Computer Networks
Spring 2025
Assignment#3 (6C & 6A)

Due Date: Tuesday, 25th March, 2025
Submission Mode & Time: Handwritten solutions to be submitted during the lecture.

Please note the following:

1. No exceptions to the above date and time will be allowed. Inability to submit the assignment by the required time will result in zero marks.

2. To ensure self-completion of assignments and discourage plagiarism, the instructor or the relevant TA may randomly contact you and ask for an explanation of your answers. Where plagiarism and/or cheating is evident, you will be referred to the departmental disciplinary committee. In extreme cases of plagiarism an F may be awarded immediately with further referral to university disciplinary committee.

3. All solutions must be **hand-written.**

4. **Assignment Solution Submission**: In case of **in person / physical lectures at the campus**, hard copy of the hand-written assignment's solutions will be submitted by **hand** by each student to the Instructor / TA directly during the lecture on the due date.

PART-1

Use the following text for completion of this part of the assignment:
Computer Networking - A Top-Down Approach 8th Edition by Kurose & Ross.

Solve the following problems from the back of **Chapter 3**. Every Question has equal marksi.e.

Review Questions: **(3*2 = 6 marks)** **[CLO 3]**

R3, R11

Problems: **(4*6 = 24 marks)** **[CLO 3]**

P2, P3, P4, P40

PART - 2

Question1 [10Marks] [CLO 3]

(a) Explain the role of port numbers in multiplexing and demultiplexing at the transport layer. [5]

(b) A host receives the following four segments: [5]

Source IP: 10.1.1.1, Source Port: 55000, Destination IP: 192.168.1.2, Destination Port: 80

Source IP: 10.1.1.2, Source Port: 55001, Destination IP: 192.168.1.2, Destination Port: 80

Source IP: 10.1.1.1, Source Port: 55000, Destination IP: 192.168.1.2, Destination Port: 8080

Source IP: 10.1.1.2, Source Port: 55001, Destination IP: 192.168.1.2, Destination Port: 443

For each segment, describe how the transport layer would demultiplex the segments to the correct application.

Question2 [5Marks] [CLO 3]

Suppose a sender is transmitting packets over a lossy channel using a Stop-and-Wait protocol. If the probability of packet loss (either the data packet or the acknowledgment) is 0.2, what is the probability that a single packet will be successfully transmitted and acknowledged without requiring retransmission?

Question3 [5Marks] [CLO 3]

Consider a TCP connection where the Maximum Transmission Unit (MTU) is 1,500 bytes, the round-trip time (RTT) is 100 ms, and no packet losses occur.

(a) If the connection is in steady state, with no losses, what is the average throughput of the connection?
Assume that the congestion window size is 10 MTU.

(b) If a single packet loss occurs, estimate how the throughput would be affected in the next RTT. Assume fast retransmit and fast recovery are used.

(c) How does TCP throughput behave when the RTT increases, assuming no other changes?