Test # 1

CSCI-3400 – Fall 2022

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**Instruction: Write clearly and give full justification to each question. Show all your MATHEMAICAL working.**

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**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**E#:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| --- | --- | --- |
| Questions | Max Points | Earned Points |
| 1 | 10 |  |
| 2 | 10 |  |
| 3 | 10 |  |
| 4 | 10 |  |
| 5 | 10 |  |
| 6 | 10 |  |
| 7 | 10 |  |
| 8 | 10 |  |
| 9 | 10 |  |
| 10 | 10 |  |
| Total | **100** |  |

**IMPORTANT**

* You can use online references, but **write answers in your own words**!  **Cite any references used**. Answer the question in your own words, no credit will be given for answers copied from any source*.*
* No collaborating with other people; a **0** will be given if any collaboration evidence is found.
* I am looking for very specific, detailed, correct, and complete answers.
* Most answers found on the Internet (especially Wikipedia) are generic answers for people without any networking background and are not any of the above! Research each problem completely.
* Turn in a Word document or pdf into the Dropbox.

1. In reference to the figure giving below. Explain each of the following:
2. *Mobile Network:*



1. *Global ISP:*
2. *Local ISP:*
3. *Home Network:*
4. *Institutional Network:*
5. Please give full mathematical justification for the following question.

a) Suppose ***N*** packets arrive simultaneously to a link at which no packets are currently being transmitted or queued. Each packet is of length ***L*** and the link has transmission rate ***R***. What is the average queuing delay for ***N***packets?

b). Now suppose that N such packets arrive to the link every ***LN/R*** seconds. What is the average queuing delay of a packet?

1. Suppose users share a 1 Mbps link. Users are generating data at a rate of 100 kbps when busy, but are busy generating data only with probability *p* = 0.1. Suppose that the 1 Mbps link is replaced by a 1 Gbps link.
2. What is ***N***, the maximum number of users that can be supported simultaneously under circuit switching?
3. Now consider packet switching and a user population of M users. Give a formula (in terms of ***p***, ***M,*** ***N***) for the probability that more than ***N*** users and sending data.

1. Suppose R1 = R2 = R3 = R and d ***proc***= 0. Further, suppose the packets switch does not store and forward packets but instead immediately transmits each bit it receives before waiting for the entire packet to arrive. What is the end-to-end delay? **(Use problem # 10 of chapter 1).**
2. Sketch the operation of your protocol for the case of a person “A” using his or her credit card in a foreign country. Use the same designing concept as you have used in your homework problem. Explicitly state the assumptions made by your protocol.
3. For each of the following questions choose the right answer and give a brief explanation for your choice.

1. E-mail is \_\_\_\_\_\_\_\_\_  
a) Loss-tolerant application  
b) Bandwidth-sensitive application  
c) Elastic application  
d) None of the mentioned

Explanation:

2. Pick the odd one out.  
a) File transfer  
b) File download  
c) E-mail  
d) Interactive games

Explanation:

3. Which of the following is an application layer service?  
a) Network virtual terminal  
b) File transfer, access, and management  
c) Mail service  
d) All of the mentioned

Explanation:

4. Electronic mail uses which Application layer protocol?  
a) SMTP  
b) HTTP  
c) FTP  
d) SIP

Explanation:

5. To deliver a message to the correct application program running on a host, the \_\_\_\_\_\_\_ address must be consulted.  
a) IP  
b) MAC  
c) Port  
d) None of the mentioned

Explanation:

1. Explain in detail, how cookies and web-caching improve the user experience on the internet? Also, how cookies and web-caching help improve the overall network performance.
2. For each of the following questions choose the right answer and give a brief explanation for your choice.

1. Which is not a application layer protocol?  
a) HTTP  
b) SMTP  
c) FTP  
d) TCP

Explanation:

2. The packet of information at the application layer is called \_\_\_\_\_\_\_\_\_\_  
a) Packet  
b) Message  
c) Segment  
d) Frame

Explanation:

3. Which one of the following is an architecture paradigm?  
a) Peer to peer  
b) Client-server  
c) HTTP  
d) Both Peer-to-Peer & Client-Server

Explanation:

4. Application developer has permission to decide the following on transport layer side  
a) Transport layer protocol  
b) Maximum buffer size  
c) Both Transport layer protocol and Maximum buffer size  
d) None of the mentioned

Explanation:

5. Application layer offers \_\_\_\_\_\_\_ service.  
a) End to end  
b) Process to process  
c) Both End to end and Process to process  
d) None of the mentioned

Explanation:

1. Consider distribution of a file ***F*** = 15 Gbits to ***N*** peers. The server has an upload rate of ***us***  = 30 Mbps, and each peer has a download rate of ***di*** = 2 Mbps and a upload rate of ***u*** . For ***N*** = 10 , 100, 1000 and ***u*** = 300 Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combination of ***N*** and ***u*** for both client – server distribution and P2P distribution.
2. Explain in detail with a help of a drawing, how does the throughput affect the network performance in terms of network delays discussed in the notes. You may consider various scenarios of throughput.