

COMP3331 Lab04 Report

Exercise 1.

Question 1.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN] Seq=
2	0.023172	128.119.245.12	192.168.1.102	TCP	62	80 → 1161 [SYN, ACK]

The IP address of gaia.cs.umass.edu is **128.119.245.12** and its port number is **80**.

The IP address of the client computer(Source) is **192.168.1.102** and its port number is **1161**.

Question 2.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.102	128.119.245.12	TCP	62	1161 → 80 [SYN] Seq=232129012 Win=16384 Len=0 MSS=1460 SACK_PERM=1
2	0.023172	128.119.245.12	192.168.1.102	TCP	62	80 → 1161 [SYN, ACK] Seq=883061785 Ack=232129013 Win=5840 Len=0 MSS=1460 SACK_PERM=1
3	0.023265	192.168.1.102	128.119.245.12	TCP	54	1161 → 80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len=0
4	0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565 [TCP segment of a reassembled PDU]
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]

* Frame 4: 619 bytes on wire (4952 bits), 619 bytes captured (4952 bits)

* Ethernet II, Src: Actionte 8a:78:1a (00:20:e8:8a:78:1a), Dst: LinksysG da:af:73 (00:06:25:da:af:73)

* Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12

* Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232129013, Ack: 883061786, Len: 565

Source Port: 1161
Destination Port: 80
[Stream index: 0]
[TCP Segment Len: 565]
Sequence number: 232129013
[Next sequence number: 232129578]
Acknowledgment number: 883061786
0101 = Header Length: 20 bytes (5)
* Flags: 0x018 (PSH, ACK)
Window size value: 17520
[Calculated window size: 17520]
[Window size scaling factor: -2 (no window scaling used)]
Checksum: 0x1fbd [unverified]
[Checksum Status: Unverified]
Urgent pointer: 0
* [SEQ/ACK analysis]
* [Timestamps]
TCP payload (565 bytes)
[Reassembled PDU in frame: 199]
TCP segment data (565 bytes)

```
0000 00 06 25 da af 73 00 20 e0 8a 70 1a 08 00 45 00  ..%.s. .p...E.
0010 02 5d 1e 21 40 00 00 06 a2 e7 c0 a8 01 66 00 77  ..].t.....f.w
0020 15 8c 04 89 00 50 00 06 01 f5 34 a3 74 1a 50 38  ...P...A.t.P.
0030 14 78 1f bd 00 00 50 4f 53 54 20 2f 65 74 60 65  bp....PO $T /eth
0040 72 63 61 6c 20 6c 61 62 73 2f 8c 61 62 33 20 33  real:lab s/lab3-1
```

The sequence number of the TCP segment containing HTTP POST command is **232129013**.

Question 3.

4	0.026477	192.168.1.102	128.119.245.12	TCP	619 1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565 [TCP segment of a reassembled
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassemble
6	0.053937	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232129578 Win=6780 Len=0
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232131038 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232132498 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU
9	0.077294	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232131038 Win=6760 Len=0
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232133958 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU
11	0.078157	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232135418 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU
12	0.124085	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232132498 Win=11680 Len=0
13	0.124185	192.168.1.102	128.119.245.12	TCP	1201 1161 → 80 [PSH, ACK] Seq=232136878 Ack=883061786 Win=17520 Len=1147 [TCP segment of a reassemble
14	0.169118	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232133958 Win=14600 Len=0
15	0.217299	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232135418 Win=17520 Len=0
16	0.267802	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232136878 Win=20440 Len=0

Segment #	Sequence #	Time sent (sec)	ACK received (sec)	RTT difference (sec)	EstimatedRTT (sec)
1 (#4)	232129013	0.026477	0.053937 (#6)	0.02746	0.02746
2 (#5)	232129578	0.041737	0.077294 (#9)	0.035557	0.028472125
3 (#7)	232131038	0.054026	0.124085 (#12)	0.070059	0.032784875
4 (#8)	232132498	0.054690	0.169118 (#14)	0.114428	0.038331
5 (#10)	232133958	0.077405	0.217299 (#15)	0.139894	0.04151425
6 (#11)	232135418	0.078157	0.267802 (#16)	0.189645	0.047733125

Question 4.

