HOMEWORK 7 (TRANSPORT LAYER)

Fill in your answers in the space provided and submit your modified copy to Connex as an attachment.

CONCEPTS

- Port Multiplexing and Demultiplexing
- Sockets and Port numbers
- Checksum
- TCP Sequence and acknowledgement Numbers

Q1

Consider a TCP connection between host A and host B. Suppose that the TCP segments traveling from A to B have source port number x and destination port number y. What are the source and destination port numbers for the segments traveling from B to A?

Q2

Suppose a process on host C has a UDP socket with port number 6789. Support both host A and host B each send a UDP segment to host C with destination port number 6789. Will both of these segments be directed to the same socket at host C? If so, how will the process at host C know that these two segments from two different hosts?

Q3

UDP and TCP use 1's complement for their checksums. Suppose you have the following three 8-bit bytes: 01010011, 01100110, 01110100. What is the 1's complement of the sum of these 3 bytes. (Note: although UDP and TCP use 16-bit word sum, we are only computing with 8-bit for this problem.) Show all steps.

1. Why is it that UDP takes the 1s complement of the sum? Why not just use the sum instead?

2. With the 1s complement scheme, how does the receiver detect checksum errors?

Q4

Host A and B are communicating over a TCP connection, and host B has already received from A all bytes up through byte 126 inclusively. Suppose host A then sends two segments to host B back-to-back. The first and second segments contain 80 and 40 bytes of data respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgement whenever it receives a segment from A.

1. In the second segment sent from A to B, what are the sequence number, source port number, and destination port number?

2. If the first segment arrives before the second segment, in the acknowledgement of the first arriving segment, what is the acknowledgement number, the source port number, and the destination port number?

3. If the second segment arrives before the first segment at B, in the acknowledgement of the first arriving segment (i.e., the second segment), what is the acknowledgement number?

4. Suppose the two segments sent by A arrive in order at B. The first acknowledgement is lost and second acknowledgement arrives after the first timeout interval at A. Draw a timing diagram (Message Sequence Chart), showing these segments and all other segments and acknowledgement sent. For each segment in your figure, provide the sequence number, the number of bytes of data; for each acknowledgement that you

add, provide the acknowledgement number.