

SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2015
ENSC 427: COMMUNICATION NETWORKS

Final Exam
Monday, April 20, 2015

Duration: 180 minutes. Attempt all problems. Questions are not equally weighted. Closed book and closed notes.

Simple calculators (with no graphing/programming functions) are permitted. PDAs, laptops, and wireless phones are not permitted. Please provide brief and concise answers and include diagrams, graphs, and tables, as needed. Expand all acronyms. Please write legibly. Illegible text will not be graded. Please use a pen (no pencils, please).

1. **Applications and Layered Architectures (15 points):**

- (a) List the layers in the OSI reference model.
- (b) List the layers present in data networks.
- (c) Indicate layers present in the following network elements: server, client, router, bridge, and hub.

2. **Peer-to-Peer Protocols and Data Link Layer (15 points):**

- (a) Write the expression for estimating *round-trip time*?
- (b) Write the expression for estimating *time-out*?
- (c) State typical values of the parameters.

3. **Packet-Switching Networks (40 points):**

Consider the packet network shown in Figure 1.

- (a) Use the Bellman-Ford algorithm to find the shortest path from node 1 to node 8. Show each step of the algorithm using an appropriate table. Draw the shortest path tree from all the other nodes to node 8.
- (b) Use the Dijkstra algorithm to find the shortest path tree from node 1 to node 8. Show each step of the algorithm using an appropriate table. Draw the shortest path tree from node 1 to all the other nodes.

4. **TCP/IP (30 points):**

- (a) What is the name for TCP connection establishment? Describe the process.
- (b) What is the name for TCP connection termination? Describe the process.
- (c) List the four phases of the TCP congestion control. Indicate each phase on a plot of *TCP window size* vs. *time*.

(d) State two mechanisms employed by TCP to detect packet loss. How does TCP react in each case?

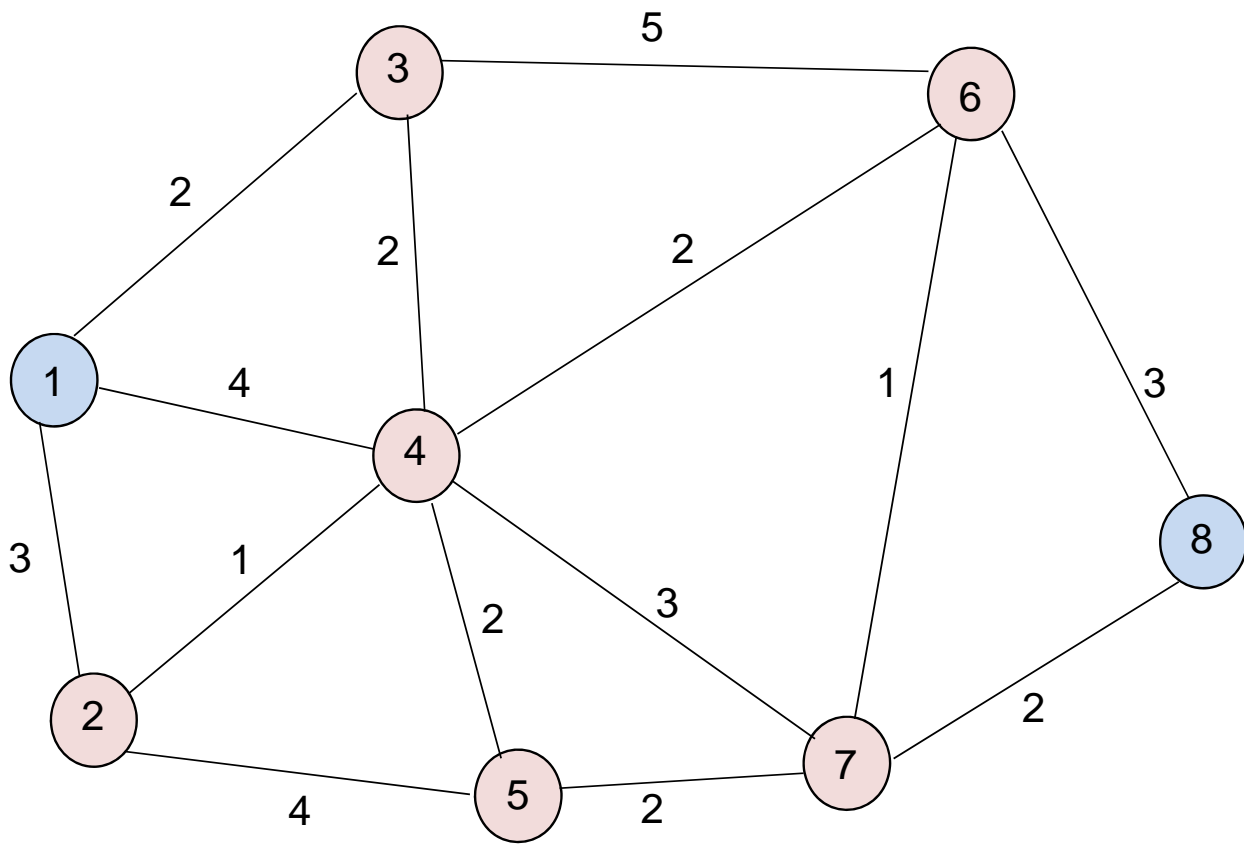


Figure 1: Packet network with eight nodes.