CSci 353 - Introduction to Internetworking

Midterm Exam

Spring 2021

(12:00pm - 12:40pm, Monday, March 15)

Instructor: Bill Cheng

Teaching Assistant: none

(This exam is open book and open notes.
Remember what you have promised in your signed pledge.)

Time: 40 minutes

_____-
Name (please print)

Total: 22 points

_____-
Signature

Instructions

1. This is the first page of your exam. The previous page is a title page and does not have a page number.
2. Read problem descriptions carefully. You may not receive any credit if you answer the wrong question. Furthermore, if a problem says *"in N words or less"*, use that as a hint that N words or less are expected in the answer (your answer can be longer if you want). Please note that points may get *deducted* if you put in wrong stuff in your answer.
3. Write answers to all problems on the answers file.
4. Show all work (if applicable). If you cannot finish a problem, your written work may help us to give you partial credit. We may not give full credit for answers only (i.e., for answers that do not show any work). Grading can only be based on what you wrote and cannot be based on what's on your mind when you wrote your answers.
5. Please do *not* just draw pictures to answer questions (unless you are specifically asked to draw pictures). Pictures will not be considered for grading unless they are clearly explained with words, equations, and/or formulas.
6. For problems that have multiple parts, please answer all parts and clearly *label* which part you are providing answers for.
7. Please ignore minor spelling and grammatical errors. They do not make an answer invalid or incorrect.
8. During the exam, please only ask questions to *clarify* problems. Questions such as "would it be okay if I answer it this way" will not be answered (unless it can be answered to the whole class). Also, you are suppose to know the definitions and abbreviations/acronyms of *all technical terms*. We cannot "clarify" them for you. We also will **not** answer any question for multiple choice problems since that would often give answers away.
9. Every multiple choice question has only one correct (or best) answer. Even if a multiple choice question, grammatically speaking, asks you to choose multiple answers, you should still choose only **one answer**. If you select two answers, the most you can get is half the credit. If you select more than two answers, you will get no credit.
10. When we grade your exam, we must assume that you wrote what you meant and you meant what you wrote. So, please write your answers accordingly.
11. Note that more *efficient* or *better* solutions to problems may receive more points (if applicable).

(Q1) (2 points) You are starting a new company and you would like to register a new domain name with the DNS registrar so your potential customers can reach all your servers on the Internet. (a) In 2 words or less each, what are the **types of the two resource records** you **must** ask the DNS registrar to add to the DNS database? (b) For **each** of these resource records, in 15 words or less, **exactly what mapping information** (i.e., map from what to what **exactly**) it must contain? Please note that you are asked to give **four** answers altogether in this question.

(Q2) (1 point) Which of the following are typically part of **HTTP cookie exchange**?

(1) server includes a "`Set-Cookie:`" line in HTTP request header
(2) server includes a "`Cookie:`" line in HTTP response header
(3) client includes a "`Set-Cookie:`" line in HTTP request header
(4) client includes a "`Cookie:`" line in HTTP request header
(5) client includes a "`Set-Cookie:`" line in HTTP response header

Answer (just give numbers): _____

(Q3) (1 point) Which of the following is true about **layering** in the Internet design?

(1) layering can make things more organized
(2) often, there is no dependency between layers
(3) layering often makes it easier to remove a layer without losing any functionality
(4) layering often makes things go faster
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q4) (1 point) Which of the following is true about **packet loss**?

(1) a router can prevent packet loss if it runs the right algorithm
(2) packet loss cannot occur when a packet is delivered from a last-hop router to an end system
(3) packet loss happens when a packet arrives at a router and the router buffer is full
(4) if a router knows that the next-hop router's buffer is full, it will delay packet transmission to prevent packet loss
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q5) (1 point) Which of the following is true about **malware**?

(1) a worm may infect others even when a user takes no action
(2) a virus may infect others even when a user takes no action
(3) a botnet is often used to record keystrokes
(4) one infected host can launch a DDoS attack all by itself
(5) only malicious people would use a packet-sniffer

Answer (just give numbers): _____

(Q6) (1 point) Assuming that all packets are of the same length, which of the follow statement is correct if routers have infinite buffer space and $aL > R$ where a is average packet arrival rate (in packets per second), L is packet length (in bits), and R is link bandwidth (in bits per second)?

(1) throughput at the router can go to infinity
(2) packet loss probability can go to infinity
(3) throughput at the router can be zero
(4) average queueing delay can go to infinity
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q7) (1 point) Which of the following is true about **DNS**?

(1) DNS service is typically provided by network-core devices
(2) in the entire DNS system, there must be at least one DNS server that has all of the mappings for all the hosts in the Internet
(3) DNS service is too slow to be provided by end systems
(4) DNS provides IP address aliasing
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q8) (1 point) Which of the following are correct about **transport service requirements** for some specific applications?

