CME 451 – Transport Networks – Winter 2016
Assignment 3
Due Date: March 7, 2016

This assignment contains 14 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)

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 5 (Iniewski textbook); 2, 20, 23 (Forouzan textbook)..

2. Explain the connections between the layers in the OSI model and those in the TCP/IP protocol suite. [Hint: you may wish to draw a block diagram].

   Solution: (C05 – Slide 25) Show (an appropriately reduced/modified) Slide 25.

3. Describe the following types of address: (a) physical address; (b) logical address; (c) port address. [Hint: you should describe at least the relevant layer, the number of bits used]. Give an example for each type.

   Solution: (C05 – Part 1 – Slides 34, 37, 43, 68, 84) Examples given can vary, as long as they conform to the proper syntax.

4. Describe the following types of delivery, and identify the associated layer in each case: (a) node-to-node delivery; (b) host-to-host delivery; (c) process-to-process delivery.

Solution: (C05 – Part 1 – Slides 13, 15-17; also C05 – Part 2 – Slide 4) Describe in the context of data, network, and transport layers.

5. What are the min & max values of the HLEN field (in IPv4)? When are these values encountered?

Solution: (C05 – Part 1 – Slides 53, 54) Consider cases with no option, and full options included.

6. Explain the following concepts (related to IPv4): (a) best effort; (b) connectionless.

Solution: (C05 – Part 1 – Slides 46, 51, 67 and class discussions; also compare with C05 – Part 2 – Slides 2, 12, 20)

7. In IPv4, what is fragmentation, and when is it needed?

Solution: (C05 – Part 1 – Slides 69, 71) Explain how the MTU is a bottleneck factor.

8. An IPv4 fragment arrives with an offset of 50. How many bytes were originally sent before the data in this fragment?

Solution: (C05 – Part 1 – Slides 73-74) Note that offset field shows the offset from the beginning of the original datagram in multiples of 8 bytes.

9. Find the HLEN field (in binary format for IPv4), if the total length is 1228 bytes, 1168 of which is data from the upper layer.

Solution: (C05 – Part 1 – Slides 53, 59, 64, 65) Note that the total length includes header length.

10. An IPv4 datagram arrives with the following information in the header:
0x45 00 0C 75 00 03 58 45 10 06 00 00 6C 1A 5C 11 5D F2 2C D5
Show your calculations in answering the following questions.

    (a) What is the size of the data?

Solution: (C05 – Part 1 – Slides 53, 60)
Locate the corresponding HLEN and Total length fields, with the proper syntax.

(b) How many more routers can the packet travel to?

Solution: Locate the TTL filed.

(c) What are the source and destination addresses? [Hint: use IP address format]

Solution: Locate the last two fields, noting 32-bit addresses in IPv4.

11. List the transition strategies to move from IPv4 to IPv6. Explain their application scenarios.

Solution: (C05 – Part 1 – Slides 91-95)

12. Explain why, as a transport protocol, UDP is described to be: (a) connectionless and (b) unreliable.

Solution: (C05 – Part 2 – slides 12, 17, 18) (Also refer to question 6).

13. For a UDP datagram, what is the: (a) minimum size; (b) maximum size? When are these values encountered?

Solution: (C05 – Part 2 – Slides 14-16; also C05 – Part 1 – Slide 53)
(a) Consider the case with no UDP data.
(b) Consider the case with no IP options, and full UDP data.

14. The following is a dump of a UDP header in hexadecimal format:
06 11 00 15 00 1C E2 17
Show your calculations in answering the following questions.

(a) What are the source and destination ports?

Solution: (C05 – Part 2 – Slides 7, 13, 14)
See syntax on slide 14, noting the ports are 16-bit.

(b) What is the total length of the user datagram? What is the length of the data?

Solution: Note that the total length includes the data length (both lengths in bytes).

(c) Is the packet from a client to a server, or from a server to a client? Explain.

Solution: Consider the corresponding IANA convention (C05 – Part 2 – Slide 7).