

**SIMON FRASER UNIVERSITY  
SCHOOL OF ENGINEERING SCIENCE**

**Spring 2011  
ENSC 427: COMMUNICATION NETWORKS**

**Midterm  
Wednesday, February 9, 2011**

*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. Applications and Layered Architecture (25 points):**

- List the layers of the OSI reference model and the layers of the data network reference model.
- Consider the data network reference model:
  - Provide examples 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 a chart with elements of the TCP/IP protocol suite.

**2. Digital Transmission Fundamentals (25 points):**

- Provide the formula and explanation for the Shannon channel capacity.
- Explain the Nyquist signaling rate. Provide a simple example.
- What is the bandwidth of a signal? Provide a simple example.
- Define SNR and give its units.
- List two models for communication channels and list the model parameters.

**3. OPNET Case Studies, GPRS (25 points):**

- List main specifications of the GPRS technology.
- List main elements of the GPRS network architecture.
- List network elements and protocols simulated in the GPRS OPNET case study.
- Explain the cell update and the mechanism used in GPRS networks to perform hand-over of mobile users.
- Illustrate graphically simulation results of a successful cell update.

**4. OPNET Tutorials, LAN Modeling (25 points):**

- List at least five types of editors used to create OPNET models.
- What is the main function of a process model? What are the elements of a process model?
- List two features in modeling of LAN networks addressed in the LAN Modeling Tutorial.
- Which application was simulated in the LAN Modeling Tutorial?
- List three types of statistics collected from the OPNET LAN simulations.