4	0.026477	192.168.1.102	128.119.245.12	TCP	619 1161 → 80 [PSH, ACK]
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [PSH, ACK]
6	0.053937	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=
▶ Frame 4: 619 bytes on wire (4952 bits), 619 bytes captured (4952 bits)					
▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)					
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12					
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232129013, Ack: 883061786, Len: 56					
Source Port: 1161					
Destination Port: 80					
[Stream index: 0]					
[TCP Segment Len: 565]					

5	0.041737	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [PSH, ACK]
6	0.053937	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=
▶ Frame 5: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)					
▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)					
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12					
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232129578, Ack: 883061786, Len: 14					
Source Port: 1161					
Destination Port: 80					
[Stream index: 0]					
[TCP Segment Len: 1460]					

7	0.054026	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK]
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK]
9	0.077294	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK]
▶ Frame 7: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)					
▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)					
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12					
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232131038, Ack: 883061786, Le					
Source Port: 1161					
Destination Port: 80					
[Stream index: 0]					
[TCP Segment Len: 1460]					

8	0.054690	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK]
9	0.077294	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK]
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK]
▶ Frame 8: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)					
▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)					
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12					
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232132498, Ack: 883061786, Le					
Source Port: 1161					
Destination Port: 80					
[Stream index: 0]					
[TCP Segment Len: 1460]					

10	0.077405	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK]
11	0.078157	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK]
12	0.124085	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK]
▶ Frame 10: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)					
▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)					
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12					
▼ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232133958, Ack: 883061786, Le					
Source Port: 1161					
Destination Port: 80					
[Stream index: 0]					
[TCP Segment Len: 1460]					

11	0.078157	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK]
12	0.124085	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK]
13	0.124185	192.168.1.102	128.119.245.12	TCP	1201	1161 → 80 [PSH,

▶ Frame 11: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits)
 ▶ Ethernet II, Src: Actionte_8a:70:1a (00:20:e0:8a:70:1a), Dst: LinksysG_da:af:73 (00:06:25:da:a
 ▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
 ▶ Transmission Control Protocol, Src Port: 1161, Dst Port: 80, Seq: 232135418, Ack: 883061786, L

Source Port: 1161
 Destination Port: 80
 [Stream index: 0]
 [TCP Segment Len: 1460]

The length of the first six segments is 565, 1460, 1460, 1460, 1460 bytes respectively.

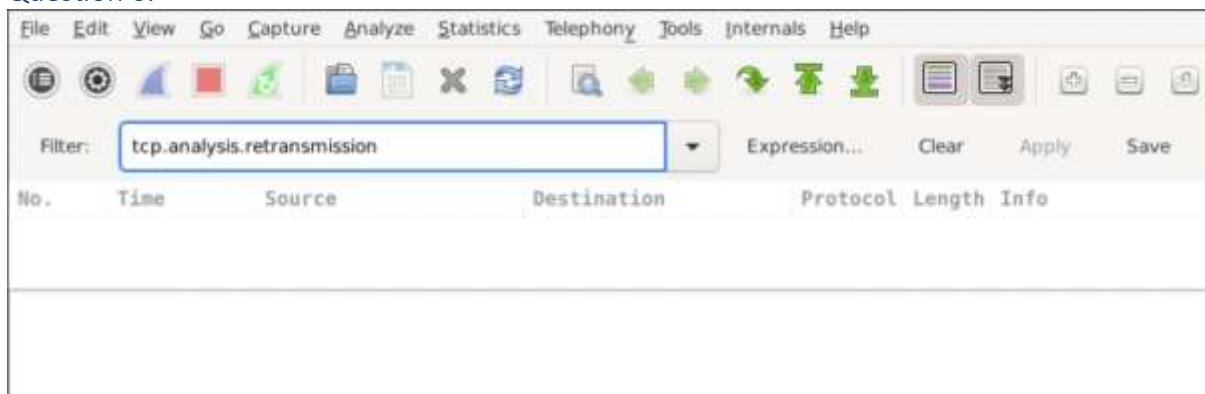
Question 5.

