Quiz 7: TCP and UDP

1. Which of these statements is correct?
   a. The window size at the receiving end of a TCP connection is communicated in one of the mandatory fields of the TCP header.
   b. The maximum segment size used on a TCP connection is communicated in one of the mandatory fields of the TCP header.
   c. The congestion window size is indicated in an optional field of the TCP header.
   d. The congestion window size is indicated in a mandatory field of the TCP header.

   Look at the TCP header. The mss (maximum segment size) is carried as an option. Congestion window size is just maintained at the sender and not communicated to the receiver in a header field.

2. If the sender’s window is as shown in the figure below, and if the advertised window size (receiver window size) is 1024 bytes, which segments can be sent? Assume that the cwnd is not a limiting factor.

<table>
<thead>
<tr>
<th>1</th>
<th>512</th>
<th>513</th>
<th>1024</th>
<th>1025</th>
<th>1536</th>
</tr>
</thead>
<tbody>
<tr>
<td>sent but unacknowledged</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   a. 513-1024, 1025-1536 segments
   b. All three segment shown above are sent
   c. No segments can be sent
   d. 513-1024 segment only

   Since the advertised window from the receiver is 1024 bytes, the sender can send two segments. Since it has already sent one segment (which is as yet unacknowledged) it can only send one more.

3. What is the cwnd value when the ack 6024 segment is received?

   ...
If cwnd = ssthresh, the sender is in slow start. Therefore it adds one mss value to the cwnd value $(4096 + 1024 = 5120)$.

4. If RTO=6 ms, A=2 ms, D=1 ms before transmission of the first segment shown in the figure, what is the RTO after the ack is received?
   a. 6.125 ms  
   b. 12.875 ms  
   c. 6 ms  
   d. 12 ms  

   X d. 12 ms

When a retransmission occurs, the RTO is doubled. So the RTO is 12ms when the packet is retransmitted. RTO is not computed when the ack arrives because of Karn’s algorithm.

5. Which of these figures represents a correct TCP transmission sequence? Each arrow represents a maximum-length TCP segment and MSS = 1024 bytes.
   a. Data flow I  
   X b. Data flow II
c. Data flow III
d. None of the above

The first flow is not correct because it shows two segments being sent when the cwnd is 1024 bytes (just 1 segment). The third flow is also not correct because the advertised window (from the receiver) is 1024 bytes; this means the sender can only send one segment even though its cwnd is 2 MSS bytes. Data Flow II is correct. cwnd is 2 MSS bytes as is the advertised window.

6. What flow control mechanism is used in the UDP protocol?
   a. ON/OFF flow control
   b. Window based flow control
   c. Rate based flow control
   X d. None of the rest

UDP is a basic transport protocol that only supports multiplexing and error detection (with a checksum field). It does not have a flow control mechanism.

7. If the sequence number of a TCP segment is 1501, and the TCP segment payload is 400 bytes long, what is the acknowledgment number carried in the TCP header of this segment?
   a. 1901
   X b. Unknown
   c. 1501
   d. 1900

The ACK number carried in the TCP header depends upon the flow in the opposite direction. Since this information is not provided in the question, the answer is Unknown.

8. If an advertised window for a TCP connection is 4000 bytes, MSS is 256 bytes, cwnd is 2560 bytes, ssthresh is 65K bytes, and a retransmission timeout occurs, what is the new value of cwnd?
   a. 512 bytes
   b. 128 bytes
   c. 2000 bytes
   X d. 256 bytes

When the retransmission timer times-out, it signifies a loss. The TCP sender reacts by lowering the rate of transmission by setting its cwnd to 1 segment. Since the MSS is 256 bytes, this is the answer.