

CS6250/4251

Spring 2021

Test 0

Important Instructions:

- *Open Book and Notes*
- *Time: Test available at 9:25am. Uploads must complete by 11:15am. Late uploads accepted until 11:30am with 20% penalty. Note system will not accept uploads after 11:30am. (All times Atlanta Time).*
- *Please answer questions on your own paper, tablet. Scan or convert to PDF and upload. Typed answers and converted to PDF are also OK.*
- *You may not consult with other “humans” (students, friends, family, ...)*
- *Ask questions during the test through 6250/4251 Piazza.*

Question 1 (20 points)

- a) How long does it take to transmit a packet that is 10,000 bits long over a link with speed 100Mbps?
- b) Consider a network path between a source and destination end systems that consists of one router. That is the end-to-end path is **end-system -> router -> end-system**. The source has a file that is 20,000 bits long that it needs to transmit to the destination. Assume that all links are 10 Mbps, propagation delay and router processing delays are negligible and all packets are 10,000 bits long. You can ignore packet headers. Also assume there is no queuing in the routers. Determine the time from when the first bit of the file is sent from the source until the last bit is received by the destination.

Question 2 (16 Points)

Which of the following IP Header Fields may change while an IP packet is being forwarded on an Internet Path from a client to a server. You can assume that there are no Network Address Translators on the path. **Make sure to explain your answer.**

- i) The Source address
- ii) The Destination address
- iii) Time to Live Field
- iv) The Checksum field

Question 3 (20 points)

An IP forwarding table has the following entries at a particular router:

Prefix	Next Hop Interface
00100	a
0010010	b
001	c

a) Which interface will be used for packets addressed to the following IP addresses:

- i) 37.128.5.5
- ii) 34.255.255.254

b) The router determines that it needs to incorporate the following routes:

- i) 37.128.0.0/9 use interface b
- ii) 37.192.0.0/10 use interface c

For each of the above routes does the router need to add another entry to the table? If so what is that entry.

Question 4 (24 points)

a) Transport protocols need a timeout value to tell a sender when it should retransmit. Explain what happens if this timeout value is

- i) too short relative to the RTT
- ii) too long relative to the RTT

b) Why is stop-and-wait ARQ considered inefficient over higher data rate network paths?

c) Two end systems are connected directly by a wire (that is, there is no network in between them just a wire). Would a transport protocol operating between these two end systems need to have flow control? What about congestion control? Explain your answers.

Question 5 (20 points)

Suppose Host A sends three TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 1200, the second has sequence number 1650, and the third segment has sequence number 2070.

- a) How many bytes are in the first and second segments?
- b) Suppose TCP will acknowledge every other segment. What is the acknowledgement number in the first acknowledgement (sent after the second segment is received)?
- c) Suppose TCP will acknowledge every segment. If the first segment is received, the second segment is lost, and the third segment is received. What is the acknowledgement number that the receiver will send upon receiving the third segment?