

Due Nov 10th at the **beginning** of class

1. Consider the CRC generator polynomial $x + 1$ used to generate CRC checksums like you did in the project.
 - a. How many bits are in the resulting checksum? **1**
 - b. Consider the message 101. What is the checksum value (show your division).
0
 - c. Consider the message 111. What is the checksum value (show your division)
1
 - d. You have seen this CRC algorithm under a different name. What is it? **parity**

2. TCP acknowledgements are not reliable – they are not retransmitted if they are lost in transit. Assume that 50% of all TCP acknowledgements are lost. Does this affect the reliability of a session? Why or why not?

Losing acknowledgements should not impact the reliability of the session so long as the sending host keeps trying to retransmit when it believes a packet has been lost (eventually an acknowledgement will get through). Losing acknowledgements will cause TCP congestion control to operate more slowly, because the congestion window is increased directly in proportion to the number of ACKs received.

3. Why do IP packets carry a time-to-live (TTL) field? What would happen if they didn't have it?

The TTL is needed to keep packets from circulating forever. This could happen, despite packets reaching all reachable nodes, if a packet is sent to a node that does not exist; fails before the packet arrives; or cannot be reached because failures have partitioned the network

4. Consider a reliable data transfer protocol that uses only negative acknowledgements (i.e. messages from the receiver indicating that particular data was not received). Suppose the sender sends data only infrequently. Would a NAK-only protocol be preferable to a protocol that uses ACKs? Why? Now suppose the sender has a lot of data to send and the end-to-end connection experiences few losses. In this second case, would a NAK-only protocol be preferable to a protocol that uses ACKs? Why?

With a NAK-based protocol, a lost packet will only be detected when a subsequent packet is correctly received by the receiver (which will then notice a gap in the received sequence numbers). This means that with infrequent data

transmissions, a NAK based protocol can have a long error recovery time. Hence, a NAK-only protocol would not be desirable in this case. On the other hand, if errors are rate and the data rate is high, an ACK-based scheme is not desirable as there is high overhead (for the ACKs).