Instructions:

I. You must submit your homework electronically only in .pdf format. All word processed, no handwriting.
II. Submit your homework via Blackboard no later than **11:59 pm April 22, 2019**.
III. Late homework is subject to 10% penalty for each day past the due date, and before the solutions are posted. No homework will be accepted after the solutions are posted.
IV. Students can discuss problems and share their ideas among themselves, but MUST work out the homework problems individually. Any deviation from this policy may result in an "F" grade for the course.
V. You must start working on these problems immediately. Otherwise, you may not have enough time to submit them on time.

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1. If the TCP round-trip time, RTT, is currently 30 msec and the following acknowledgements come in after 26, 32, and 24 msec, respectively, what is the new RTT estimate using the Jacobson algorithm? Use $\alpha = 0.9$

2. A TCP machine is sending full windows of 65,535 bytes over a 1-Gbps channel that has a 10-msec one-way delay. What is the maximum throughput achievable? What is the line efficiency?

   Problem 33, page 609 of the text

3. What is the fastest line speed at which a host can blast out 1500-byte TCP payloads with a 120-sec maximum packet lifetime without having the sequence numbers wrap around? Take TCP, IP, and Ethernet overhead into consideration. Assume that Ethernet frames may be sent continuously. Problem 34, page 609 of the text

   - TCP overhead is 20 bytes, IP overhead is 20 bytes, Ethernet overhead is 26 bytes, Total 66 bytes

4. In a network whose max segment is 128 bytes, max segment lifetime is 30 sec, and has 8-bit sequence numbers, what is the maximum data rate per connection? Problem 36, page 609 of the text