First Third-Term Exam

Open book and notes; In class   *Thursday, October 14th*

⊕ *Do not forget to write your name on the first page. Initial each subsequent page.*
⊕ *Be* **neat** *and* **precise**. **I will not grade answers I cannot read.**
⊕ *You should draw simple figures if you think it will make your answers clearer.*
⊕ *Good luck and remember, brevity is the soul of wit*

- All problems are mandatory

- I cannot stress this point enough: **Be precise**. If you have written something incorrect along with the correct answer, you should **not** expect to get all the points. I will grade based upon what you **wrote**, not what you **meant**.

- Maximum possible points: 50.

Name: _____

Problem	Points
1	
2	
3	
4	
5	
Total	

1. Routing

   (a) Show with a small example a case where the *Poisoned Reverse* technique fails. (4 points)

   (b) Are packet sequence numbers *required* to implement reliable flooding for link state routing? Why or why not? (3 points)

   (c) What specific problems does *subnetting* solve? (3 points)

2. IP, Addressing

    (a) How are IP multicast addresses allocated? (2 points)

    (b) Does BGP require knowledge of CIDR allocations? (3 points)

    (c) Propose a lookup algorithm for a CIDR forwarding table that does not require linear scanning for the longest match. Explain your assumptions and worst case performance. (5 points)

3. TCP and IP

   (a) In each case, state whether the following state transitions are legal for TCP. If legal, state what actions at the two ends might cause the transition. If not legal, state why it cannot happen. (2 points each)

   - LISTEN → SYN_RECVD

   - SYN_SENT → SYN_RECVD

   - ESTABLISHED → TIME_WAIT

   (b) Suppose you are designing a reliable byte-stream protocol (like TCP) that uses a sliding window. The protocol will run over a 1-Gbps (10^9 bps) network; the max. RTT in the network is 140ms (a ms is 10^{-3} seconds), and the max. segment lifetime in the network is 60 seconds. How many bits would you include in the AdvertisedWindow and SequenceNumber fields of your protocol header? Why (Show your work)? (4 points)

4. IP and Multicast

   (a) Show an example of why and how a parent router is chosen in DVMRP. (3 points)

   (b) Describe a situation where you might you IP tunneling.(2 points)

   (c) What is the action prescribed by PIM-SM when a single source sends data to the group at a high rate? Explain in detail. (5 points)

5. Reliable Transfer

    (a) Derive an expression for the largest size of the sending window for an arbitrary (but fixed) receiver window size. Prove that your sending window size limit is necessary (i.e. a larger window will lead to errors). (5 points)

    (b) Describe using pseudocode how you implemented timeouts in Assignment 3. (5 points)