Communication Protocols and Internet Architectures
Harvard CSCI 40
Practice Exam Questions

   The midterm and final exams will be made up of a combination of multiple-choice questions, True/False questions, matching questions and essay questions. This practice exam includes examples of the type of essay questions that you will see.

   The solutions for these questions have been posted on the course website, but we strongly suggest that you try to answer these questions in writing before you look at them. If any question below is incomplete or if you believe that some details are missing, you should describe the technical assumptions you made in order to answer the question. This is the same approach that you should use on the actual exam.

   Please note that these practice questions might cover topics that we did not discuss this term, or are not included on the exam, and of course, the exam will cover topics that are not included in these practice questions. Do not hand in or send us your solutions to these practice questions.

1.) Token ring networks (an older form of LAN) and ethernet networks have different maximum frame sizes (approximately 1,500 versus 4,500 bytes.) Given that layer 2 switches could be used to interconnect these two different types of networks, should these switches be designed so that they implement fragmentation and reassembly? Why or why not? (Note that even though you don't know about token ring networks, you should still be able to answer this question.)

2.) Study the TCP state diagram (which is shown in the RFC on TCP.) Describe two ways to get into the SYN RCVD state. Note that if we asked this question on the exam we would provide a copy of the state diagram.

3.) Explain the use of both upward multiplexing and downward multiplexing in relation to the transport layer. Do comparable approaches apply to other layers?

4.) Explain how a link level protocol that uses a window size of 127 could be more efficient than a protocol that uses a window size of 7. Include in your answer how the link's end-to-end delay and the link's bandwidth influence the link's performance.

5.) In the Internet today the only layer 3 protocol that is used and processed by the routers is IP. Yet, people are still able to send and use other network layer protocols, such as vendor-specific protocols and other proprietary protocols, across the Internet. By this we mean that the proprietary layer 3 protocol header is still present in the packet that is sent across the Internet. How is this accomplished? Explain the technical issues in detail.

6a.) Describe what happens to a TCP/IP packet that is encapsulated within an ethernet frame when it traverses an old-style wiring hub, an ethernet switch and a router? In each of these cases, describe what protocol fields (if any) change at both layer 2 and layer 3.

6b.) Which of these devices inherently adds the the most delay to the arrival of a single packet? Why?

7.) Use the SP3 framework described in class to compare and contrast the PPP and 802.3 protocols. (If the point-to-point protocol was not studied in class this term, replace it with another protocol of your choice and try to answer the question. The intent of the question is to have you apply the SP3 framework to compare two different protocols.)

                    (Last revised October 2016, LNE)