CMPEN/EE 362 - HW2

Student Name: __________________________

Problem 1

Consider the following string of ASCII characters that were captured by Wireshark when the browser sent an HTTP GET message (i.e., this is the actual content of an HTTP GET message). The characters <cr><lf> are carriage return and line-feed characters (that is, the italized character string <cr> in the text below represents the single carriage-return character that was contained at that point in the HTTP header). Answer the following questions, indicating where in the HTTP GET message below you find the answer.

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

a) What is the URL of the document requested by the browser?
b) What version of HTTP is the browser running?
c) Does the browser request a non-persistent or a persistent connection?
d) What is the IP address of the host on which the browser is running?
e) What type of browser initiates this message? Why is the browser type needed in an HTTP request message?

Problem 2

The text below shows the reply sent from the server in response to the HTTP GET message in the question above. Answer the following questions, indicating where in the message below you find the answer.

```
HTTP/1.1 200 OK<cr><lf>Date: Tue, 07 Mar 2008 12:39:45GMT<cr><lf>Server:
Apache/2.0.52 (Fedora)<cr><lf>Last-Modified: Sat, 10 Dec2005 18:27:46
GMT<cr><lf>ETag: ”526c3-f22-a88a4c80”<cr><lf>Accept-Ranges:
bytes<cr><lf>Content-Length: 3874<cr><lf>Keep-Alive:
timeout=max=100<cr><lf>Connection: Keep-Alive<cr><lf>Content-Type: text/html;
charset=ISO-8859-1<cr><lf><cr><lf><!doctype html public ”-//w3c//dtd html
4.0transitional//en”><lf><html><lf><head><lf> <meta http-equiv=”Content-Type”
content=”text/html; charset=iso-8859-1”><lf> <meta name=”GENERATOR”
content=”Mozilla/4.79 [en] (Windows NT 5.0; U) Netscape]”><lf> <title>CMPSCI
453 / 591 /NTU-ST550ASpring 2005 homepage</title><lf></head><lf><much more
document text following here (not shown)>
```

a) Was the server able to successfully find the document or not? What time was the document reply provided?
b) When was the document last modified?
c) How many bytes are there in the document being returned?
d) What are the first 5 bytes of the document being returned? Did the server agree to a persistent connection?

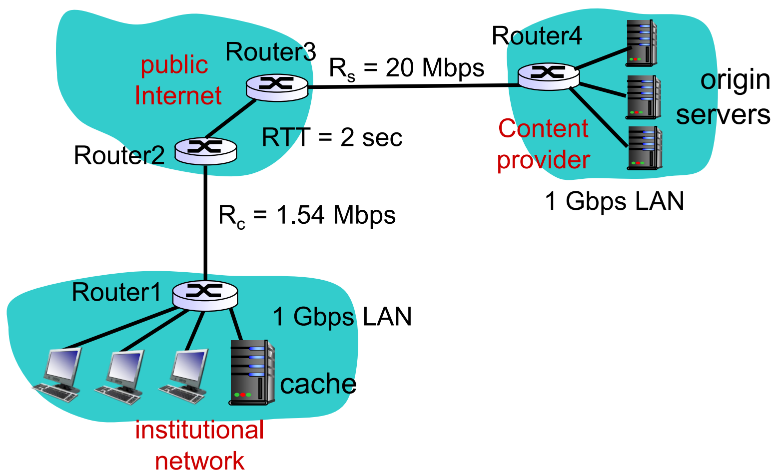
Problem 3

Using your Web browser to obtain a Web page containing a small HTML file referring to 12 objects, each of size 100K bits. Suppose that for each of the following questions, the IP address of the Web server is initially unknown, and that your host needs to visit *all* types of DNS servers (one server per type) to retrieve the IP address. Each visit to a DNS server takes an RTT of 10 ms. The path between your host and the Web server has an RTT of 50 ms and a throughput of 1 Mbps.

e) How long does it take to obtain the base HTML? (hint: ignore transmission time)
f) How long does it take to obtain the entire Web page using non-persistent HTTP without parallel connections?
g) Repeat b) for using 5 parallel connections, each having an RTT of 50 ms and a throughput of 1 Mbps.
h) How long does it take to obtain the entire Web page using persistent HTTP without pipelining?
i) Repeat d) for persistent HTTP with pipelining.
j) What is the minimum number of parallel connections that non-persistent HTTP needs to be faster than persistent HTTP without pipelining? Assume that each connection has the same RTT and throughput as in c).

Problem 4

Consider hosts in an institutional network accessing content via the following network. Suppose each object is 80K bits, hosts in the institutional network generate 18 requests/sec, and hosts from other parts of the Internet (not shown) generate 100 requests/sec. Suppose that the total delay for Router2 to send a request to Router3 and Router3 to send the response back to Router2 is 2 seconds. Ignore propagation delays for other links. Ignore the delays from hosts to the cache in the case of cache misses. Approximate the access link delay (including queuing and transmission delays) by $1/(\mu - \lambda)$, where μ is the service rate and λ is the arrival rate (unit: objects/sec).



a) Find the total delay for obtaining one object from the origin server to a host in the institutional network.
b) Suppose that 20% of requests generated by the institutional network are served by a local cache (i.e., the cache hit rate is 0.2). Repeat a).
c) What is the minimum cache hit rate to make the delay no greater than 100 ms (answer to the second decimal place)?

Problem 5

Use the tool **nslookup** to find out:

a) the IP address and the canonical name of CNN's web server (hostname: www.cnn.com),
b) the IP address and name of CNN's authorative DNS servers (domain name: cnn.com), and
c) the IP address and name of CNN's mail servers (alias: cnn.com).

You should submit a printout of the command line input/output and clearly mark the answer to each question.

Problem 6

Consider distributing a file of F=80 Gbits to N peers. The server has an upload capacity of u_s=10 Mbps. Each peer has a download capacity of d=10 Mbps, and an upload capacity of u. Round all answers to integers.

a) For N=10, 100, 1000, and u=500 Kbps, 2 Mbps, 10 Mbps, make a chart (i.e., a table) giving the minimum file distribution time for each combination of N and u for the client-server architecture.
b) Repeat a) for the P2P architecture.