CN WS20/21 – Exercise 2 (Solutions Nov 19th)

1. True or false?
   - a. A user requests a Web page that consists of some text and three images. For this page, the client will send one request message and receive four response messages.
   - b. Two distinct Web pages (for example, www.mit.edu/research.html and www.mit.edu/students.html) can be sent over the same persistent connection.
   - c. With nonpersistent connections between browser and origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages.
   - d. The *Date:* header in the HTTP response message indicates when the object in the response was last modified.
   - e. HTTP response messages never have an empty message body.
2. Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies.
3. Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects requested by a user or for only some of the objects? Why?

4. Consider distributing a file of F=15 Gbits to N peers. The server has an upload rate of us=30 Mbps, and each peer has a download rate of di=2 Mbps and an upload rate of u. For N=10 and 100 and u = 300 Kbps and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution.

5. Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of RTT1,. . .,RTTn. Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object? Does it make a difference whether the IP is obtained by an iterated or a recursive query?

6. Put these actions into the right order:

- Alice uses UA to compose message “to” `bob@someschool.edu`
- Bob invokes his user agent to read message
- SMTP client sends Alice’s message over the TCP connection
- Client side of SMTP opens TCP connection with Bob’s mail server
- Alice’s UA sends message to her mail server; message placed in message queue
- Bob’s mail server places the message in Bob’s mailbox