EECS 3214 Midterm Test
Winter 2017
March 2, 2017
Instructor: S. Datta

Name (LAST, FIRST): _____

Student number: _____

Instructions:

1. If you have not done so, put away all books, papers, and electronic communication devices. Write your name and student number.
2. Check that this examination has 9 pages. There should be 14 questions together worth 40 points.
3. You have 120 minutes to complete the exam. Use your time judiciously.
4. Show all your work. Partial credit is possible for an answer, but only if you show the intermediate steps in obtaining the answer.
5. If you need to make an assumption to answer a question, please state the assumption clearly.
6. Points will be deducted for vague and ambiguous answers.
7. Your answers MUST be LEGIBLE.
8. Good luck!

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page.

1. (2 points) Most stock trades today are done by computerized agents rather than by human traders as in past decades. Stock price information has to be transmitted (you may have seen this information visualized as stock tickers on television) and this data is used by agents (computer or human) to make trades. What are the service requirements of stock price data transmission?

2. (2 points) Which layer(s) of the TCP/IP architecture would you put DNS in? Justify in 1 or 2 sentences.

3. (2 points) Think of the streaming video applications of today and the old stored video applications where the entire video would have to be transferred before could playback start. List the differences in the service requirements for these two transfer sessions.

4. (2 points) How can DNS servers be used for aliasing of different servers that serve the same URL?

5. (2 points) Why has digital telephony reduced costs compared to analog telephony? Consider only technical aspects, not business or marketing models.

6. (2 points) How is the time-to-live (TTL) header field of TCP used to implement the traceroute service?

7. (a) (1 point) What is Little's law? Define the variables.

(b) (4 points) Note that as long as the arrival rate is strictly smaller than the service rate, the actual arrival process has a big influence. For example if a server gets exactly 1 packet a second (not just at an average of 1 packet/sec) and the service time is 0.9 seconds, there is no delay in the system in addition to the 0.9 seconds. However, Little's law makes a statement without any reference to the nature of the arrival patterns other than the average rate. Explain this apparent contradiction.

8. (3 points) Suppose a trunk router satisfies the requirements of a M/M/1 queue. That is, assume it has infinite buffer space and the incoming traffic is Poisson with a mean arrival rate λ and the packet processing times follow an exponential distribution with parameter $\mu = 1000$ pkts/sec. List the utilization and the expected number of packets in the buffer for $\lambda = 900, 990, 1000$ packets/second. What conclusions can be drawn from the above calculations?

9. (1 point) We saw that in BitTorrent, peers optimistically unchoke other peers or choke other peers. If you change the optimistic unchoking period from 30 seconds to 15 seconds or 60 seconds, how would the performance of the system be affected?

10. (4 points) Describe the TCP connection teardown process on both the client and server sides.

11. (3 points) Describe the advantages and disadvantages of using (a) an email anonymizer site versus (b) using encrypted email. Include a scenario when (a) is useful and one when (b) is useful.

    Anonymizer sites work as follows: when A sends a mail to B using the site, B receives a mail with some sender address C (C and A are different). If B replies to that email, A gets the reply as usual.

12. (4 points) Using a pictorial proof similar to that in the book, prove that a multiplicative-increase-additive-increase (MIAD) is unfair.

13. (2 points) We saw that the multiplicative decrease step in the AIMD scheme cuts the window size by half upon encountering congestion. What impact would changing the fraction from 0.5 to 0.75 or 0.25 have on the system?

14. (6 points) Suppose you need to implement a distributed data backup system over a P2P network. Each user encrypts their files and stores it at other peers. You may assume that the P2P system has no other function.

    (a) (2 points) Discuss the advantages and disadvantages of using structured versus unstructured overlays. For structured overlays you can restrict your attention to distributed hash tables.

    (b) (2 points) How would a peer select recipients for its encrypted files? That is what are good criteria to use in this choice?

    (c) (2 points) Propose a scheme similar to optimistic unchoking in Bittorrent to make it easy for newcomers to join this system.

Use this page if you need extra space. Mark the question number clearly.