

Final Exam

*Closed book and notes; In class**Saturday, May 18*

- ⊕ *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: 60.

Name: _____

Problem	Points
1	
2	
3	
4	
5	
6	
Total	

1. General

(a) Precisely define the following terms: (5 points)

i. Protocol:

ii. Latency:

iii. IP subnet:

iv. DNS Zone:

v. Ethernet Bridge:

(b) Describe the service provided by TCP. (5 points)

2. IP addressing and routing

(a) How does CIDR *change* the IP forwarding rule? Explain with an example. (5 points)

(b) Give two differences between BGP and RIP (a distance-vector routing protocol). (5 points)

3. Application-layer protocols

- (a) Describe why FTP does not work with plain NAT, and propose a fix. (Explain any complications/problems with the fix as well) (4 points)

- (b) How does NNTP propagate news articles? (2 points)

- (c) Describe in detail the problems with the multiple HTTP/1.0 connections approach used by some early browsers (notably Netscape). (4 points)

4. Error correction, MAC Layer Protocols

- (a) Why is *slotted-Aloha* more efficient than *Aloha*? (2 points)
- (b) Assume that the probability of a successful transmission using slotted-Aloha is e^{-G} , where G is the total load offered per slot time. Derive the maximum channel utilization. (4 points)
- (c) Describe how the CRC checksum algorithm works. (4 points)

5. Advanced topics: IP-mobility and traceback

- (a) What is the *safest* way to send packets under IP-mobility? Show with an example why this can sometimes not be ideal. (5 points)

- (b) Describe how a TCP-SYN attack is performed. (2 points)

- (c) Why can't an attacker *fake* information when the *edge-marking* algorithm is used for IP traceback?
(3 points)

6. Design

- (a) Suppose Alice wants to send Bob the message “Meet me for dinner at 8p”. Alice and Bob know each other’s public keys. Devise a simple protocol that Alice and Bob can use to efficiently exchange a symmetric key (called a session key) such that Alice can send her message to Bob using this session key. (2 points)
- (b) The “Slashdot Effect” is a colloquial term which describes overload on Internet Web servers that host popular pages (e.g. pages that have recently been referenced on www.slashdot.org). Devise a protocol for handling such short busty load spikes. If your solution works, then the response time for pages will not increase appreciably even if the number of users accessing these pages increase by several orders of magnitude. Be precise about your assumptions and describe the shortcomings (if any) of your solution. (8 points)