Computer Networks || Assignment # 3

Question 1

In this problem we investigate whether either UDP or TCP provides a degree of end-point authentication.

a. Consider a server that receives a request within a UDP packet and responds to that request within a UDP packet (for example, as done by a DNS server). If a client with IP address X spoofs its address with address Y, where will the server send its response?

b. Suppose a server receives a SYN with IP source address Y, and after responding with a SYNACK, receives an ACK with IP source address Y with the correct acknowledgment number. Assuming the server chooses a random initial sequence number and there is no "man-in-the-middle," can the server be certain that the client is indeed at Y (and not at some other address X that is spoofing Y)?

Question 2

Consider the rdt 3.0 protocol. Draw a diagram showing that if the net-work connection between the sender and receiver can reorder messages (that is, that two messages propagating in the medium between the sender and receiver can be reordered), then the alternating-bit protocol will not work correctly (make sure you clearly identify the sense in which it will not work correctly). Your diagram should have the sender on the left and the receiver on the right, with the time axis running down the page, showing data (D) and acknowledgment (A) message exchange. Make sure you indicate the sequence number associated with any data or acknowledgment segment.

Question 3

Consider a channel that can lose packets but has a maximum delay that is known. Modify protocol rdt2.1 to include sender timeout and retransmit. Informally argue why your protocol can communicate correctly over this channel.

Question 4

Suppose that the UDP receiver computes the Internet checksum for the received UDP segment and finds that it matches the value carried in the checksum field. Can the receiver be absolutely certain that no bit errors have occurred? Explain.

Question 5
a. Why is the three-way handshake considered a reliable method for establishing a TCP connection?
b. Can you describe a scenario where one of the steps in the three-way handshake fails, and how the protocol handles this situation?
c. Compare and contrast the two-way handshake with the three-way handshake in TCP.
d. What are the potential drawbacks or limitations of using a two-way handshake compared to a three-way handshake?
e. In what specific situations might a two-way handshake be preferred over a three-way handshake, and why?

Question 6
Scenario: A client is transmitting data to a server using the Go-Back-N protocol over a network connection. The client window size is set to 4. The client has sent frames 1, 2, 3, and 4 successfully to the server. However, the ACK for frame 3 is lost in transit.

a. Describe what happens at the client's side and the server's side when the ACK for frame 3 is lost.
b. How does the Go-Back-N protocol handle this situation? Explain the actions taken by both the client and the server.
c. If the timeout period expires at the client side after the loss of ACK for frame 3, what frames will be retransmitted by the client?

Question 7
A client and a server are communicating over a network connection using the Selective Repeat protocol with a window size of 4. The client has sent frames 1, 2, 3, 4, 5, and 6 to the server. The server has received frames 1, 2, and 4, but frames 3, 5, and 6 are lost in transit.

a. Describe the actions taken by the server upon receiving the frames.
b. Explain how the client handles the situation when it doesn't receive ACKs for frames 3, 5, and 6.
c. Discuss the retransmission process for frames 3, 5, and 6 at the client's side.
d. If the client's window size were smaller (e.g., 3), how would it affect the protocol's behavior in this scenario?