Department of Computer Science and Engineering,
Anna University, Chennai- 600025
CS23502– NETWORKS AND DATA COMMUNICATION
Practical
July- Oct 2026
Year/Sem/Batch : III/V/ N

Exercise: 8	TCP Congestion Control	03- 09- 2026

Observation questions:

1. Go-Back-N

In Go-Back-N ARQ, assume the sender window size is **4** and frames 0, 1, 2, and 3 are transmitted. If frame 2 is lost, explain:

- What acknowledgement is generated by the receiver?
- Which frames are retransmitted by the sender?
- Why are correctly received frames after frame 2 retransmitted?

2. Selective Repeat with Timeout

In Selective Repeat, frames 0–4 are sent and frame 2 is lost. The receiver successfully receives frames 3 and 4. If the sender uses **individual timers**, explain what happens when the timer for frame 2 expires.

3. Selective Repeat with NAK

Differentiate between **ACK-based retransmission** and **NAK-based retransmission** in Selective Repeat. If frame 3 is missing but frame 4 is received, what information should the receiver send to the sender?

4. Fast Retransmission

A sender receives three duplicate ACKs for frame 5. Explain how the **Fast Retransmission** mechanism responds without waiting for the normal timeout. Why is this mechanism faster than timeout-based retransmission?

5. Comparison

Compare **Go-Back-N, Selective Repeat with Timeout, Selective Repeat with NAK, and Fast Retransmission** based on:

- Retransmission strategy
- ACK/NAK mechanism
- Timer requirement
- Bandwidth efficiency
- Handling of lost frames

Execution Questions

1. Develop a Java **TCP Client–Server application** to simulate the **Go-Back-N ARQ protocol**.

The Client acts as the sender and the Server acts as the receiver.

The program should:

1. Accept the total number of frames and sender window size from the Client.
2. Transmit frames according to the Go-Back-N window.
3. Allow the user to specify a frame that is considered **lost/corrupted**.
4. The Server should discard the lost frame and subsequent out-of-order frames.
5. The Server should send cumulative ACKs.
6. On detecting the loss, the Client should retransmit the lost frame **and all subsequent frames in the current window**.
7. Display the complete transmission, ACK, loss, and retransmission sequence.

2. Develop a Java **Client–Server program** to simulate **Selective Repeat ARQ using individual timeout timers**.

The program should:

1. Accept the number of frames and window size.
2. Transmit multiple frames within the window.
3. Allow the user to specify one or more lost frames.
4. The Server should accept correctly received out-of-order frames and buffer them.
5. The Client should maintain a **separate timer for each transmitted frame**.
6. When a frame's timer expires, only that frame should be retransmitted.
7. The Server should send individual ACKs for successfully received frames.
8. Display the timer expiration and retransmission process.

3. Develop a Java **TCP Client–Server application** to simulate **Selective Repeat ARQ using NAK**.

The program should:

1. Send frames using a sliding window.
2. Simulate the loss of a selected frame.
3. Allow subsequent frames to reach the Server.
4. The Server should detect a missing frame when a higher-numbered frame arrives.
5. The Server should send a **NAK containing the missing frame number**.
6. On receiving the NAK, the Client should immediately retransmit only the requested frame.
7. The Server should acknowledge the retransmitted frame.
8. Display the complete ACK, NAK, and retransmission sequence.

4. Develop a Java **Client–Server application** to simulate **Fast Retransmission using duplicate ACKs**.

The program should:

1. Establish communication between Client and Server using TCP sockets.
2. Send frames sequentially using a sliding window.
3. Simulate the loss of a frame.
4. The Server should generate duplicate ACKs when it receives subsequent out-of-order frames.
5. The Client should maintain a duplicate-ACK counter for each frame.
6. When **three duplicate ACKs** are received for the same frame, the Client should immediately retransmit that frame.
7. The retransmission must occur **without waiting for the timeout**.
8. Display the duplicate ACK count and fast retransmission event.

Spot Question

1. Modify the Go-Back-N Client–Server program so that:

- Window size is changed from **4 to 3**.
- Frame **3** is considered lost instead of frame 2.
- The program should display which frames are retransmitted.

2. Modify the Fast Retransmission Client–Server program so that:

- The retransmission threshold is changed from **3 duplicate ACKs to 2 duplicate ACKs**.
- Frame **4** is lost.
- Display the duplicate ACK count and retransmission event.