

ECE3076 Final Exam**Dec. 2009**

RULES.

- i This quiz is **not** open book. Three original sheets of hand-written notes may be used. Calculators are ok.
- ii Answer all questions and **show all work** to receive full credit. Use back of sheets only if necessary.
- iii Please do not ask the proctors any questions during the exam about exam questions. Part of the test is understanding the question, as written, without supplemental information. If you feel additional data is needed to solve the problem, make (and state) an assumption and then work the problem.
- iv. This is a time-limited test. If you find you are taking more than 15 minutes on a particular problem, move on and come back to that problem after finishing the others. Each answer counts 1.6 points.
- v. There should be no headphones, and no active wireless devices of any sort. Cell phones should be turned off and in a book bag on the floor, or not brought into the room. Computers and PDAs must be off and out of sight.
- v. The Georgia Tech Honor Code applies (see last page).

John Copeland

Honor Code - I affirm that I have obeyed and will obey the rules of the Georgia Tech Honor Code*.

Signature _____

*Basically, I did not cheat, and I reported any observed cheating. Discussing this exam with someone yet to take it, or who previously took it, is a type of cheating.

Question 1 - Network and Socket "addresses"

Name the three "addresses" needed to send a TCP segment to www.cnn.com, for the transport layer, network layer, and the link/physical layer. Show (a) what the "address" is commonly called, (b) how each local "address" value is found (by protocol name, or assigned by whom, or is it a standard value).

| | (a) What is the "Address" equivalent called? | b) How is the local "address" value found, or assigned? | (c) How is the remote "address" value found, or assigned? |
|---------------------|--|--|--|
| Link/Physical Layer | MAC Address | Built into network adapter | ARP |
| Network Layer | IP Address | DHCP or Manual, assigned by network administrator. | DNS request to local DNS Server |
| Transport Layer | Port Number | Requested by application, provided by OS. | Well Known Port - for all common servers. |

What "addresses" define an active Network Socket (for network software)?

List them: _____ **Remote IP and Port No., Local IP and Port No** (*UDP or TCP*) _____

What "addresses" define a listening Network Socket (for network server software)?

List them: _____ **Local IP and Port No** (*TCP*) _____

Question 2 – Applications and Application Layer

- | | |
|--|----------------------|
| a. "Ephemeral" (temporary) port numbers are assigned to applications acting as (a) _ applications. | a. <u>Client</u> |
| b. "Well Known" port numbers are standardized for the most common types of (b) _ applications. | b. <u>Server</u> |
| c. An application requests that a "socket" be allocated to connect it to the (c) _ protocol layer. | c. <u>Transport</u> |
| d. What common transport protocol sends streaming multimedia data. | d. <u>UDP</u> |
| e. Transport layer protocol used for pings and error messages. | e. <u>ICMP</u> |
| f. Popular application layer protocol that uses out-of-band signaling for control. | f. <u>FTP (RTSP)</u> |
| g. Popular application layer protocol that usually sets up multiple parallel TCP connections | g. <u>HTTP (P2P)</u> |

Question 3 – Domain Names and DNS. Your **local DNS server receives a request** to look up the 32-bit (a) _ address for "web.mit.edu".

a. IP

This (b) _ transport protocol is used for the above DNS requests and responses.

b. UDP

Assuming all caches are empty, the first inquiry goes to a (c) _ DNS server that knows the address of a (d) _ DNS server that knows the address of all authoritative servers for URL's that end in ".edu".

c. rootd. top-level

That server provides the address of authoritative server for the domain named (e) _ that in turn provides the address of "web.mit.edu".

e. mit.edu

Question 4 – Streaming Media

- | | |
|---|---|
| a. Which transport layer was first used for streaming media? | a. <u>UDP</u> |
| b. Why is TCP problematic for interactive media connections? | b. <u>Slows down when segment dropped</u> |
| c. What 3 parameters does QoS guarantee minimum or maximum performance? | c1. <u>minimum bit rate</u> |
| | c2. <u>maximum timing jitter</u> |
| | c3. <u>error rate (or maximum delay)</u> |
| d. What technique can make up for missing data due to lost packets? | d. <u>FEC (better with Interleaving)</u> |
| e. What technique can make up for occasional delays on the data path? | e. <u>Playback (receiver) buffer</u> |
| f. What function for interactive voice or teleconference connections is played by SIP or H.323? | f. <u>Call setup</u> |
| g. What layer usually takes care of fixing the problems caused by lost packets? | g. <u>Application</u> |
| h. What future IPv6 routing technique can be used for QoS Internet connections? | h. <u>Flow switching</u> |

Question 5 – Security

What are the four services are provided by network security (in book)?

(**Authorization** was omitted by the book)

- a. ___ **Privacy** (Encryption) _____
- b. ___ **Data Integrity** _____
- c. ___ **Authentication** _____
- d. ___ **Access** (Reliability) _____

Question 6 – Host Configuration

a. What protocol is used to automatically configure PC's that plug into a LAN? a. ___ **DHCP** _____

b-d. What are the three parameters that are needed by a host to operate on an IP network (besides **DNS server IP**)?

- b. ___ **Host IP Address** _____
- c. ___ **Network Mask** _____
- d. ___ **Gateway Router IP Address** _____

e. How does a host find out the 32-bit IP address to use for URL "www.cnn.com"? e. ___ **DNS request** _____

f. Given the IP address, how does a host find the right MAC destination address to use? f. ___ **ARP** _____

Question 7 - Cellular Networks

a. How can a cellular network serve many more customers than the 1960 mobile telephone network?

- a. ___ **Cells - Frequency Reuse** * _____

b-c. Name two multiple access techniques used by today's digital telephones.

- b. ___ **CDMA** _____
- c. ___ **TDMA** _____

d. The "4G" cellular network uses what wireless data network standard?

- d. ___ **WiMAX** (IEEE 802.16) _____

** While it's true that additional frequencies and digital multiplexing may have each added an order of magnitude to the number of wireless mobile telephone circuits, the big leap was dividing the area into cells so that the same frequencies could be reused many thousands of time in a metro area (Bell Labs, c. 1975).*

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