Homework 10

Graded

Student

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Total Points

97 / 104 pts

Question 1

IP Networks — **12** / 15 pts

1.1 **Network Count** — **3** / 3 pts

- ✔ **– 0 pts** Correct (6)
- **– 1 pt** Ignoring networks between routers (4)
- **– 0 pts** Correct
- **– 3 pts** Incorrect

1.2 **Grouping Hosts** — **6** / 6 pts

- **– 0 pts** Correct
- ✔ **– 0 pts** Correct (A, Q, Z)
- **– 3 pts** Checked one other host
- **– 3 pts** Checked two other hosts
- **– 6 pts** Incorrect

1.3 **Locating Network** — **3** / 3 pts

- ✔ **+ 3 pts** Correct (F)
- **+ 0 pts** Incorrect
- **+ 3 pts** Correct

1.4 **(no title)** — **0** / 3 pts

- **+ 3 pts** Correct (5)
- ✔ **+ 0 pts** Incorrect

Question 2

Network Calculation **16** / 16 pts

2.1 **Transmission Time** **8** / 8 pts

✔ **– 0 pts** Correct (25.1)

– 0 pts Correct

– 2 pts Rounding error

– 4 pts Did not convert 1000 bytes to bits (answer was 20.6/21.2)

– 4 pts Did not properly convert from seconds to milliseconds

– 6 pts Incorrect transmission time formula

– 8 pts Incorrect

2.2 **Throughput** **8** / 8 pts

✔ **– 0 pts** Correct (1434262.9)

– 0 pts Correct

– 0 pts FOLLOW-THROUGH: Correct based on answer to Q2.1 (1747572.8)

– 2 pts Rounding error

– 3 pts Calculation/Unit error (right formula with right numbers, but wrong answer)

– 4 pts Did not properly convert from milliseconds to seconds.

– 4 pts Did not properly convert bytes into bits

– 6 pts Incorrect throughput formula

– 8 pts Incorrect

2.3 **Work (Optional)** **0** / 0 pts

✔ **+ 0 pts** Correct

Question 3

Transport Layer Protocols **15** / 15 pts

3.1 **Stop-and-Wait** **5** / 5 pts

- ✔ **– 0 pts** Correct (32)
- **– 5 pts** Incorrect
- **– 0 pts** Correct

3.2 **No-ACK** **5** / 5 pts

- ✔ **– 0 pts** Correct: pipelined/sent all packets at the same time (3)
- **– 0 pts** Correct
- **– 0 pts** Correct: stop-and-wait protocol ()
- **– 5 pts** Incorrect

3.3 **Sliding Window** **5** / 5 pts

- ✔ **– 0 pts** Correct (10)
- **– 0 pts** Correct
- **– 5 pts** Incorrect

3.4 **Work (Optional)** **0** / 0 pts

- ✔ **+ 0 pts** Correct

Question 4

Packet Calculation **24** / 24 pts

4.1 **Number of Packets** **8** / 8 pts

- ✔ **– 0 pts** Correct (469)
- **– 0 pts** Correct
- **– 2 pts** Correct formula, wrong answer
- **– 2 pts** Rounded down/forgot the last packet (390)
- **– 4 pts** Divided by payload size + header instead of just payload size
- **– 2 pts** Included ACK packets
- **– 8 pts** Incorrect

4.2 **Number of Bytes** **8** / 8 pts

- **– 0 pts** Correct (129380)
- ✔ **– 0 pts** Correct (129444)
- **– 0 pts** Correct
- **– 0 pts** FOLLOW-THROUGH: Correct calculation based on incorrect 4.1 answer (incorrect calculation marked below as appropriate)
- **– 2 pts** Transmitted full payload on partial empty packet (i.e. did 4.1 answer * sizeof(packet))
- **– 2 pts** Correct formula, but incorrect answer
- **– 8 pts** Incorrect

