CS 344/444
Computer Network Fundamentals
Midterm Exam
Spring 2007

03/07/2007

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<th>Question</th>
<th>344 Points</th>
<th>444 Points</th>
<th>Score</th>
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<tbody>
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Name:_________________________________

Course:   CS344 □            CS444 □

**Instructions:**
1. You have 60 minutes to finish
2. Question 5 is **only** for 449 students
3. Closed books, closed notes. Write all your answers using the pages on this exam (use back pages if needed)
   • Calculators allowed
   • This exam has 8 pages, including this cover page
**Question 1 (10 points)** Answer the following using True/False. You do not need to explain your answers.

1. One of the functionalities that transport protocols provide is reliable transfer over unreliable channels.

2. The Selective Repeat ARQ protocol is more efficient than the Go-Back-N ARQ protocol.

3. Efficiency of the Token Ring MAC protocol is higher than Ethernet when network utilization is high.

4. ARP is used to bind MAC addresses to IP addresses.

5. A router works at the Networking layer of the protocol stack.

6. Routing on the Internet is divided in two tiers.

7. CSMA/CD is an appropriate MAC protocol for ad-hoc wireless networks.

8. Link State routing protocols suffer from the "count to infinity" problem.

9. Reassembly of IP fragments happens only at the destination host.

10. Each router in OSPF broadcasts its *routing table* to all the other routers in the network.
**Question 2:** Suppose node A is connected to B via an intermediate router R. The A-R link is instantaneous, but the R-B link transmits only one packet each second, one at a time (so two packets take 2 seconds). Assume A sends to B using the sliding window protocol with SWS=4. For Time=0,1,2, state what packets arrive at and are sent from A and B. How large does the queue at R grow?
**Question 3:** For the network below, give global distance-vector tables for all nodes in the network when:

**Note:** Each row in the distance-vector table should contain destination and distance to that destination.

(a) **(10 points)** Each node knows only the distance to its immediate neighbors.
(b) (10 points) Each node has reported the information it had in the preceding step to its immediate neighbors

(c) (10 points) Step (b) happens a second time
Question 4: (30 points)
Consider the situation involving the creation of a routing loop in the network below, when the A-E link goes down. List a sequence of table updates among A, B, and C, pertaining the destination E, that leads to a loop. Assume that table updates are done one at a time, that the split horizon technique is used by all participants, and that A sends an initial report of E's unreachability to B before C. You man ignore updates that don't result in changes.
Question 5: (CS444 Only)
Consider the shortest path problem from every node to node 1 and Dijkstra's algorithm. Suppose that we have already calculated the shortest path from every node to node 1, and assume that a single arc length increases. Modify Dijkstra's algorithm to recalculate as efficiently as you can the shortest paths.