Exercise 1

Question 1 . What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection? What are the IP address and TCP port numbers used by the client computer (source) that is transferring the file to gaia.cs.umass.edu?

Gaia.cs.umass.edu:

- IP = 128.119.245.12
- PORT = 80

Client computer (source)

- IP = 192.168.1.102
- PORT = 1161

Question 2 . What is the sequence number of the TCP segment containing the HTTP POST command?

Note that to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a " POST " within its DATA field.

The sequence number of the TCP segment is 232129013

Question 3.

(a) Sequence number	*(b) Time*	*(b) ACK*	*(b) RTT*	*(c) EstimatedRTT*	*(d) Length*
232129013	0.023172	0.053937	0.02746	0.02746	565
232129578	0.053937	0.077294	0.035557	0.028472	1460
232131038	0.077294	0.124085	0.070059	0.03367	1460
232132498	0.124085	0.169118	0.114428	0.043765	1460
232133958	0.169118	0.217299	0.139894	0.055781	1460
232135418	0.217299	0.267802	0.189645	0.072514	1460

Question 4. What is the minimum amount of available buffer space advertised at the receiver for the entire trace? Does the lack of receiver buffer space ever throttle the sender?

The minimum amount of available buffer space would be 5840. The lack of receiver buffer space will not throttle the sender because window size can continue increasing

Question 5. Are there any retransmitted segments in the trace file? To answer this question, what did you check for (in the trace)?

There are no retransmitted segments in the trace file. This answer was determined by checking change in the sequence numbers from client to server.

Question 6. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment (recall the discussion about delayed acks from the lecture notes or Section 3.5 of the text)?

The receiver can typically acknowledge 1460 byte of data. The TCP strategy of delayed ACKs allows for a receiver to delay sending an ACK. This can result in the receiver sending an ACK for every other received segment if the sender is sending segments in quick succession.

Question 7. What is the TCP connection's throughput (bytes transferred per unit of time during the connection)?

Explain how you calculated this value.

TCP Throughput = (total data transmitted) / time

Total data = (first sequence number) - (last ack packet)
= 232293103 - 232129013
= 164090 bytes

Time = 5.455830 - 0.026477
= 5.429353 secs

Thus, throughput = 164090 / 5.429353 Bytes per second

Exercise 2

Question 1 . What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and server?

281843618

Question 2. What is the sequence number of the SYNACK segment sent by the server to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did the server determine that value?

Sequence Number = 1247095790
ACK = 2818463619

Sequence number is determined by the server by adding 1 to the client computer

Question 3 . What is the sequence number of the ACK segment sent by the client computer in response to the SYNACK? What is the value of the Acknowledgment field in this ACK segment? Does this segment contain any data?

Sequence Number = 2818463619
ACK = 1247095791

This segment does not contain data and no data is transferred as the next sequence number does not change as such it has a size of 0 bytes.

Question 4 . Who has done the active close? Is it the client or the server? How you have determined this? What type of closure has been performed? 3 Segment (FIN/FINACK/ACK), 4 Segment (FIN/ACK/FIN/ACK) or Simultaneous close?

The active close is done by both client and server. The client and server performed a simultaneous close. The client and server sent FIN/ACK to each other where there in no change in the sequence number meaning no data is sent.

Question 5 . How many data bytes have been transferred from the client to the server and from the server to the client during the whole duration of the connection? What relationship does this have with the Initial Sequence Number and the final ACK received from the other side?

Client to Server:
2818463653 - 2818463618 - 2
= 33 bytes

Server to Client:
1247095832 - 1247095790 - 2
= 40 bytes

As data gets transmitted between the ISN and the final ACK, the sequence number increases by the byte size sent. As such, the ACK is the next expected sequence number