4.3 **Loss Rate** **8** / 8 pts

- ✔ **– 0 pts** Correct (519)
- **– 0 pts** Correct
- **– 0 pts** FOLLOW-THROUGH: Correct calculation from incorrect number of packets in 4.1
- **– 2 pts** Different rounding, i.e. always round up or standard (434 or 435 or 436)
- **– 2 pts** Only counted lost packets (did not include initial packets) (42)
- **– 8 pts** Incorrect
- **– 2 pts** Calculation Error
- **– 2 pts** Missing the Last Transmission

4.4 **Work (Optional)** **0** / 0 pts

- ✔ **+ 0 pts** Correct

Question 5

Link Layer

18 / 18 pts

✔ **– 0 pts** Correct

– 3 pts Did not identify CSMA/CD as being used for Ethernet / wired protocols

– 1 pt Did not identify CSMA/CA as being used for IEEE 802.11 / Wi-Fi / wireless protocols

– 3 pts Partially incorrect or incomplete description of how CSMA/CD handles collisions

– 7 pts Did not identify how CSMA/CD handles collisions (listens to wire, transmits, listens for other transmissions, stops transmission if collision, etc.; look for general understanding for full points)

– 3 pts Partially incorrect or incomplete description of how CSMA/CA handles collisions

– 7 pts Did not identify how CSMA/CA handles collisions (listens to medium, can use Request-to-Send (RTS)/Clear-to-Send (CTS) packets, or mentions hidden node/terminal problem or its own transmission drowning out the medium as why CSMA/CD can't work, etc.; look for general understanding for full points)

– 20 pts Blank/no answer

Question 6

Network Stack Layers

12 / 16 pts

6.1 (no title)

4 / 4 pts

✔ **+ 4 pts** Correct

+ 0 pts Incorrect

6.2 (no title)

0 / 4 pts

+ 4 pts Correct

✔ **+ 0 pts** Incorrect

6.3 (no title)

4 / 4 pts

✔ **+ 4 pts** Correct

+ 0 pts Incorrect

6.4 (no title)

