

SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2021

ENSC 427: COMMUNICATION NETWORKS
ENSC 894: SPECIAL TOPICS II COMMUNICATION NETWORKS

Midterm No. 1
Monday, March 01, 2021

Duration: 110 minutes. Attempt all problems. Questions are not equally weighted. Please provide detailed answers and include diagrams, graphs, and tables, as needed. Expand all acronyms. Closed book and closed notes. Simple calculators (with no graphing/programming functions) are permitted. PDAs, laptops, and wireless phones are not permitted. Please write legibly. Illegible text will not be graded. Please use a pen (no pencils, please).

1. Chapter 1 Computer Networks and the Internet (15 points):

Consider sending a packet from a source host to a destination host over a fixed route.

- (a) List the delay components in the end-to-end delay. (3 points)
- (b) Which of these delays are constant and which are variable? (3 points)
- (c) How long does it take a packet of length L to **propagate** over a link of distance d , propagation speed s , and transmission rate R bps? (3 points)
- (d) Does this delay depend on packet length? Justify your answer. (3 points)
- (e) Does this delay depend on transmission rate? Justify your answer. (3 points)

2. Chapter 2 Application Layer (15 points):

Consider an HTTP client that wants to retrieve a Web document at a given URL. The IP address of the HTTP server is initially unknown.

- (a) What transport and application-layer protocols besides HTTP are needed in this scenario? (5 points)
- (b) Provide an example of DNS name resolution. (5 points)
- (c) What transport protocol(s) does DNS use: TCP, UDP, or both? (5 points)

3. Chapter 3 Transport Layer (35 points):

Use flow diagrams with a sender and a receiver side to illustrate your answers.

- (a) Describe the Stop-and-Wait protocol. (5 points)
- (b) Illustrate the following cases:
 - i. Operation with no loss; (5 points)
 - ii. Lost packet; (5 points)
 - iii. Lost ACK; (5 points)
 - iv. Premature time-out. (5 points)
- (c) Describe Go-Back-N in operation with a lost packet. (5 points)
- (d) Describe Selective Repeat in operation with a lost packet. (5 points)

4. Chapter 3 Transport Layer (15 points):

Consider the Selective Repeat protocol. Use flow diagrams with a sender and a receiver side to illustrate your answers.

- (a) Illustrate the Selective Repeat receiver dilemma with too-large windows: a new packet or a retransmission? (Hint: Consider the cases when all ACK packets are lost.) (5 points)
- (b) Suppose the sequence number space is of size k . What is the largest allowable sender window that will avoid the occurrence of such problems? Justify your answer. (10 points)

5. Case Study: Distributed Denial of Service Attacks (20 points):

- (a) What was the goal of the simulation study? (2 points)
- (b) What are distributed denial of service (DDoS) attacks? (3 points)
- (c) List four elements and steps that take place during a DDoS attack. (3 points)
- (d) List at least three defenses against such attacks. (3 points)
- (e) Describe simulation topologies. (3 points)
- (f) List at least three queuing algorithms used in simulation scenarios. (3 points)
- (g) Summarize the main findings based on simulation results. (3 points)