352 summer 17 midterm grading outline

Question 0 (24 points) [Grader: Mohamed Abdellatif]

How the question was graded:

I graded 4 parts of the 9, each worth 4 points. This is how I chose what parts to grade:

1. If the student determines what to grade (by marking the part), I will grade what is marked only.
2. If the student determines what NOT to grade (by scratching a canceling sign on the part), I will choose the unmarked questions.
3. If neither 1 nor 2, I'd grade the first 6 parts.

Accuracy of the answers

Answers do not need to be as exact/specific/accurate as this answer model. If you just wrote down what tells me that you get the, complete and correct, concept, I'd give you full credit.

1 (4 points)

1. Application Layer
2. Presentation Layer
3. Session Layer
4. Transport Layer
5. Network Layer
6. Data Link Layer
7. Physical Layer

2 (4 points)

Preparing and formatting data for the application layer.

1. Data conversion
2. Character-code translation
3. Compression and decompression
4. Encryption and decryption

3 (4 points)

1. Iterative DNS: It is the client's responsibility to communicate with different DNS servers until it gets a response to the query.
2. Recursive DNS: It is the DNS server's responsibility to communicate with different DNS servers until it gets a response to the query.

4 (4 points)

Routing packets OR delivering packets to different networks.

5 (4 points)

The same as packet switching except that entire data is routed as one packet one hop at a time.

6 (4 points)

1. Flow Control: An end-to-end communication technique/algorithm/protocol/concept to combat the issue of a sender overwhelming a single receiver.
2. Congestion Control: An end-to-end communication technique/algorithm/protocol/concept to combat the issue of a sender contributing to a network-wide resources overuse. OR to guarantee fair usage of network resources among a group of senders.

7 (4 points)

UDP

8 (4 points)

- Full-credit answer: FTP, SMTP, TCP
- Full-credit answer: FTP, SMTP, TCP, HTTP (persistent)

9 (4 points)

- A top-level-domain DNS server: refers to the last chunk of a DNS name, such as ".com"; each top-level domain server has its own set of name servers which are responsible for their leg of the name resolution process.
- A root server: knows where to find the servers for a top-level-domain servers (which in turn know where to find other “lower-level” name servers that can resolve earlier parts of the name.

Question 1 (20 points) [Grader: Nader Morad]

0 (4 Points)

- Reliability
- In-order/ordered
- Flow control
- Congestion control
- Connection oriented

Each service worth 1 point (mentioning 4 out of 5 to receive 4 points). 0.5 points given if retransmission was mentioned instead of reliability.

1 (4 Points)

TCP sender keeps the amount of unacknowledged data that is sending into the connection smaller that the receive window. More specifically, the sender keeps two variables, lastByteSent and LastByteAcked and it maintains the following invariant:

lastByteSent – lastByteAcked <= receive window

lastByteAcked is determined from the sequence number sent back by the receiver.

Partial points for mentioning the above idea, but not necessarily using the correct terminology

2 (4 Points)

To adjust for network congestion, the TCP sender maintains another variable, the congestion window. Congestion control's value decreases if the sender detects a packet loss which is done TCP timeout events (the full details of TCP congestion control is mentioned in slides)
Full points for mentioning the congestion window and timeouts and providing a similar explanation to above.
Partial credit was given if the answer mentioned what congestion control was as this is not what the question is asking for.

3 (4 Points)

The TCP's sliding window determines the number of packets the sender will send at once. By increasing the sliding window, the sender will send more packets at once and improve the connection's bandwidth.

4 (4 Points)

3 Duplicate acknowledgements for the same data (packet).

5 (4 Points)

All senders will start increasing their window size exponentially. Eventually they'll reach a point where packet loss will occur (due to congestion). At that point, the senders will start reducing their window size by moving to congestion avoidance state and fast recovery. Which instead of exponentially increasing the window size, they'll start increasing the window size linearly to match the network capacity.
For full marks, we wanted the mention of this window size increase and the back off and moving forward of the senders to reach a stable state which leads to the fair usage of the link between different TCP connections.

6 (4 Points)

TCP slow starts increases the window size until it detects congestion by observing packet loss in the network. However, on a wireless link, other reasons such as noise spikes and interference can result in packet loss as well. TCP slow start will reduce the window size even in such events which are not due to congestion. Thus, reducing the bandwidth on the wireless link.
Partial credit was given if answers contained information about TCP slow start but no mention of how it can reduce bandwidth on a wireless link.

Question 2 (20 points) [Grader: Nader Morad]

0 (4 Points)

This question was removed from the exam.

