COMP 5416 Week 5

Exercise 1 Stop-and-Wait ARQ vs. Go-Back-N ARQ

In the following net its packets that pass through B and C, and arrive at the destination D. Th is R = 1 Mbit/sec. The maximum packet size in the network is 500 Byte size. The one-way propagation delay on each link is 4msec.

(1) How long does it take to transmit a file of size 40,000 Bytes if A and D use Stop-and-Wait ARQ? Assume that there is no error in transmission in the network, and the size of ACK packets is negligible.

N = 40000/500 = 80 packets

RTT = 6 * prop_delay + 3 * T = 24 + 12 = 36 msec

Total delay = 80 * 36 = 2.88 sec

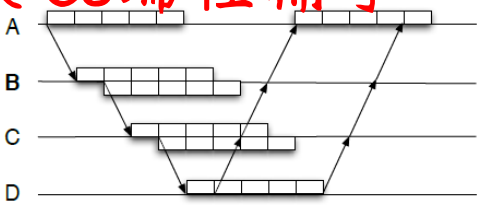
(2) How long does it take to transmit a file of size 40,000 Bytes if A and D use the Go- Back-5 ARQ and B and C are Store-and-Forward? Assume that there is no error in transmission in the network, and the size of ACK packets is negligible

RTT = 3T + 6 * prop_delay
= 3 * 4 + 6 * 4
= 36 msec

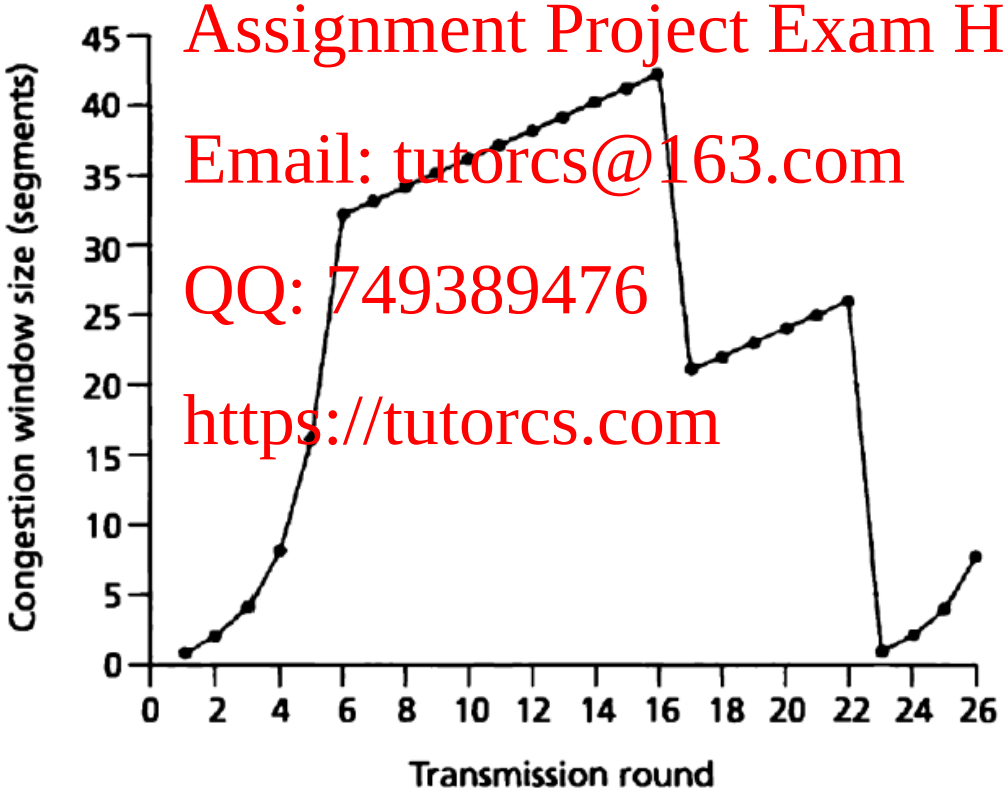
no of batches =

Total delay =
=

The ACK for t
in the last windo



Exercise 2: Congestion Control



Consider the above figure. Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions. In all cases, you should provide a short discussion justifying your answer.

a. Identify the intervals of time when TCP slow start is operating. 1,2,3,4,5,23,24,25,26

b. Identify the intervals of time when TCP congestion avoidance is operating. 6--22

c. After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? triple duplicate ACK

d. After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? timeout

e. What is the initial value of ssthresh at the first transmission round? 32

f. What is the value of ssthresh at the 18th transmission round? 21
g. What is the value of ssthresh at the 24th transmission round? 8
h. During what transmission round is the 70th segment sent?
7th round (first 6 rounds 1+2+4+8+16+32=63, 7 round 33)
i. Assuming a packe[illegible]r the 26th round by the receipt of a triple duplicate ACK, what will be t[illegible]gestion window? 7 (but will become 4 if newACK is received)
j. Suppose TCP Tah[illegible] TCP Reno), and assume that triple duplicate ACKs are received at the 1[illegible] the ssthresh and the congestion window size at the 19th round? ssthresh
k. Again suppose TC[illegible]d there is a timeout event at 22nd round. How many packets have been sent out from 17th round till 22nd round, inclusive?

	17	18	19	20	21	22	sum
cwnd	1	2	4	8	16	21	52
ssthresh	21	21	21	21	21	21	