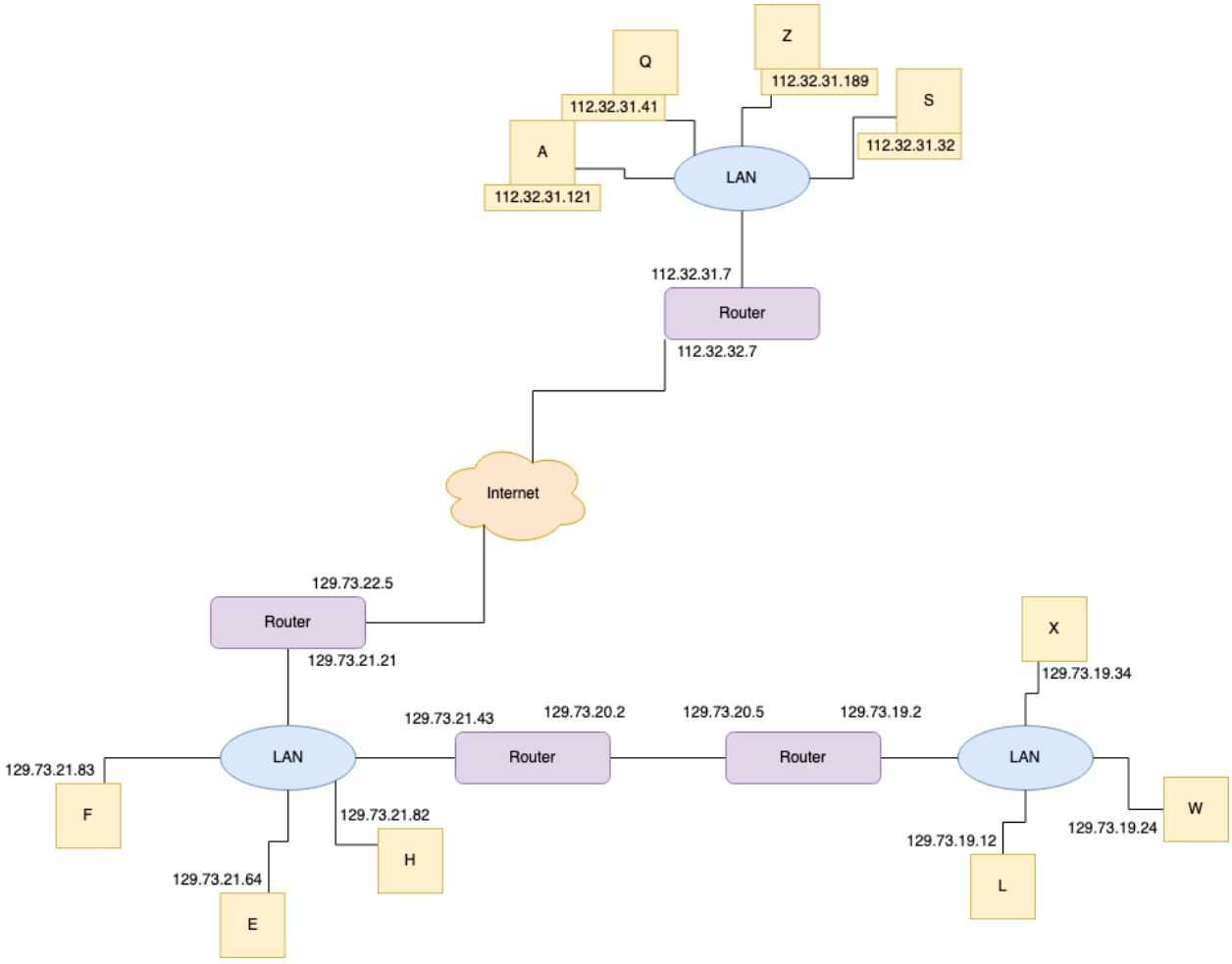
4 / 4 pts

✔ **+ 4 pts** Correct

+ 0 pts Incorrect

Q1 IP Networks
15 Points

Use the diagram to answer the following questions. Assume that the top 24 bits of the 32-bit address name an IP network.



Q1.1 Network Count
3 Points

How many IP networks are contained in the diagram? (Ignoring the Internet bubble)

6

Q1.2 Grouping Hosts
6 Points

Which hosts are on the same IP network as host S?

- [x] A
- [ ] E
- [ ] F
- [ ] H
- [ ] L
- [x] Q
- [ ] W
- [ ] X
- [x] Z

Q1.3 Locating Network
3 Points

Which host would be in the same IP network as a new host with the address 129.73.21.44?

- (•) F
- ( ) X
- ( ) A
- ( ) L

Q1.4
3 Points

In order for packets to flow from X to Z, How many intermediate network hops will it use? (Skip the internet bubble)

- ○ 2
- ○ 4
- ○ 5
- ◉ 6

Q2 Network Calculation

16 Points

You are to send a 4500 byte message over a network with the following specification:

- Wire Bandwidth: 8 Mbps (8×10^6 bits per second)
- Time of Flight: 18 ms
- Processing Delay at the Sender: 1.3 ms
- Processing Delay at the Receiver: 1.3 ms

Q2.1 Transmission Time

8 Points

Calculate the total time for message transmission in milliseconds. Do not include the units when you enter your answer. Round your answer to 1 decimal place.

Use the rounded value to answer the next question.

25.1

Q2.2 Throughput

8 Points

Calculate the throughput for the message in units of bits/sec. Do not include the units when you enter your answer. Round your answer to 1 decimal place.

