

SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2012

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

Midterm No. 1

Wednesday, February 8, 2012

Duration: 50 minutes. Attempt all problems. Please provide brief and concise answers and include diagrams and tables, as needed. Expand all acronyms. Questions may not be 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. Communication Networks and Services (15 points):

- List main elements of a telephone network. Show hierarchical telephone network structure.
- What is a protocol? Give an example of a connection oriented protocol.
- What is the Domain Name System?

2. Applications and Layered Architecture (20 points):

- List the layers of the OSI reference model and the layers of the data network reference model.
- Consider the data network reference model:
 - List one example of a protocol used in each layer. List names of data units for each layer.
 - Name the layer responsible for providing end-to-end communications with reliable service.
 - Show layers present in the following network elements: server, client, and router.

3. Digital Transmission Fundamentals (20 points):

- Give the formula for the Shannon channel capacity. Define SNR and give its units.
- Explain the Nyquist signaling rate. Provide a simple example.
- What is the bandwidth of a channel? Provide a simple example.
- Briefly describe sampling and quantization of analog signals.

4. Case Study: Mapping the Internet (20 points):

- List three key principles used to map the Internet.
- Describe how “traceroute” works.
- Provide several key details regarding the algorithm proposed in the study.
- List the main conclusions of the study.

5. OPNET Tutorial: M/M/1/Queue (25 points):

- Describe the M/M/1 queue, show the system diagram, and describe its components.
- List the main model parameters.
- List the process model attributes of the processor module.
- List the process model attributes of the queue module.
- List the statistics that you collected in the OPNET M/M/1 queue tutorial. Show graphs illustrating typical simulation results.