

**CME 451 – Transport Networks – Winter 2016**  
**Assignment 4**  
**Due Date: March 21, 2016**

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This assignment contains 12 problems. Completed assignments must be submitted on the specified due date by 4:30pm in the CME451 assignment box (second floor, across Room 2C94E). Late assignments will not be marked, and will be given a mark of zero.

Marking scheme:

- 30% completion mark
  - 70% based on a selected set of problems (to be determined by the marker)
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*Note to students:* in the following you will NOT find full solutions, but instead sufficient hints towards the full solutions. When appropriate, pointers to appropriate lecture slides are provided in parentheses. When in doubt, feel free to contact the teaching assistant or the instructor for further help on your assignments.

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1. Read chapters 7, 9 (Iniewski textbook); 23 (Forouzan textbook).
2. What is the maximum size of a TCP header? What is the minimum size of the TCP header? How is this size specified in the TCP protocol (i.e., what is the syntax)?

**Solution:** (C31, Slides 38-40) Briefly define entity authentication, and explain the time-varying nature of this approach.

3. How is the TCP window size determined in receiver-based flow control?

**Solution:** (C31, Slides 38-40) Briefly define entity authentication, and explain the time-varying nature of this approach.

4. What is the value of the receiver window for host A, if the receiver, host B, has a buffer size of 6500 bytes and 2100 bytes of received and unprocessed data?

**Solution:** (C31, Slides 38-40) Briefly define entity authentication, and explain the time-varying nature of this approach.

5. What is the rationale of the transmitter-based flow control in TCP? Describe a possible scheme for flow control (Hint: you may consider the simple slow-start scheme).

**Solution:** (C31, Slides 38-40) Briefly define entity authentication, and explain the time-varying nature of this approach.

6. Discuss the PROs and CONs of SCTP as a transport layer protocol.

**Solution:** (C05 – Part 3 – Slides 2-5) Discuss SCTP as a compromise, or strategic combination of the best features, of UDP and TCP.

7. Describe at least 3 features found in SCTP, but not in previous transport layer protocols. For each feature, explain which relevant issue is being addressed.

**Solution:** (C05 – Part 3 – Slides 6, 8, 21) Answers vary. Acceptable examples include: multiple streams, multi-homing, cookies, etc.

8. What is the preferred semiconductor technology used in VLSI, and why?

**Solution:** (C07, Slide 2) Justify CMOS as the preferred solution.

9. In the context of designing network ICs,

- (a) List the external I/O interfaces and their functions. (Hint: Draw a diagram, showing line side vs. system side).

**Solution:** (C07, Slides 21, 22) Describe the three interfaces: data, microprocessor and memory. Draw Figure 7.8, slide 22, Chapter 7.

- (b) Compare serial vs. parallel I/O for chip interfaces.

**Solution:** (C07, Slides 23, 24, 25) Contrast in terms of speed and the need for control signals and CDR.

10. With respect to the OSI model, which layers utilize VLSI technologies? For each of the identified layer, provide an example of: (a) the equipment; (b) the corresponding ICs.

**Solution:** (C07, Slides 8, 10) Provide suitable examples based on Fig. 7.4, Slide 10.

11. In the context of a SONET link, explain the roles of the relevant PMD and PHY devices (Hint: consider drawing a schematic block diagram in your explanation).

**Solution:** (C07, Slides 12, 13). Describe various devices in Figure 7.5.

12. Describe the types of external memories available, and how they should be selected.

**Solution:** (C07, Slide 37, 39) Describe SRAMs vs. DRAMs. Select based on cost constraints and required clock speeds (Fig 7.25).