

CS447 – Networks and Data Communications

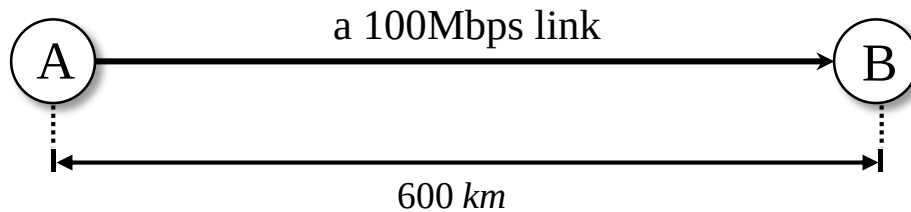
Summer 2026

Exercise Questions on June 23rd, 2026

EXERCISE #1:

Estimate the link-bandwidth utilization for the link (connection) from A to B using stop-and-wait flow-control with the following assumptions:

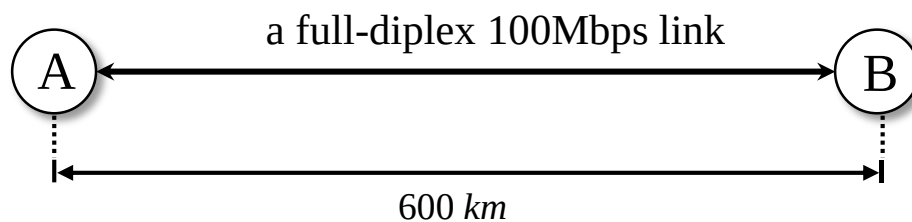
- The signal transmission rate between A and B (each direction) is 100 Mbps ($M = 10^6$)
- The propagation delay is $5\mu s/km$ (1 second = 1,000,000 λs , $km = 10^3m$)
- All packets are 500 bits long; ACK messages are separate packets of negligible length.
- The link distance is 600 km
- No error



EXERCISE #2:

Estimate the link-bandwidth utilization for the link (connection) from A to B using sliding-window with the following assumptions:

- The signal transmission rate between A and B (each direction) is 100 Mbps ($M = 10^6$)
- The propagation delay is $5\mu\text{s}/\text{km}$ for both lines
- The link (connection) is full-duplex connection
- All packets are 1,000 bits long; ACK messages are separate packets of negligible length.
- The link distance is 600 km
- Window-size is 20
- No error



EXERCISE #3:

In the figure below, frames (packets) are generated at node A and sent to node C through node B. Determine the minimum data rate required between nodes B and C so that the buffers at node B are not flooded, based on the following assumptions. If it is not possible, show that it is impossible.

- The signal transmission rate between A and B is 10 Mbps ($M = 10^6$)
- The propagation delay is $5\mu\text{s}/\text{Km}$ for both lines
- The two links are both full-duplex lines
- All data packets are 1,000 bits long; ACK messages are separate packets of negligible length.
- Sliding-window flow control is used for link A-B.
- Stop-and-wait flow control is used for link B-C
- Window size = 100 for A-B
- No error

