**Question 1**

Client IP Address = 192.168.245.12

Client Port = 1161

**Question 2**

Dest IP = 128.119.245.12

Dest Port = 80

**Question 3**

Sequence number of SYN segment = 232129012 to initiate the TCP connection.

For identification, the SYN bit is set = 1

**Question 4**

Sequence number of SYNACK segment = 883061785.

Acknowledgement field = 232129013.

This is determined by taking the client\_isn + 1 (232129012 + 1 = 232129013)

For identification, the ACK bit = 1 and SYN bit = 1

**Question 5**

Sequence number of ACK segment = 232129013.

Acknowledgement field = 883061786. (again incremented from prev SYNACK sequence number)

This segment does not contain any payload / data.

For identification, the ACK bit = 1

**Question 6**

Sequence number of segment with POST command = 232129013.

**Question 7**

Using EstimatedRTT = (1 – a) \* EstimatedRTT + a \* SampleRTT

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Seg 1** | **Seg 2** | **Seg 3** | **Seg 4** | **Seg 5** | **Seg 6** |
| Seq # | 232129013 | 232129578 | 232131038 | 232132498 | 232133958 | 232135418 |
| Time sent (from begin=0) | 0.026477 sec | 0.041737 sec | 0.054026 sec | 0.054690 sec | 0.077405 sec | 0.078157 sec |
| ACK received | 0.053937 sec | 0.077294 sec | 0.124085 sec | 0.169118 sec | 0.217299 sec | 0.267802 sec |
| RTT val (secs) | 0.02746 | 0.035557 | 0.070059 | 0.11443 | 0.13989 | 0.18964 |
| EstimatedRTT | 0.02746 (Sample = Est) | 0.0285 | 0.0337 | 0.0438 | 0.0558 | 0.0725 |

**Question 8**

Seg 1 = 565 bytes

Seg 2 = 1460 bytes

Seg 3 = 1460 bytes

Seg 4 = 1460 bytes

Seg 5 = 1460 bytes

Seg 6 = 1460 bytes

**Question 9**

Min buffer = 5840 bytes up to a max of 62780 bytes.

No it doesn’t throttle the sender.

**Question 10**

There are no retransmitted segments in the file.

This can be checked by looking through all sequence numbers of the TCP segments. If there is a retransmitted segment, sequence number < prev segments sequence number.

**Question 11**

|  |  |  |
| --- | --- | --- |
|  | Ack sequence number | Data acknowledged |

|  |  |  |
| --- | --- | --- |
| ACK 1 | 0 | 565 |
| ACK 2 | 232129578 | 1460 |
| ACK 3 | 232131038 | 1460 |
| ACK 4 | 232132498 | 1460 |
| ACK 5 | 232133958 | 1460 |
| ACK 6 | 232135418 | 1460 |
| ACK 7 | 232136878 | 1147 |
| ACK 8 | 232138025 | 1460 |

**Question 12**

Total data transmitted = acknowledgement seq number of last seg - seq number of 1st segment

= 232,293,103 – 232,129,012 bytes

= 164,091 bytes

Transmission time = 5.455830 (last seg #202) – 0.026477 (first seg #4) = 5.42494

Therefore, throughput = 164,091 bytes / 5.2494 seconds =~ **30223 bps**