1) (5 pts) Chapter 5 Text Book Problem 8.

2) (5 pts) Chapter 5 Text Book Problem 9. Additional information: use 1Gbps = $1x10^9$ bits per second. On part b) the book is asking about the numbers for the Bandwidth, RTT and maximum segment lifetime

3) (5 pts) Chapter 5 Text Book Problem 12. Additional information: 1Gbps = $1x10^9$ bits per second. For part b, the 32 bit timestamp field is incremented by 1 and it is incremented 1000 times during the time it takes the sequence numbers to wrap around (i.e. if the sequence numbers wrap every 15 seconds, then after 15 seconds the timestamp field has incremented 1000 times)

4) (5 pts) Chapter 6 Text Book Problem 10. Assume A_i = 0 for all packets when they arrive. Remember each flow is independent of the others. Since the packet sizes are all different, use the packet size as the increment instead of 1(i.e., Fi for packet 1 is 0 +100, Fi for packet 2 is 100+100, etc.) remember that each flow has its own Fi.

5) (10 pts) Chapter 6 Text Book Problem 14. – Show all your work in how you come up with the order in which the packets are transmitted. One packet will be transmitted every wall clock time unit. For part a, at wall clock time 1, packet A1 is transmitted and packet C1 is transmitted at wall clock time 2.

Use the following flow times instead of what is in the text. All packets are the same size, so use an increment value of 1 when computing the Fi for each of the flows

Flow A: 1, 2, 4, 7, 9
Flow B: 2, 3, 5, 6
Flow C: 1, 3, 4, 5, 7, 8, 9

FQ-clock time increment is dependent on how many queues have packets to transmit.
The following assumptions are to be made to help with the problem.

- FQ-clock is denoted as A_i and A_i is used to determine F_i which determines the order in which packets are transmitted
- The packets arrive at the wall clock time and take one wall clock time unit to transmit.
- The FQ-clock time is dependent on the number of active queues between the current wall time and the next wall time.
    - If one queue only has packets, then FQ-clock and wall clock follow one another.
    - If 2 queues are active, then for every change in wall clock time, the FQ-clock time advances by 0.5 – i.e. if wall clock is 1 and FQ-clock is A_i = 1, then when wall clock is 2, FQ-clock will be A_i = 1.5
    - A_i is incremented an amount of 1.0/(number of active queues)
    - while **a packet is transmitting, the queue it belongs to is considered active**
- A packet takes one wall clock time to transmit. Therefore $F_i = \max(F_{i-1}, A_i) + 1.0$ (the 1.0 is the transmit time unit) for an arriving packet
- Use a designator for packets based on the wall time that they arrive. For example, the second packet of the B-flow arrives at wall clock time 6, so it is designated as B6
- If a packet arrives and it has the smallest F_i, then it is the packet transmitted for that time period. If two flows have a packet with the same F_i , then to resolve the tie the transmission order is A, B, C. – for example, at wall clock 1, flow A and C both have a packet arrive, so Flow A transmits its packet first between wall clock 1 and wall clock 2
- Remember that each flow has its own F_i for packets on that flow. The router looks at the F_i's for all flows and sends the earliest one

For part b, the formula for the weighted queue (flow C) is $F_i = \max(F_{i-1}, A_i) + 0.5$. 0.5 is used instead of 1because the weight factor for flow C is 2 – it sends 2 bits instead of 1.

The following problems are extra problems that you should consider working.
A) Chapter 6 Text Book Problem 11
B) Chapter 6 Text Book Problem 15
C) Chapter 6 Text Book Problem 27 (no solution yet in the 8b solutions)
D) Chapter 6 Text Book Problem 35