

Final Exam

*Open book and notes; In class**Thursday, December 16th*

- ⊕ *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. IP, Multicast

(a) Give a simple example where CIDR prefixes are aggregated *two* levels. Describe your example with IP addresses that match at each level. (3 points)

(b) Why is pruning necessary for DVMRP?(2 points)

(c) Why are IP addresses suited for global routing (as opposed to, say, MAC addresses)? (5 points)

3. Application-layer Protocols, Sockets

(a) How does NNTP ensure that articles do not circulate forever in the network? (2 points)

(b) In the worst case, how many “chunks” can be affected by the change to a single byte in a LBFS file? Explain. (3 points)

(c) Suppose 20% of the hosts in a Chord system are disconnected because they all belonged to a single AS and that AS's outgoing link fails. Suppose each item was replicated at 3 successors (4 copies total). What is the probability that any given item can still be located in the network? Show your work and rationale. (5 points)

4. MAC Layer protocols/Error Correction

(a) Describe *Binary Exponential Backoff* as used in Ethernet. (2 points)

(b) Prove that in a correctly transmitted data block with 2-D parity, the bit shared by the parity row and the parity column will be consistent (i.e. set to the same number). Be precise. (4 points)

(c) Consider the CRC generator polynomial $x^4 + 1$. What properties does it have and why? (4 points)

5. Design

Consider file-swapping programs such as Kazaa or Gnutella (to be used only for explicitly legal purposes, such as scalably distributing research papers!). These systems often construct a two layer hierarchy in which some peers are promoted to be “supernodes”. Peers are either a supernode, or connected to a supernode. Supernodes index content that is available at peers connected to them. Queries not satisfied at a supernode are resolved using some supernode-supernode protocol.

(a) How would you choose a peer to be a supernode? Critique your choice. (5 points)

(b) Suppose Chord is used as the supernode-supernode protocol. Discuss the merits and demerits of such a choice. (5 points)