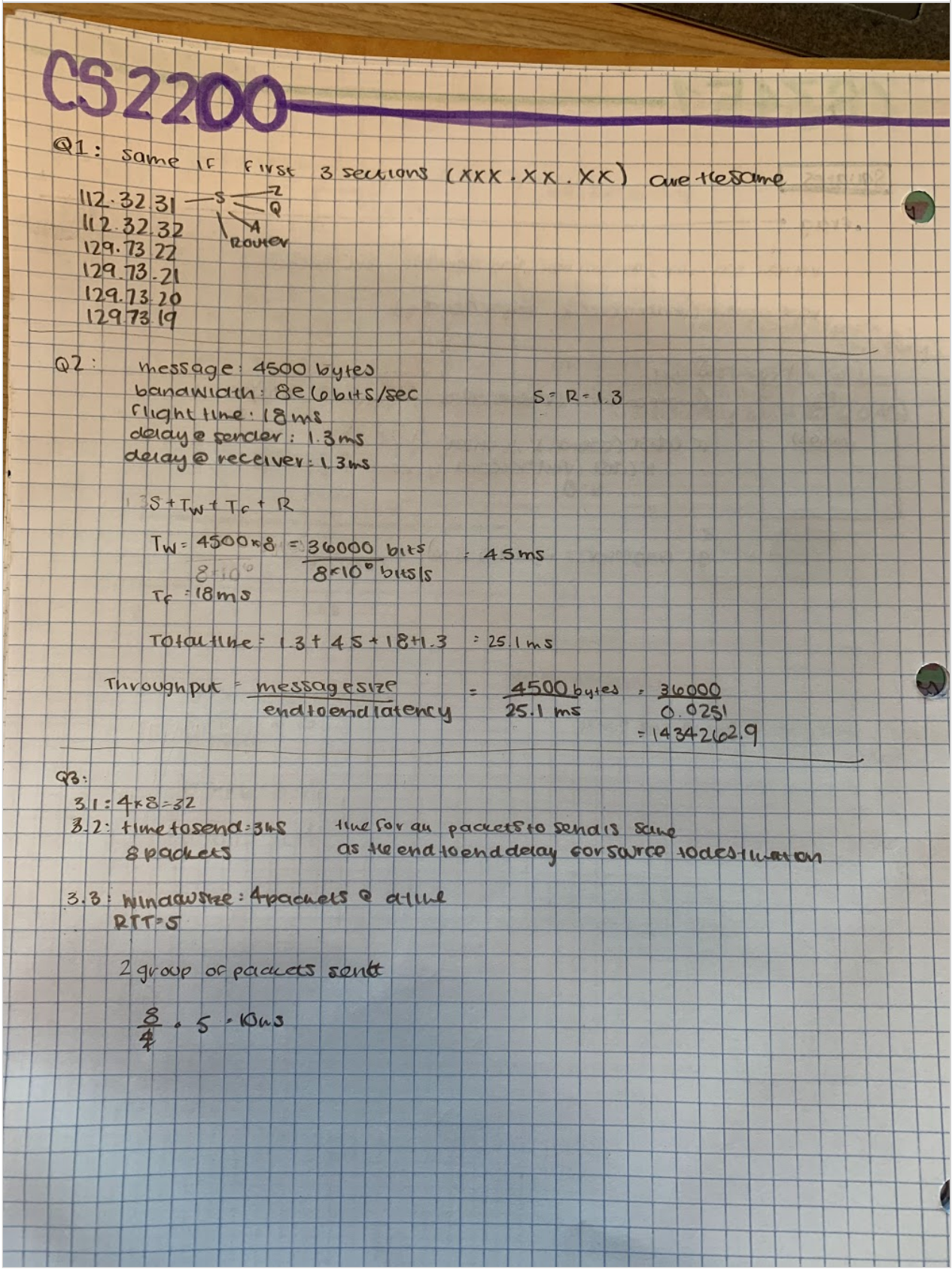
1434262.9

Q2.3 Work (Optional)
0 Points

If you would like partial credit in case of an incorrect answer on the previous parts, show your work in the field below or attach it as a file:

Homework10 Q1-3.jpg

Download



Assumption of flight time meaning total flight time, not requiring multiplication of flight time as shown in lecture

Q3 Transport Layer Protocols
15 Points

Different transport-layer protocols perform differently; this question will show the difference in propagation time between different protocols.

