ECE 545 Quiz 2

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Question 1:

1. Error Detection: The protocol should have a mechanism to detect errors in the received data, such as checksums or cyclic redundancy checks (CRC).
2. Error Correction: The protocol should be able to correct errors detected by the error detection mechanism. For example, the receiver can request the sender to retransmit the data that was corrupted.
3. Flow Control: The protocol should ensure that the sender does not overwhelm the receiver with too much data. This can be achieved using techniques such as windowing or feedback-based control.
4. Congestion Control: The protocol should be able to handle situations where the network is congested, either due to heavy traffic or temporary failures. This can be achieved through mechanisms such as rate control or congestion avoidance.
5. Retransmission: The protocol should have a mechanism for retransmitting lost or corrupted data. This can be done by having the sender maintain a buffer of previously sent data or by using sequence numbers to detect and retransmit lost packets.
6. Acknowledgment: The protocol should require the receiver to acknowledge the receipt of data, to ensure that the sender knows that the data was successfully received.
7. Timeout: The protocol should have a timeout mechanism to ensure that the sender does not wait indefinitely for an acknowledgment or a response from the receiver.
8. Sequencing: Sequencing is used to ensure that data is transmitted and received in the correct order. This is important because packets can arrive out of order due to network congestion, delays, or errors. The receiver must be able to put the packets in the correct order to reconstruct the original data.
9. Buffering: Buffers are used to store data temporarily to smooth out variations in transmission rates. Buffers can also be used to hold packets that have arrived out of order until they can be re-sequenced.
10. Quality of Service (QoS): QoS mechanisms are used to prioritize traffic and ensure that critical data gets through the network with minimal delay and loss. QoS can be implemented using traffic shaping, prioritization, and scheduling techniques.

Question 2:

TCP Reno and TCP Tahoe are two congestion control algorithms used in the Transmission Control Protocol (TCP). While both algorithms regulate data flow over a network to avoid congestion and ensure reliable communication, they differ in how they handle congestion control. TCP Tahoe uses a simple slow-start mechanism, with cwnd always set to 1 (timeout or 3 duplicate acks), while TCP Reno introduces a more aggressive fast recovery mechanism. The main advantage of TCP Reno over TCP Tahoe is that it can recover more quickly from congestion events and resume sending data at a higher rate.