CS 640: Introduction to Computer Networks
Homework 1

SOLUTION

1. **Transmission overheads**

1.1. [0.5]

Total number of bytes transmitted = size of file + number of checksum bytes
= 16K + 16K/128 = 16.125K bytes

Total Time for tx = time for connection setup + time for tx
= 30s + (16.125K * 8bits)/33.3k (note that kbps is kilo bits per sec)
= 33.97 sec

1.2. [0.5]

Total Time for tx = propagation delay + time for tx
= 0.25 sec + (16K*8bits)/8k sec
= 16.634sec

1.3. [0.5]

Total Time for tx = 30s + (64.5K * 8bits)/33.3k
= 45.87 sec

1.4. [0.5]

Total Time for tx = 0.25 sec + (64K*8bits)/8k sec
= 65.79sec

1.5. [1.0]

It depends upon the size of the file being transferred. Setting 1 is better if the file size is big as compared to setting 2. As long as the file size is less than 38.33Kbytes, Setting 2 will be better but for files greater than 38.33Kbytes, setting 1 will be better.

2. **HTTP persistent connections**

2.1. [1.0]

In persistent http, the client must be able to tell different objects apart from each other. For this to happen, the server must include the size of the content in the header. However, the output size of the cgi scripts and the size of the dynamic content cannot be determined in advance.

2.2. [1.0]

Since the large objects will take a lot of time to download, the user will not see any content for a long time and get an impression that the server is not responding. So he will refresh the page and the same thing will start over again.

2.3. [1.0]

The client can reserve one connection for large objects and use the rest for small objects. The client can use the HEAD method of http and request the meta-data of the objects (here images) including the size of the object. Then it can use the GET method to retrieve the large-sized images on one connection and the smaller objects on the other connections.

3. **Traceroute**

3.1. [1.0]

The number of hop is neglected.

No, traceroute to www.washington..edu takes 9 hops whereas that to www.cmu.edu takes 14 hops despite CMU being closer to Wisconsin than Washington is.

3.2. [1.0]

US (Chicago, New York) → Denmark (Copenhagen) → Sweden(Stockholm)→ Belarus(Minsk)
(Other answers will also be accepted as long as you specify how you got them)

3.3. [1.0]

No, the traceroute indicates that the path goes to San Francisco.
[gar4-p300.sffca.ip.att.net]

4. Packets and Headers

4.1) [1.0]

S IP – (I,3), (II,3), (III,3), (IV,3), (V,3), (VI,3)
D IP - (I,3), (II,3), (III,3), (IV,3), (V,3), (VI,3)

S MAC – (II,2), (III,2)
D MAC – (V,2)
B MAC- None (The bridge just forwards the frames and its MAC does not appear in any frame)

4.2) [1.0]

(I,3), (II,3), (III,3), (IV,3), (V,3), (VI,3)

4.3) [1.0]

R1 MAC – In (II, 2) and (III,2) R1's MAC appears as the destination. In (IV,2), R1's MAC appears are the source.

R2 MAC – In (IV,2) – as a destination. In (V,2) – as a source.

R1 and R2 IPs will never appear.

4.4) [1.0]

8080 – (I,4), (II,4), (III,4), (IV,4), (V,4), (VI,4)
19999- (I,4), (II,4), (III,4), (IV,4), (V,4), (VI,4)