Second Third-Term Exam

⊕ *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. Nomenclature

   (a) Describe the following terms: (2 points each)
      - Authoritative Answer

      - BitCoin Block Chain

      - DNS Zone

      - Silly Window Syndrome

      - Congestion Avoidance

2. Reliable Transfer

   (a) What are *incarnation numbers* for a TCP connection? (1 point)

   (b) When might you consider disabling Nagle's algorithm? Why? (2 points)

   (c) What is the TIME-WAIT state in TCP? Why is it required? (3 points)

   (d) Suppose you implement reliable transfer using sliding windows using 3-bit sequence numbers, send/receive window sizes of 5 (frames can have sequence numbers 0, 1, 2, 3, 4). Assume that you have a *perfect* forward channel, but a lossy reverse channel, i.e. data can never be lost, but ACKs can be lost or delayed. Argue why your choice of parameters is safe or show with an example how the protocol fails. (4 points)

3. DNS/TCP

    (a) What is the difference between iterative and recursive DNS lookups? (2 points)

    (b) What is "simultaneous open" in TCP? Explain with a labeled diagrams demonstrating the state transitions and packet timings. (3 points)

    (c) What is a "glue" record? How are they used?(2 points)

    (d) Describe the compression scheme used in DNS messages. (3 points)

4. 802.11

   (a) Describe the role of beacon frames in 802.11. (2 points)

   (b) Why are acknowledgements used in 802.11 but not in Ethernet?(2 points)

   (c) Alice and Bob attempt to send one piece of data at the same time over WiFi. Assuming that RTS/CTS is used for all messages, draw the remaining interactions until both users finish. (2 points)
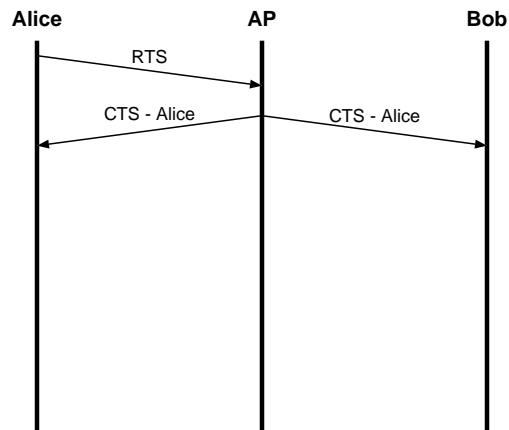
   (d) Describe the problem that occurs when B tries to transmit to A while C tries to transmit to D. How can we solve it? (4 points)
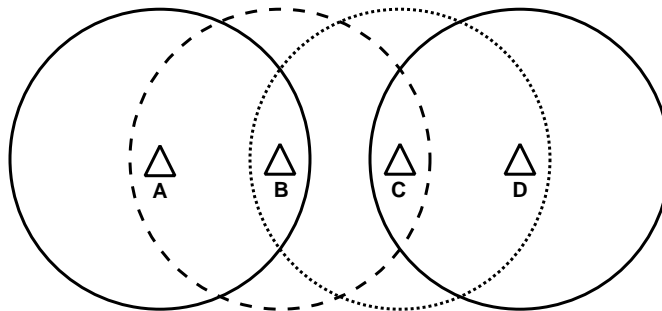
5. DHTs, BitTorrent and BitCoin

    (a) Describe two attacks an adversary could mount if they could control the head of the BitCoin block chain. (2 points)

    (b) Recall that BitTorrent clients provide equal service to the top-four clients from the previous round. Explain two ways in which this behavior can be exploited for receiving disproportionate service. (It is fine to list the techniques described in BitTyrant). (2 points)

    (c) Assume you have implemented a DHT (such as Chord). Describe a protocol for using the DHT to provide multicast service. Assume that a single DHT node is the source of data that a subset of DHT nodes are interested in. List the protocol steps the source, the destinations, and intermediate nodes (if any) must implement. Discuss the relative merits and demerits of your design. (6 points)