1 (4 Points)

Circuit switching is used for high rate and reliable connection so it needs a wired connection.
Message switching is used for low rate and mostly reliable connection so it can use microwave for its communication media.
Packet switching is often used for bursty traffic and not very reliable connections. For this we can use different types of communication media such as wired or wireless.
Partial credit was given if the answer mentioned different types of applications that would be suitable for each type of switching.

2 (4 Points)

Since there is a circuit setup time for circuit switching, to amortize the cost of circuit setup time, the type of traffic optimal for circuit switching is constant or has high bandwidth requirements (or both).
The type of traffic optimal for packet switching is usually bursty, small, and has low priority.
The type of traffic suitable for message switching is between the types of traffic mentioned for circuit and packet switching where it's regular, medium, and receiving just parts of the message is not useful.

3 (4 Points)

No. When we have a high send rate over a reliable connection, selective repeat will have a higher overhead since the receiver has to send an acknowledgement for each packet it receives whereas go-back-n will receive one acknowledgement for each window of packet is sends.

4 (4 Points)

As the packet size approaches the header size.
0.5-1 point was deducted if the answer mentioned packet size becoming smaller than the header.

5 (4 Points)

Since the data is send over several packets, each relay doesn't have to wait for the whole message to start sending. Thus, the relay can start sending the packet it receives while it waits for other packets to arrive. This pipelining effect increases bandwidth.

6 (4 Points)

Unlike circuit switching, the link is shared based on users' demand. And since not all users are going to use the link at the same time, we can usually support more users with packet switching.

7 (4 Points)

Using a sliding window 1 smaller than the sequence numbers causes ambiguity on the receiver's end where the receiver cannot determine if it's receiving new data or a retransmission. A detailed scenario is mentioned in the textbook (3.4.4).
Answers that provided a similar scenario which highlighted this ambiguity, received 4 points. Partial credit was given for mentioning ambiguity, but not providing a scenario were such ambiguity occurs.

8 (4 Points)

Network fluctuations are a common occurrence. If we base our RTT measurement solely on new data, we won't have a good estimate of the typical network RTT. To achieve a better RTT estimate, we average the value of new RTT data with the previous RTT measurements.

Question 3 (20 points) [Grader: John-Austen Francisco]

a (5 points)

Time = C + M / B = 32 sec + 96 MB / 8 Mbps = 32 * 96 = 128 seconds.

b (5 points)

Time = (ceiling[m / d] + s) * ([h + d] / bw) = (ceiling[96 * 2^20 / 3 * 2^20] + 16) * ([2^20 + 3^20] / 2^20) = 128.0625 seconds.

c (5 points)

Circuit-switching, by 1/16 of a second.

d (5 points)

None. Both take more than 2 minutes.

Question 4 (30 points) [Grader: Mohamed Abdellatif]

4.1 (10 points)

a

- Full credit answer (2 points): 404.
- Half credit answers (1 point): anything with the meaning “file not found” without specifying the response code.

b

- Full credit answer (2 points): 404.
- Half credit answers (1 point): anything with the meaning “file not found” without specifying the response code.

c

- Full credit answer (2 points): 403 (forbidden).
- Half credit answers (1 point): 401 (unauthorized).
- Half credit answers (1 point): anything with the meaning “forbidden or unauthorized” without specifying the response code.

d

- Full credit answer (2 points): 200.
- Half credit answers (1 point): 505 (version not supported).

- Half credit answers (1 point): anything with the meaning “OK or unsupported version” without specifying the response code.
- 0-credit answer (0 points): 503 (internal server error). While 505 is debatable, we can’t be 100% sure that the server will crash if it gets this request, so I can’t make sense of any argument to support 503.

e

- Full credit answer (2 points): 400 (bad request).
- Half credit answers (1 point): 505 (version not supported).
- Half credit answers (1 point): anything with the meaning “Bad request or unsupported version” without specifying the response code.

4.2 (10 points)

- Full credit answer (10 points): To be able to 1- support different encoding types (extensions/applications/..) and 2- match content encoding with content type.
- Partial credit answer (5 points): Mentioning only 1 or only 2.

4.3 (10 points)

- Full credit answer (10 points): SMTP.
- Half credit answer (5 points): Electronic Mail protocol (SMTP is a one, but it is not the only one).

Question 5 [Grader: John-Austen Francisco]

0 (1 point)

418 (I am a teapot)

1 (1 point)

Border Gateway Protocol is a protocol to exchange routing information (and hence enable routing packets) between different Autonomous Systems.

2 (1 point)

DNS