(1) e-mail is loss-tolerant and elastic throughput is acceptable
(2) text messaging is loss-tolerant but not time sensitive
(3) file transfer is loss-tolerant and has minimum throughput requirement
(4) music streaming is loss-tolerant and has minimum throughput requirement
(5) interactive gaming requires no data loss and has minimum throughput requirement

Answer (just give numbers): _____

(Q9) (1 point) Which of the following is **not** a **disadvantages** of a **centralized DNS architecture** (although it may not be an advantage)?

(1) difficult to maintain a centralized database that's huge and being updated all the time
(2) single point of failure
(3) resilient to DDoS attacks
(4) high traffic volume
(5) slow respones time for distant clients

Answer (just give numbers): _____

(Q10) (1 point) Which of the following is **a service guarantee that UDP provides**?

(1) security
(2) congestion control
(3) minimum throughput
(4) timing
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q11) (1 point) Let's say that your node is using **BitTorrent** to download a file and that BitTorrent system is distributing just one very large file. Which of the following is true?

(1) your node typically gets the entire file content from the same neighbor node
(2) if your node does not contribute to the torrent, chances are, your download time will be much longer than other nodes who contribute to the torrent
(3) your node typically knows which parts of the file each node in the torrent has
(4) your node must not leave the torrent until you finish the download
(5) your node is rquired to stay in the torrent until you have helped at least one other node in the torrent

Answer (just give numbers): _____

(Q12) (1 point) Which of the following is true about the **HTTP protocol**?

(1) HTTP server must use port 80 for its master socket
(2) HTTP typically runs on top of UDP
(3) HTTP client must use port 80 for its socket
(4) HTTP is "stateless"
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q13) (1 point) Which of the following is true about **TLD (top-level domain) DNS servers**?

(1) there is a good chance that the TLD server for the `.edu` domain knows the IP address of `viterbi-scf1.usc.edu`
(2) there is a good chance that the TLD server for the `.com` domain knows the IP address of `viterbi-scf1.usc.edu`
(3) for each of the top-level domains, there is exactly one TLD server in the world
(4) each root DNS server knows the IP addresses of one or more of the TLD servers in each domain
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q14) (1 point) If you were to write a specificiation for a new and non-trivial **application-layer networking protocol**, what usually does **not** go into such a spec?

(1) semantics of messages
(2) types of messages exchanged
(3) how to respond to messages
(4) syntax of messages
(5) what programming language to use

Answer (just give numbers): _____

(Q15) (1 point) If an HTML file contains references to 9 images (assuming they are all about the same size), which of the following is true about the **HTTP response time** for a web client to download all 10 objects (one HTML and 9 images) from a web server? Please note that parallel connections and pipelining are **not permitted**. You can only send an HTTP request when you are done with the previous download.

(1) over persistent HTTP, it will take about 2 RTTs plus 10 file transfer times
(2) over persistent HTTP, it will take about 20 RTTs plus 10 file transfer times
(3) over non-persistent HTTP, it will take about 11 RTTs plus 10 file transfer times
(4) over non-persistent HTTP, it will take about 20 RTTs plus 10 file transfer times
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q16) (2 points) Suppose you have a 12-car caravan at a toll booth, ready to be serviced. No other cars are present. The toll booth takes one minute to service a car and it can service one car at a time. Cars travel at 1000 kilometer/hour and the next toll booth is 100 kilometers away. (a) (1 pt) In how many minutes will the **4th car** arrive at the next toll booth? (b) (1 pt) When the **4th car** arrives at the next toll booth, how many cars are still at the first toll booth?

(Q17) (1 point) Which of the following is true about the **bottleneck link**?

(1) the bottleneck link is the link on the end-to-end path that has the largest propagation delay
(2) the bottleneck link is the link on the end-to-end path that has the most packet loss rate
(3) the bottleneck link is the link on the end-to-end path that has the largest nodal delay
(4) the bottleneck link is the link on the end-to-end path that constrains the end-to-end throughput
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q18) (1 point) Which of the following is true about **TCP sockets**?

(1) for a TCP server, the socket used for accepting a client connection can be used to read requests from the client
(2) for a TCP server, the socket used for accepting a client connection must be different from the socket used for sending data to the client
(3) the way a socket is use in a TCP server is identical to the way a UDP server users its socket
(4) for a TCP server, the socket for reading requests from the client must be different from the socket used for sending data to the client
(5) none of the above is a correct answer

Answer (just give numbers): _____

(Q19) (1 point) Which of the following is true about **SMTP**?

(1) SMTP servers by default listens on port 22
(2) if you are using web-based e-mail, your browser would use SMTP to talk to another browser
(3) if you are using web-based e-mail, your browser would use SMTP to download e-mail messages from a mail server
(4) mail servers use the SMTP protocol to exchange e-mail messages
(5) if you are using web-based e-mail, your browser would use HTTP to send e-mail messages to a mail server

Answer (just give numbers): _____

(Q20) (1 point) Which of the following is **a service guarantee that TCP provides**?

(1) minimum throughput
(2) timing
(3) flow control
(4) security
(5) none of the above is a correct answer

Answer (just give numbers): _____