SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2012
ENSC 427: COMMUNICATION NETWORKS
ENSC 894 SPECIAL TOPICS II: COMMUNICATION NETWORKS

Midterm No. 2
Wednesday, March 14, 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. **Circuits-Switching Networks (25 points)**:
   (a) Provide detailed specification of the T-1 carrier system.
   (b) Describe elements of a typical traffic model.
   (c) What is *offered load*? What does 1 Erlang of offered load correspond to?
   (d) Give the expression for the Erlang B formula. Provide details for each variable.
   (e) Give an example of a system where the formula may be applied.

2. **Peer-to-Peer Protocols and Data Link Layer (25 points)**
   (a) Briefly describe major functions of ARQ protocols.
   (b) List the three ARQ protocols. Use *the flowing sequence of events diagrams* for each. Clearly identify both the frame and ACK numbers.
   (c) What is the maximum window size in each case?

3. **Case Study, WiMAX: (25 points)**:
   (a) Describe the focus of the case study.
   (b) Show the network architecture used in the study.
   (c) List main WiMAX broadband access specifications.
   (d) Show simulated network and video clients topologies.
   (e) List main conclusions emanating from the OPNET simulations. Include performance metrics and expected average and ideal values.

4. **OPNET Tutorials, CSMA/CD (25 points)**:

   (a) List two channel access protocols that were modeled in this tutorial and show the digram of the modeling hierarchy.

   (b) Show the elements of the Aloha transmitter process model and the generic transmitter node model.

   (c) Show the elements of the generic receiver process model and the node model.

   (d) Provide a graph showing simulated *channel throughput* as a function of *channel traffic*.

   (e) What is the expected theoretical result for a pure Aloha system? How did the simulation results compare to the theoretical analysis?