For each question, we will send a message that contains **8 packets**. Additionally, assume that the time to send or receive the packet and the ACK (if present) are negligible compared to the propagation time on the medium, and that there is no packet loss in the medium.

Q3.1 Stop-and-Wait
5 Points

Assume we are using a stop-and-wait protocol with a RTT for a packet is 4 ms. How much time is required to complete the transmission?

32

Q3.2 No-ACK
5 Points

If the protocol does not send acknowledgements, how much time is required to complete the transmission if the time to send a packet from source to destination is 3 ms? Assume the source knows this time, and the time does not change.

3

Q3.3 Sliding Window
5 Points

Assume we are using a sliding window protocol with a window size of 4 and a RTT of 5 ms. How much time is required to complete the transmission?

10

Q3.4 Work (Optional)
0 Points

If you would like partial credit in case of an incorrect answer on the previous parts, show your work in the field below or attach it as a file:

Homework10 Q1-3.jpg

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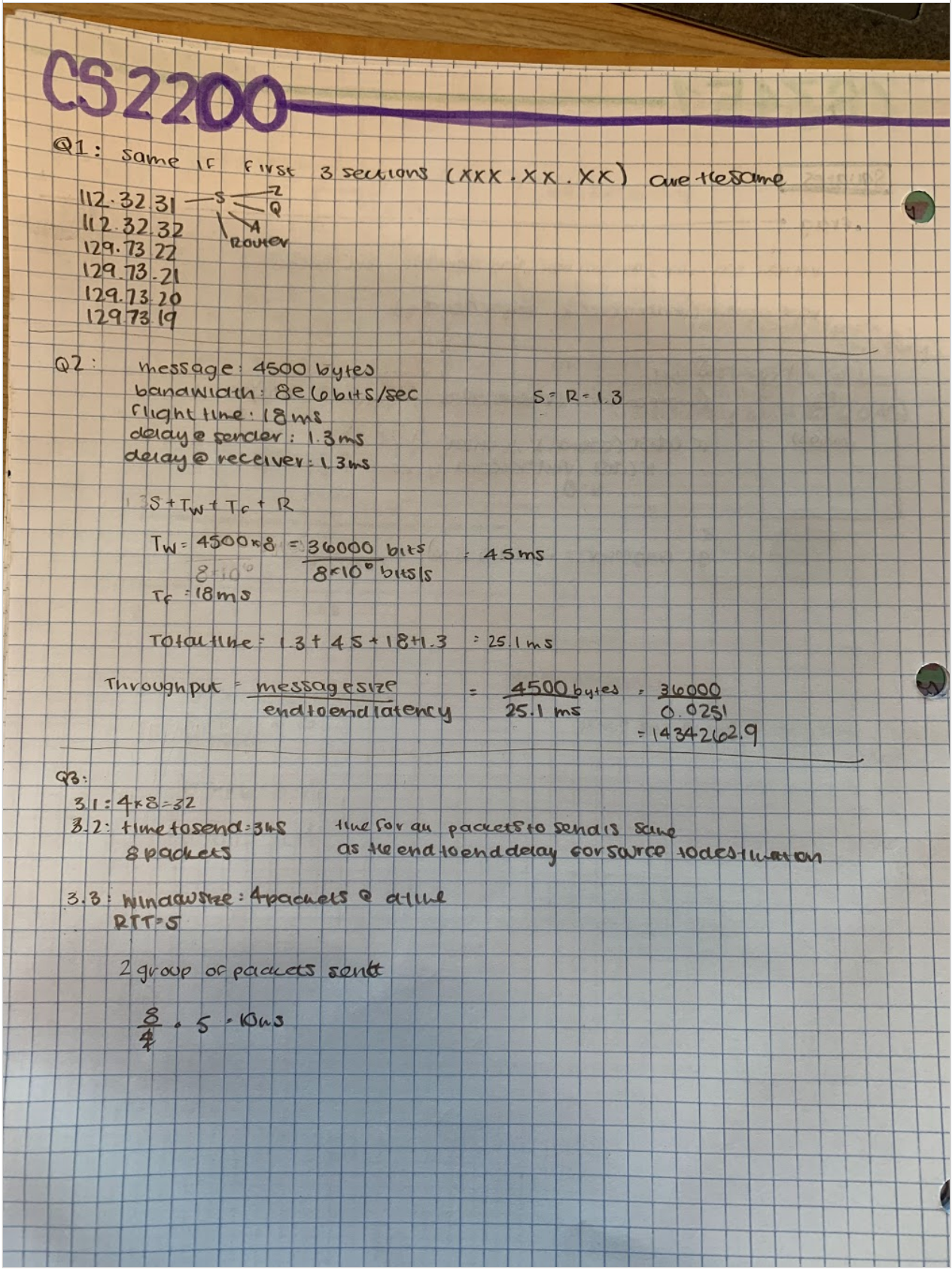


