Section B

Overview:

The task here is to analyze the congestion control in TCP packets.

Code:

1. Class **Packet** is used to read the packet bytes and ascertain the packet attributes. Function **parse** is used to initialize the packet attributes.
2. Class **Connection** is used to ascertain the flow of the packets between the source and destination ports.
3. Function **ParseConnections** is used to assign ports and track the flow of each packet.
4. Function **retransmissions** are used to calculate the retransmitted packets, and differentiate between the number of packets retransmitted due to TDA and timeout.

Output:

1. **Congestion Window Size:**

```
Congestion Window:  [1, 14, 27, 56, 74, 100, 141, 216, 298, 386]
Congestion Window:  [1, 11, 33, 41, 63, 96, 139, 196, 309, 413]
Congestion Window:  [1, 29, 54, 59, 100, 129, 217, 341, 196]
```

2. **Compute Retransmissions:**

```
Retransmission of duplicate packets : 3
Packets retransmitted due to Triple Ack Loss: 2
Packets retransmitted due to timeout: 1

Retransmission of duplicate packets : 94
Packets retransmitted due to Triple Ack Loss: 36
Packets retransmitted due to timeout: 58

Retransmission of duplicate packets : 0
Packets retransmitted due to Triple Ack Loss: 0
Packets retransmitted due to timeout: 0
```

Explanation:

1. **Congestion Window Size:**

Congestion window size is the number of unacknowledged packets from the sender to the receiver. For a failed packet, we have multiple ACKs. The window size is estimated per the RTT value. We calculate the number of packets sent in the time between first packet is sent and 1 RTT elapses. So the congestion window size estimation is done at the sender.

We calculate 10 such congestion window sizes. The initial congestion window is 1, as we wait for SYN-ACK following the SYN.

We observe that the congestion window size increases multiplicatively, but not by a factor of 2.

2. **Compute Retransmissions:**

We calculate the retransmitted packets in the flow. These might be due to Triple Duplicate ACK or due to timeout.

TDA: We find the sequence number of the retransmitted packets in the ACK, and keep its count. If this count is more than or equal to 3, we declare TDA.

Timeout: We find the number of packets retransmitted due to Retransmission Time Out (RTO) by subtracting TDA packets from the total retransmitted packets.