2	0.023172	128.119.245.12	192.168.1.102	TCP	62	80 → 1161 [SYN, ACK] Seq=883061785 Ack=232129013 Win=5840
3	0.023265	192.168.1.102	128.119.245.12	TCP	54	1161 → 80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len=
4	0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520
6	0.053937	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786 Ack=232129578 Win=6780 Len=0
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232131038 Ack=883061786 Win=17520 Len=
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=232132498 Ack=883061786 Win=17520 Len=
9	0.077294	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=883061786 Ack=232131038 Win=8760 Len=8

Acknowledgment number: 232129013
 0111 = Header Length: 28 bytes (7)
 ▶ Flags: 0x012 (SYN, ACK)
 Window size value: 5840
 [Calculated window size: 5840]

The minimum amount of the buffer space advertised at the receiver for the entire space is **5840**. Since the window size is increasing, the lack of receiver buffer space **does not** throttle the sender.

Question 6.



There is **no** retransmitted segment in the listing of captured packets. We applied “tcp.analysis.retransmission” for the filter to check for any retransmitted segments.

Question 7.

The data size that the receiver typically acknowledge in ACK is 1460 bytes.

53	1.117333	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232162691 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
54	1.118133	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232164061 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
55	1.119029	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232165521 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
56	1.119858	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232166981 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
57	1.120902	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232168441 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
58	1.121891	192.168.1.102	128.119.245.12	TCP	946 1161 → 80 [PSH, ACK] Seq=232169901 Ack=883061786 Win=17520 Len=892 [TCP segment of a reassembled PDU]
59	1.200421	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232164061 Win=62780 Len=0
60	1.205076	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232166981 Win=62780 Len=0
61	1.362074	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232169901 Win=62780 Len=0
62	1.389886	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232170793 Win=62780 Len=0
63	1.390110	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232170793 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
64	1.390824	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232172253 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
65	1.391683	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232173713 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
66	1.392594	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232175173 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
67	1.393390	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232176633 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
68	1.394202	192.168.1.102	128.119.245.12	TCP	946 1161 → 80 [PSH, ACK] Seq=232178093 Ack=883061786 Win=17520 Len=892 [TCP segment of a reassembled PDU]
69	1.488313	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232173713 Win=62780 Len=0
70	1.584980	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232176633 Win=62780 Len=0
71	1.661513	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232178093 Win=62780 Len=0
72	1.661734	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232178985 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
73	1.662474	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232180445 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
74	1.663315	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232181905 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
75	1.664190	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232183365 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
76	1.665254	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [ACK] Seq=232184825 Ack=883061786 Win=17520 Len=1460 [TCP segment of a reassembled PDU]
77	1.666151	192.168.1.102	128.119.245.12	TCP	946 1161 → 80 [PSH, ACK] Seq=232186285 Ack=883061786 Win=17520 Len=892 [TCP segment of a reassembled PDU]
78	1.758227	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232181905 Win=62780 Len=0

At the beginning, we could find that the receiver will acknowledge each packet. However, at segment #60, it acknowledges two segments with sequence number of 232164061 and 232165521. The receiver sends a cumulative ACK for the two segments. In addition, there are some same cases happened that the receiver sends ACK for two received segments after segment #60. The reason why is because TCP uses delayed ACK for the next segment and send cumulative ACK for the received segments.

Question 8.

We take sequence #4 and #202 for example.

3	0.023265	192.168.1.102	128.119.245.12	TCP	54 1161 → 80 [ACK] Seq=232129013 Ack=883061786 Win=17520 Len=0
4	0.026477	192.168.1.102	128.119.245.12	TCP	619 1161 → 80 [PSH, ACK] Seq=232129013 Ack=883061786 Win=17520 Len=565
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514 1161 → 80 [PSH, ACK] Seq=232129578 Ack=883061786 Win=17520 Len=1460
6	0.053937	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232129578 Win=62780 Len=0
200	5.389471	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232291321 Win=62780 Len=0
201	5.447887	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232293053 Win=62780 Len=0
202	5.455830	128.119.245.12	192.168.1.102	TCP	60 80 → 1161 [ACK] Seq=883061786 Ack=232293103 Win=62780 Len=0
203	5.461175	128.119.245.12	192.168.1.102	HTTP	784 HTTP/1.1 200 OK (text/html)
206	5.651141	192.168.1.102	128.119.245.12	TCP	54 1161 → 80 [ACK] Seq=232293103 Ack=883062516 Win=16790 Len=0
213	7.595557	192.168.1.102	199.2.53.206	TCP	62 1162 → 631 [SYN] Seq=234062521 Win=16384 Len=0 MSS=1460 SACK_PERM=1

