

**SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE**

**Spring 2009
ENSC 427: COMMUNICATION NETWORKS**

Final Examination
Thursday, April 9, 2009

Duration: 180 minutes. Attempt all problems. Please provide detailed answers and include diagrams and tables, as needed. Expand all acronyms. Questions are equally weighted. Closed book and closed notes. Simple calculators (with no graphing/programming functions) are permitted. PDAs, laptops, and wireless phones are not permitted.

1. Consider telegraph, telephone, and the Internet network architectures:
 - List and approximately date main historical developments in their evolution.
 - Identify types of deployed switching technologies.
 - List main network elements.
 - Provide examples of applications delivered to users.

2. Consider data networks:
 - List five layers in the data network reference model. Describe the role of each layer and its protocols.
 - Show a diagram describing headers and trailers in each layer. Identify the names of each data unit.
 - Show a diagram of the TCP/IP protocol suite.
 - Describe the Hypertext Transfer Protocol. What are caching and cookies and why are they used?

3. Consider circuits-switching networks:
 - Provide detailed specification of the T-1 carrier system.
 - What is the difference between the North American Digital Multiplexing Hierarchy and the CCIT Digital Hierarchy? List the DS1/E1 and DS2/E2 bit rates.
 - What is the SONET hierarchy? List the STS-1/OC-1 and STS-3/OC-3 bit rates.
 - Describe a model for a typical traffic process. Give the expression for the Erlang B formula. Describe the system where the formula may be applied.

4. Consider local area networks:

- Describe three scheduling algorithms: polling, token passing, and random access.
- Describe the ALOHA random access scheme. Show its diagram.
- Describe the Carrier Sense Multiple Access scheme. List two of its variants. Where is the CSMA scheme used?
- Provide details of the Ethernet LAN protocol. What are Fast and Gigabit Ethernets? Indicate their speeds.

5. Consider packet-switching networks:

- Show the network layers and protocol stacks and identify the end-to-end and the node-to-node layer operations.
- Describe routing. Identify the layer responsible for its implementation.
- What are routing tables and where are they stored?
- Name and describe two main shortest-path routing algorithms.