MIDTERM SOLUTIONS:

CH 1 P22

Consider the following data,

- The number of routers between the client and the server = *N*.
- The number of links between the client and server = *N*
- The packet loss probability between the server and the client = *p*.
- The packet loss probabilities are independent for each link.

Probability that the packet is successfully received by the receiver (p_1) for N links = $(1-p)^N$.

The probability that the packet sent or transmitted by the server is received by the client successfully = $\frac{1}{p_1}$.

Therefore, the probability that the packet received successfully by the client from the server is $\frac{1}{p_1}$.

The probability of the re-transmission of the packet by the server to the client successfully= the probability of successful transmissions -1.

= $\frac{1}{p_1}-1$

Therefore, on average the re-transmiss ion of the packet to the client by the server will be $\frac{1}{p_1}-1$.

CH 2 P 4

Consider the HTTP GET message from text book. Now, convert the given HTTP request message into the above format as follows:

GET	sp	**/cs453/index.html**	sp	**HTTP/1.1**	
Host:	sp	**gaia.cs.umass.edu**			
User-Agent:	sp	**Mozilla/5.0** (Windows;U; Windows NT 5.1; en-US; rv:1.7.2) Gecko/20040804 Netscape/7.2 (ax)			
Accept:	sp	ex t/xml, application/xml, application/xhtml+xml, text /html;q=0.9, text/plain;q=0.8,image/png,*/*;q=0.5			
Accept-Language:	sp	en-us,en;q=0.5			
Accept-Encoding:	sp	zip,deflate			
Accept-Charset:	sp	ISO -8859-1,utf-8;q=0.7,*;q=0.7			
Keep-Alive:	sp	300			
Connection:	sp	**keep-alive**			

a) The URL of the document requested by the browser is **/cs453/index.html**

The actual URL entered by the user in the browser is http://gaia.cs.umass.edu/cs453/index.html

c) 'Connection' head line in the given ASCII string is set to 'keep-alive'.

Therefore, the browser is requesting for the persistent connection.

d) This information cannot be given using the given HTTP GET message.

From the 'User-Agent:' header we can know the browser version and operating system of the host (e.g. Windows NT 5.1) on which the browser is running.

e) Mozilla/5.0 initiates the given HTTP GET message.

Server can send different versions of the same requested message to different types of browsers based on their versions. So mentioning browser type is required in the HTTP request message to receive related version of the requested object.

b) By observing the version field in the given ASCII string, we can say the browser is running HTTP/1.1 version.

CH 3 P 3

Consider three 8-bit bytes 01010011, 01100110 and 01110100.

The sum of three 8-bit bytes 01010011, 01100110 and 01110100 is as shown below:

First, find the sum of first two 8-bit bytes 01010011 and 01100110.

0 1 0 1 0 0 1 1

+

0 1 1 0 0 1 1 0

---

1 0 1 1 1 0 0 1

The sum of first two 8-bit bytes 01010011 and 01100110 is 10111001.

Now, to the sum obtained, add the third 8-bit byte 01110100.

1 0 1 1 1 0 0 1

+

0 1 1 1 0 1 0 0

Wrap around 1 0 0 1 0 1 1 0 1

1

Sum 0 0 1 0 1 1 1 0

Checksum 1 1 0 1 0 0 0 1

Step 2 of 4

The reason for UDP taking the 1's complement of the sum instead of just the sum is as follows:

- When the 1's complement of sum is performed, the resultant will be the checksum.
- The receiving host uses the checksum to check whether there are errors in the segment.

The sum of three 8-bit bytes 01010011, 01100110 and 01110100 is 00101110.

The checksum of three 8-bit bytes 01010011, 01100110 and 01110100 is 11010001.

The 1's compliment can be obtained by reversing the bits. One's complement is achieved by converting all 1s into 0s and all 0s into 1s.

Therefore, the 1's complement of Sum 00101110 will be **11010001**.

It can be observed that the 1's complement of Sum is same the Checksum.

The following is the procedure used by the receiver to detect the errors in the packet:

- At the receiver end, all the bytes including the checksum are added.
- The receiver checks for errors by looking at the sum.
- If the sum contains all 1's, then there are no errors.
- If the sum contains at least one bit as 0, then there are errors.

At the receiver end, all the bytes and checksum are added together to detect an error. If the sum contains at least one bit as 0, then there is an error.

- All one-bit errors will be detected using this method.
- Two-bit errors can be undetected by using this method. This is because two different bits may change but the sum may still be same.

CH 3 P 15

a). We know that in TCP, data is transferred in the form of segments. The segment contains the TCP header which holds the necessary information of data. In segments, data is stored in the form of bytes.

so first segment store data = 110 - 90 = 20 bytes. Bytes 90-109 are in the first segment.

b). 90. TCP uses cumulative acknowledgments. Hence host B will acknowledge that it has received all segments excluding sequence number 90. So it will acknowledge host A with 90.