Segment #	Data (bytes)	Time (sec)
4	232129013	0.026477
202	232293103	5.455830

$$\text{Total amount of data} = 232293103 - 232129013 = 164090 \text{ bytes}$$

$$\text{Total transmission time} = 5.455830 - 0.026477 = 5.429353 \text{ sec}$$

$$\text{Throughput} = \frac{\text{Total amount of data}}{\text{Total transmission time}} = \frac{164090}{5.429353} = 30222.75398 \text{ bytes/s}$$

Exercise 2.

No	Source IP	Destination IP	Protocol	Info
295	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [SYN] Seq=2818463618 win=8192 MSS=1460
296	10.99.6.175	10.9.16.201	TCP	5000 > 50045 [SYN, ACK] Seq=1247095790 Ack=2818463619 win=262144 MSS=1460
297	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [ACK] Seq=2818463619 Ack=1247095791 win=65535
298	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [PSH, ACK] Seq=2818463619 Ack=1247095791 win=65535
301	10.99.6.175	10.9.16.201	TCP	5000 > 50045 [ACK] Seq=1247095791 Ack=2818463652 win=262096
302	10.99.6.175	10.9.16.201	TCP	5000 > 50045 [PSH, ACK] Seq=1247095791 Ack=2818463652 win=262144
303	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [ACK] Seq=2818463652 Ack=1247095831 win=65535
304	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [FIN, ACK] Seq=2818463652 Ack=1247095831 win=65535
305	10.99.6.175	10.9.16.201	TCP	5000 > 50045 [FIN, ACK] Seq=1247095831 Ack=2818463652 win=262144
306	10.9.16.201	10.99.6.175	TCP	50045 > 5000 [ACK] Seq=2818463652 Ack=1247095832 win=65535
308	10.99.6.175	10.9.16.201	TCP	5000 > 50045 [ACK] Seq=1247095831 Ack=2818463653 win=262144

Question 1.

The sequence number of the TCP SYN segment that is used to initiate the TCP connection between client and server is **2818463618**.

Question 2.

The sequence number of the SYNACK segment sent by the server to the client in reply to the SYN is **1247095790**. The value of the Acknowledge field in the SYNACK segment is **2818463619**. It is determined by the addition of the sequence number from client and 1.

Question 3.

The sequence number of the ACK segment sent by the client in response to the SYNACK is **2818463619**. The value of the Acknowledgement field in this ACK segment is **1247095791**. This segment **does not** contain any data since its sequence number is same as the one from segment #298.

Question 4.

Both client and server **have** done the active close since both have sent [FIN, ACK] flags to each other without receiving ACK flag. In addition, the sequence number in segment #304 is equal to the value of the acknowledgement field in segment #305. Hence, after both sent ACK to each other, the value of the acknowledgement field is equal to the sequence number + 1, which means that both client and server have received FIN flag, then both close connections. The type of closure is **simultaneous close**.

Question 5.

From client to server = $2818463653 - 2818463618 - 2(\text{SYN} \& \text{FIN}) = \mathbf{33 \text{ bytes}}$

From server to client = $1247095831 - 1247095790 - 2(\text{SYN} \& \text{FIN}) = \mathbf{40 \text{ bytes}}$

Note that SYN and FIN flags will increase 1 for the value of acknowledgement field without containing any data.

Since the segment with Sequence Number and Data is sent from client to server or vice versa, and server is expected to receive the segment that contains the value of acknowledgement field which is equal to the addition of the sequence number and data length from the previous segment. This relationship can be used to calculate the data transfer.