

SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2014

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

Final Examination
Thursday, April 17, 2014

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 detailed answers and include diagrams, graphs, and tables, as needed. Expand all acronyms.

Please write legibly. Illegible text will not be graded. Use a ball-point pen for writing the examination (no pencils, please).

1. **Circuit Switching Networks (10 points)**

- (a) Write the Erlang B formula. Explain all variables.
- (b) Illustrate the usage of the formula.

2. Medium Access Control Protocols and Local Area Networks (20 points):

- (a) What is CSMA/CD? Briefly describe the algorithm.
- (b) List and briefly describe the three CSMA back-off mechanisms.

3. Packet-Switching Networks (25 points):

- (a) List two main families of routing algorithms. List an example for each family.
- (b) Describe the Bellman-Ford algorithm using the network shown in Fig. 1. Assume that node 6 is the destination node. Show each step of the algorithm using an appropriate table. Draw the shortest path tree found by the algorithm.
- (c) What is the counting to infinity problem in routing? Show a simple example to illustrate the problem.
- (d) Describe two remedies: Split Horizon and Poisoned Reverse.

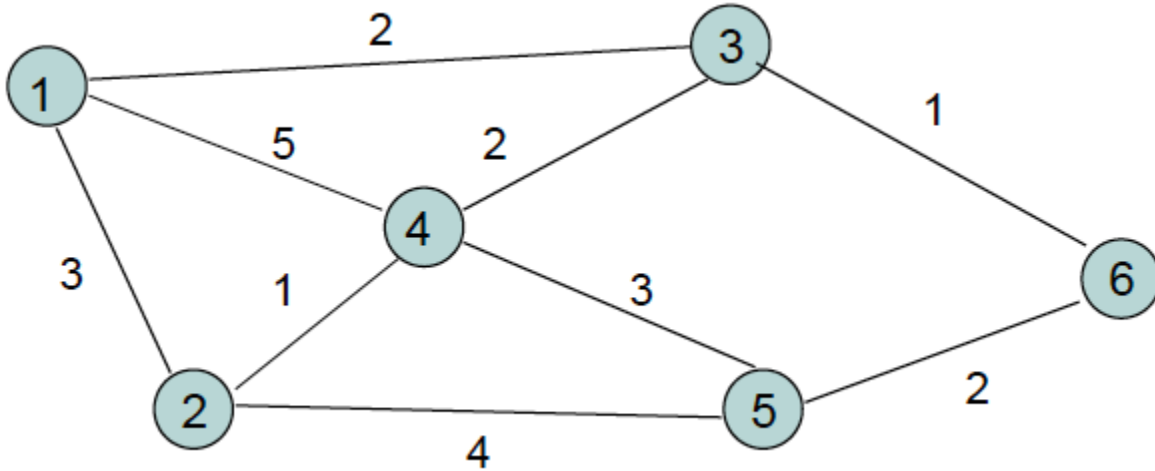


Figure 1: A network with associated link costs.

4. **TCP/IP (20 points):**

- (a) What is an Autonomous System (AS)?
- (b) What is the Interior Gateway Protocol (IGP)? Where is it used? List two well known IGPs.
- (c) What is the Exterior Gateway Protocol (EGP)? Where is it used? List the well known EGP example.
- (d) List two main IPv6 features. What is the mechanism used to route IPv6 packets through a network with IPv4 routers?

5. **TCP/IP (25 points):**

- (a) List all steps of the TCP connection establishment. Include all messages and sequence numbers. State the commonly used name of this process.
- (b) List all steps of the TCP connection closing. Include all messages and sequence numbers. State the commonly used name of this process.
- (c) List the four phases of the TCP congestion control algorithm. Indicate each phase on a plot of TCP *window size* vs. *time*.
- (d) What are the two mechanisms used by TCP to detect packet loss? How does TCP react in each case?