assuming all answers in milliseconds

Q4 Packet Calculation
24 Points

Assume that a computer wants to send a message 120,000 bytes long. The computer sends the message packet by packet across a reliable connection using the stop-and-wait protocol.
Each packet has a header that is 20 bytes long and a payload of 256 bytes.

Q4.1 Number of Packets
8 Points

Calculate the minimum number of packets that need to be sent to transmit the entire message (assuming no packet loss).

469

Q4.2 Number of Bytes
8 Points

How many bytes does the sender transmit in total using the packets above?

129444

Q4.3 Loss Rate
8 Points

Now assume 1 out of every 10 packets is lost. How many packets will need to be sent to the receiver to transmit all the packets?

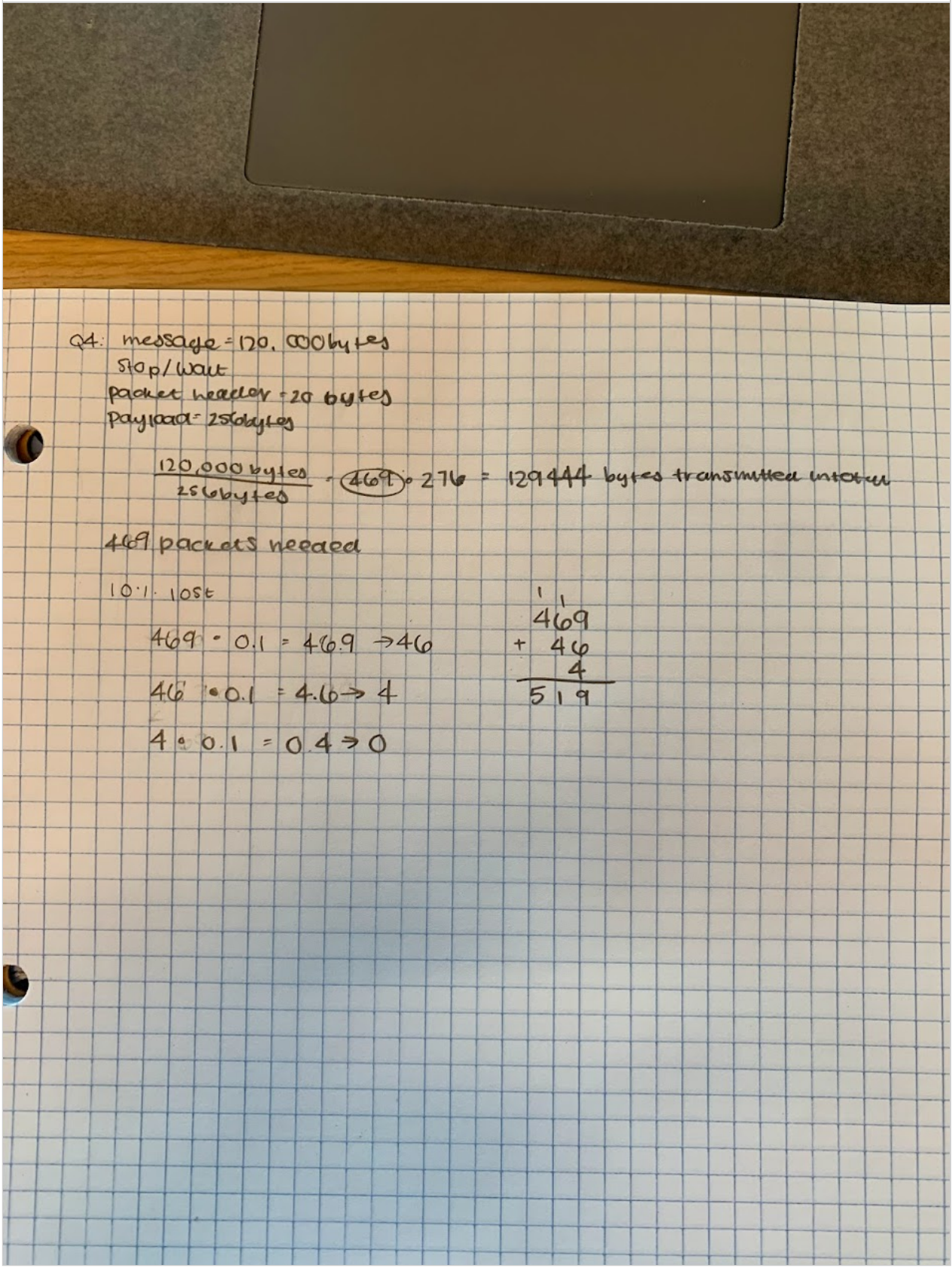
Note: assume no acknowledgments are lost. If you lose a non-whole number of packets, **round down** to determine the number of packets lost.

