CMSC 417 Computer Networks **Fall 2017**

Final Exam

Open book and notes; In class *Tuesday, Dec. 19th, 1030a*

⊕ *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: (2 points each)

   - Burst error

   - Distribution System (DS)

   - DNS Zone

   - Go-Back-N

   - Exposed Node Problem

2. Network and Transport

   (a) List two uses of the AS-path attribute in BGP. (3 points)

   (b) Why does TCP require the `TIME-WAIT` state? (3 points)

   (c) Suppose you enable the TCP window scale (WSCALE) option (and use maximum scaling), but do *not* enable the Timestamps (TS). What is the maximum throughput you can achieve on a 40Gbps, 100ms RTT end-to-end link? Explain why. (4 points)

3. MAC Protocols

(a) How does 802.3 (Ethernet) address "hidden" nodes? (2 points)

(b) A 802.11 DCF sender waits for one DIFS prior to sending even if the channel is sensed free. Why? (2 points)

(c) Suppose you increased the data transmission rate on 802.3 (Ethernet) to 100Mbps, without changing the MAC protocol or any protocol parameters. Explain one problem that would ensue. (2 points)

(d) List three different changes you could make to fix this problem (1+1+2 points)

4. DNS/Application Layer

(a) Why do typographic errors form a major fraction of queries received at DNS root servers? (2 points)

(b) What is the per-peer state kept by BitTorrent peers? (Describe each state, as opposed to just naming them.) (2 points)

(c) Suppose *all* the peers in a BitTorrent swarm are behind NATs. (How) Would the protocol function? (3 points)

(d) Consider a Chord alternate that replicates items r times by "naming" an item using r different hash functions, and inserting each item at these r names. Compare this design to Chord's original technique of replicating at $r - 1$ successors. (3 points)

5. General

(a) A CRC with divisor degree n can detect all n bit burst errors. Can a n-bit CRC detect all errors in a message with n bits of data? Why/why not? (2 points)

(b) The Ethernet CRC polynomial is $x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x^1 + 1$. Can it detect an odd number of errors? If yes, explain why. If not, give an example of a transmitted message and received where an odd number of errors is not detected. (4 +1 bonus points)

(c) Suppose you administer the domain `ispyon.everyone` and have delegated a subdomain `secret.ispyon.everyone`. (How) can you ensure that you can log every IP address that looks up a name in the delegated domain? (4 +1 bonus points)