PART B

(1) Print the first ten congestion window sizes:

Explanation:

Here, I am keeping track of the last packet sent by the sender and the first packet received by the sender from the receiver. Then, the difference between the sequence number of the last packet sent and acknowledgement number of the first packet received is the congestion window.

One can see from below results that for each flow, the congestion window first increases then decreases. This is because the packets must have been getting lost at that time. The window size keeps on increasing until one of the packets is lost. At loss, the congestion window size decreases. This is the expected behavior which I witnessed in my code results as well.

Initial congestion window will be equal to the maximum segment size: 1460

Code Results:

Calculating the first 10 congestion window sizes for Flow: 1
Congestion Window: 11584
Congestion Window: 13032
Congestion Window: 14480
Congestion Window: 15928
Congestion Window: 17376
Congestion Window: 18824
Congestion Window: 20272
Congestion Window: 18824
Congestion Window: 17376
Congestion Window: 15928
Calculating the first 10 congestion window sizes for Flow: 2
Congestion Window: 11584
Congestion Window: 13032
Congestion Window: 11584
Congestion Window: 15928
Congestion Window: 17376
Congestion Window: 15928
Congestion Window: 14480
Congestion Window: 17376
Congestion Window: 18824
Congestion Window: 17376
Calculating the first 10 congestion window sizes for Flow: 3
Congestion Window: 11584
Congestion Window: 13032
Congestion Window: 11584
Congestion Window: 10136
Congestion Window: 8688

Congestion Window: 7240
Congestion Window: 5792
Congestion Window: 4344
Congestion Window: 2896
Congestion Window: 1448

(2) Number of times retransmission occurred due to triple duplicate ack for each flow:

Number of retransmissions due to triple duplicate ack: 2
Number of retransmissions due to triple duplicate ack: 36
Number of retransmissions due to triple duplicate ack: 0

Number of times retransmission occurred due to timeout for each flow:

Number of retransmissions due to timeout: 2
Number of retransmissions due to timeout: 59
Number of retransmissions due to timeout: 1

Explanation:

Here, I have taken 2 dictionaries that will hold the number of packets with the same sequence number and the number of packets with the same acknowledgement number. Then, I have checked whether an acknowledgement for a packet has been sent more than 2 times, in that case triple ack will occur. Counter is kept to store the number of triple acks. Further, I have subtracted the total retransmitted packets from the number of triple acks counter value which provided me with the value for packets lost due to timeout.