the window.
 - ☐ d) Can not be avoided.
7. (1p) TCP assumes that congestion exists when a segment is lost or duplicated ACKs are received. This open-loop technique may fail, that is, it may detect congestion erroneously. In which case?
- ☐ a) TCP uses a closed loop technique, not open.
 - ☐ b) When the physical medium has a significant failure rate.
 - ☐ c) When the network protocol needs source packet fragmentation.
 - ☐ d) Segment loss is due to a flow control problem, not congestion.
8. (1p) The re-transmission timer...
- ☐ a) is recalculated continuously.
 - ☐ b) depends on sequence number.
 - ☐ c) is negotiated during connection establishment.
 - ☐ d) is specified in the TCP header.
9. (1p) What are the usual traffic profiles?
- ☐ a) Slow traffic and fast traffic.
 - ☐ b) Only one traffic profile exists.
 - ☐ c) Constant bit rate and variable bit rate.
 - ☐ d) Constant bit rate, variable bit rate and burst
10. (1p) Half-duplex is characterized by...
- ☐ a) Data can flow only in one direction.
 - ☐ b) It's possible to transmit and receive simultaneously.
 - ☐ c) It's possible to transmit and receive, but not simultaneously.
 - ☐ d) The data is temporarily stored in the queue of the router.
11. (1p) Which of the following fields do **NOT** appear in the TCP header?
- ☐ a) Destination port.
 - ☐ b) Urgent pointer.
 - ☐ c) Destination IP address.
 - ☐ d) Header size.
12. (1p) With TCP, if host A sends a segment to host B with a value of window=0. What happens next?
- ☐ a) A sends a connection close segment.
 - ☐ b) B is waiting before sending new data.
 - ☐ c) A notifies the end of the disconnect or keep-alive timeout.
 - ☐ d) B sets its cwnd to half the threshold value at that time.

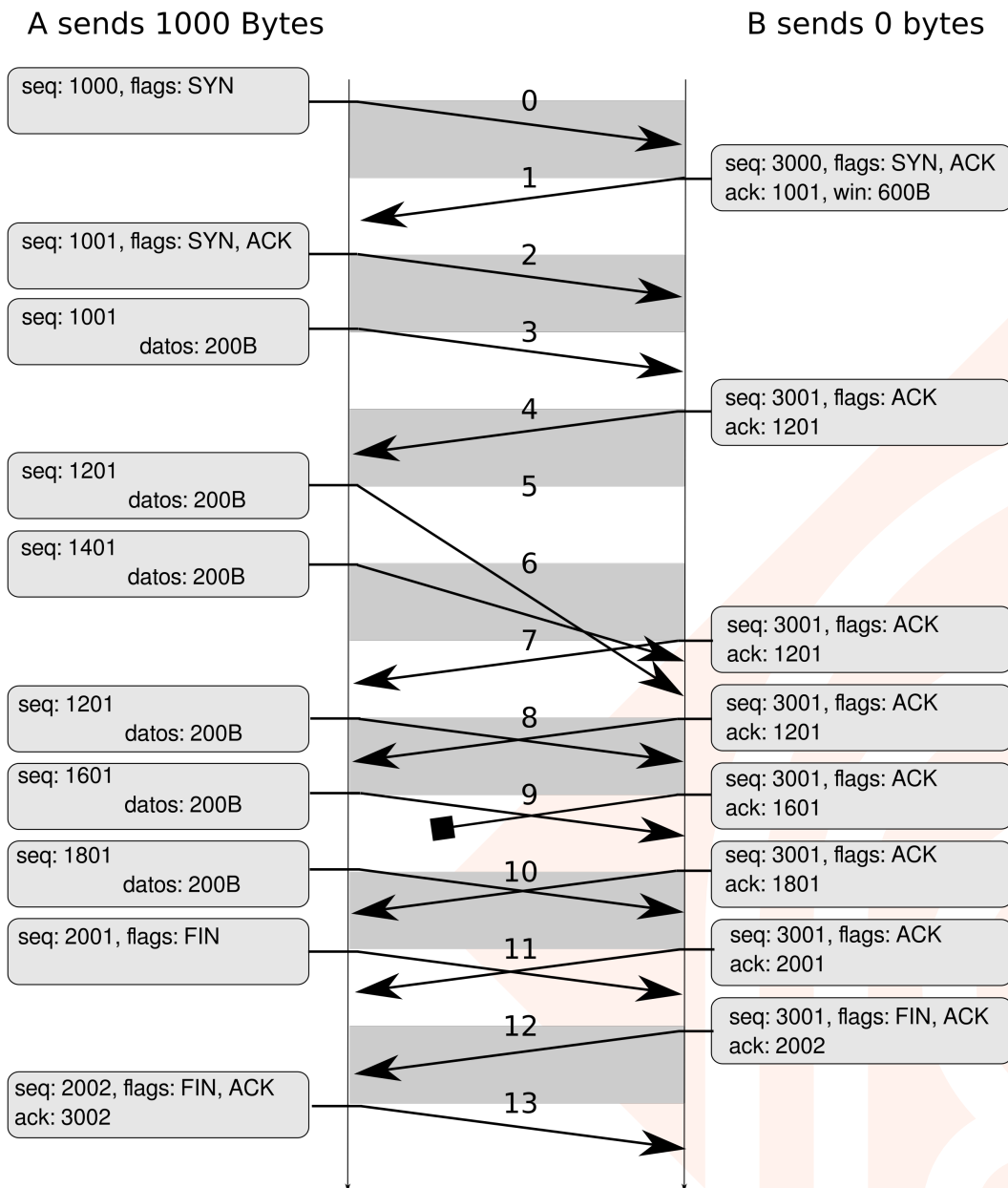
13. (1p) What does the "window size" field mean in the TCP header?

- ☐ a) TCP header size in bytes. ☐ c) Amount of data that the sender may send.
- ☐ b) Received segment size in bytes. ☐ d) Number of data the sender may receive.

14. (4p) The following figure shows a TCP flow, including connection and disconnection. Note that:

- A is using Slow Start to prevent congestion.
- The retransmission timer for segments in A is set to 3 clock ticks.
- A uses a fixed segment size of 200 bytes.
- A will send segments with data whenever possible.

Correct (on the figure) the 4 existing errors: 1 segment left over, 3 segments contain wrong values in the header. Errors marked incorrectly will result in 1 point penalty (in this exercise).



15. (3p) During a TCP connection, the following events have occurred:

- During the connection, client and server negotiated a MSS=200 btes and a threshold=60000 bytes in both directions.
- Timeouts for segments 7 and 13 sent by the server expired before the corresponding ACKs arrive.
- Just after the server sent the segment 23, it received an ACK identical to the previous 3.

Continue the graph of the server congestion window until the round 12 assuming ($rwnd > cwnd$) was fulfilled throughout the connection

Write the the value of the server threshold whenever it changes.

