CS 447-003 Networks and Data Communications
Fall 2023
Quiz #6 on September 28, 2023

Your Last Three Digits: ________________
(please do NOT write all of your student ID or your name)

Grade: ______

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(1) How do CRC detect transmission errors (explain)? It is suggested to answer this question using an example. If your solution needs more space (than provided below, use extra piece of papers (will be provided during Quiz #6).

M: 1110110
K: 10110
K: 10110

(2) Calculate the (expected) link-utilization if the sliding-window flow-control is used for the following case:

Signal Propagation Delay \((P)\): 25ms
Packet size: 450 bytes
Signal Transmission Rate: 1Gbps \((1G = 10^9)\)
Window-size \((N)\): 9,500

\[
T = (450 \times 8) \times 1.0\text{ns} = 3,600 \times 1.0\text{ns} = 3,600\text{ns}
\]

\[
U = (N \times T)/(T + 2 \times 25\text{ms}) = (9,500 \times 3,600\text{ns})/(3,600\text{ns} + 50\text{ms})
\]

\[
= (34,200,000\text{ns})/(50,003,600\text{ns})
\]

\[
= (34,200,000\text{ns})(50,003,600\text{ns})
\]

\[
= 0.684 \ (= 68.4\%)
\]
(3) Describe how “TCP slow-start” and “linear growth” are used for dynamically adjusting the window size.

The following four properties are expected for full credit:

(a) TCP slow-start starts at ‘1’ (or 2)

(b) TCP slow-start increases the window size by the number of ACKs comeback (or double when all ACKs comeback)

(c) When one of the ACKs did not come back, the windows size will be ½

(d) After the window size becomes ½, then, increase the window size by one each time all ACKs come back

(4) What are the primary disadvantages of “GBN-ARQ” over “selective-reject ARQ”?

(a) Since GBN will retransmit all the packets after the one “NACKed” by a receiver (even though all of them, except the NACKed one) are successfully received a receiver), GBN will increase the network traffic load (or GBN will cause logically unnecessary packet transmissions).

(b) Retransmitting possibly a large number of unnecessary packet will take longer for transmitting payload data.

Note: As long as (a) is mentioned, you will earn full credit.

(5) What is (are) the primary advantage(s) of “GBN-ARQ” over “selective-reject ARQ”?

(a) Since GBN will retransmit all the packets after the one “NACKed” by a receiver (even though all of them, except the NACKed one) are successfully received a receiver), the receiver does not have to keep (buffer) all the packets after the one NACKed. This is a safer approach than the selective-reject ARQ especially for the host computers that are connected to a fast network (e.g., one @ 10 Gbps).