First 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)
        - Proxy ARP

        - Autonomous System

        - Split Horizon

        - Default-free router

        - Subnet mask

2. Routing

   (a) What changes were required in routing and forwarding protocols due to CIDR?(3 points)

   (b) What happens when a router fails in link-state routing? How is the situation different if it reboots quickly vs. after a prolonged period? (3 points)

   (c) After processing a routing update, the propagate step at node x in Distance Vector routing states:
       $\forall$ dest. y and neighbor w
           if $min_w D^x(y, w)$ changed, send $D^x(y, w)$ to all neighbors
       Show with an example why the min_w clause is required, i.e., incorrect routes are computed if updates are sent out without the minimum changing. (4 points)

3. Internet Protocol

  (a) How does the creation of a new subnet with an AS affect global routing tables? Why?(2 points)

  (b) Consider an IP packet sent from A to B through router R. Using the terminology in class (node A's IP address is A, MAC address is a, B's (IP, MAC) address are B, b)), draw a diagram that shows the different headers and addresses on the packet as it traverses from A to B. (3 points)

  (c) Suppose you need fragment a IP datagram with 1280 payload bytes to be transmitted over a link with 1044 byte MTU (excluding link layer headers). Fill in the values below assuming maximum sized fragments. (2 points) (Each incorrect value will lose $\frac{1}{2}$ point)

Identification	Offset	MF	DF	Total len.
1044				

  (d) Suppose you've been allocated 123.45.67.00/21. Can you split your addresses into three equal size subnets? If yes, list the subnet IDs and subnet masks. If no, say why not. (3 points)

4. Mobile IP, CIDR, BGP

   (a) What is the difference between a stub and multi-homed AS? (2 points)

   (b) Give two examples where BGP improves on EGP? (2 points)

   (c) Under what circumstance can a mobile host *not* tunnel *return* packets via its Home Agent? (3 points)

   (d) What prefix should ISP A advertise on link l to the Internet? Ci are customers of ISP A with the address allocations as shown. Note: 224 = 128+64+32. (3 points)

118.20.224/22

Link l

ISP A

C1

C2

118.20.230/23

C3

118.20.228/23

Miscl.
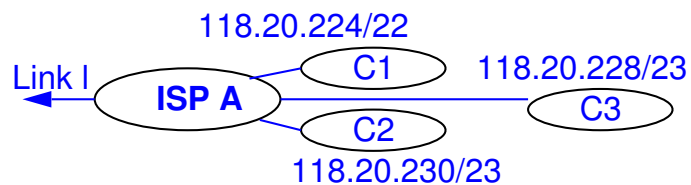
5. (a) How did IP forwarding change when subnetting was added? (2 points)

   (b) Show an example where Split Horizon fails to stop counting to infinity. List the events that cause DV to "fail". (3 points)

   (c) Suppose you want to write a single-process TCP server that accepts new connections on two sockets $s1$ and $s2$. Write pseudocode to show how you would set up these sockets such that the server can reliably read 512 bytes from each client no matter when they connect how they send the data (one byte at a time, all 512 at the same time...). (5 points)

   (d) Where are the Pitcairn islands? (Bonus, 1 point)