519

Q4.4 Work (Optional)
0 Points

If you would like partial credit in case of an incorrect answer on the previous parts, show your work in the field below or attach it as a file:

Homework10 Q4.jpg Download



Rounded down for the number of lost packets in every step instead of just rounding at the end to oblige by the instruction of rounding down for each

time losing a non-whole number of packets.

Q5 Link Layer
18 Points

Compare and contrast how CSMA/CD and CSMA/CA handle the problem of collisions, including when each method is used.

With CSMA/CD, there is a detection for multiple access/collision that occur when multiple units sense that the transmission medium is idle and attempt to start their respective frame transmission. An example of this method is within an ethernet cable where the base band signaling technique is used to ensure only one frame is able to be on the medium at a time. With CSMA/CA, there is a method for collision avoidance since stations can't determine a collision on the medium. Whereas CD handling results in immediate transmission sending, CA includes a random amount of time as a delay prior to sending. A way in which to do this is for a unit to send a RTS (request to send) packet to the destination, and the destination will send a CTS (clear to send) control packet back, if the RTS packet arrived with no interference. CSMA/CA is the standard for wireless LAN protocols.

Q6 Network Stack Layers
16 Points

Q6.1
4 Points

Which layer of the network stack has the role of sending a packet from the source to the destination?

- ○ Application
- ○ Transport
- ◉ Network
- ○ Link
- ○ Physical

Q6.2
4 Points

Which layer of network stack would be responsible for acquiring physical medium for transmission, and sending the packet to the destination host?

- ○ Application
- ○ Transport
- ○ Network
- ○ Link
- ◉ Physical

Q6.3
4 Points

Which layer of the network stack would protocols such as TCP and UDP be considered part of?

- ○ Application
- ◉ Transport
- ○ Network
- ○ Link
- ○ Physical

Q6.4
4 Points

Which layer of the network stack would protocols such as SMTP and HTTP be considered part of?

- ◉ Application
- ○ Transport
- ○ Network
- ○ Link
- ○ Physical