THE UNIVERSITY OF BRITISH COLUMBIA

Cpsc 317 Spring 2009

Internet Computing

Midterm

Student Name:_____ OPEN NOTES - 1 hour

Student ID: _____ *Instructor:* Dr. SON VUONG

This exam has 15 questions, which should be answered on this exam paper. **Answer True (T) or False (F), or select the (most) correct answer (a, b, c, d, e or f) to the following:**

_____**1.** The Internet access service (e.g. ADSL and cable) is symmetric in that each subscriber usually gets equal bandwidth for both downstream (download) and upstream (upload).

_____ **2**. Give at least 4 names of the application protocols that typically use (sit on top of) TCP:

(i) _____, (ii) _____ (iii) _____ (iv) _____

_____**3.** HTTP is a connection-oriented application protocol.

_____**4.** A web browser gets **a base object** (html file) and **5 referenced objects** from a web server using HTTP. How many **RTTs** (Round-Trip Times) can be saved if **persistent** connections **with pipelining** are used instead of **persistent** connections **without pipelining**?

(a) 2 **(b)** 4 **(c)** 6 **(d)** 8 **(e)** 10 (**f**) None of those

_____**5.** Which of the following rules **CANNOT** be used to identify the end of a HTTP response message?

(a) The number of bytes in the body of the response as indicated by the Content-Length header value.

(b) The closing of the TCP connection by the server when the response ends.

(c) The receipt of an empty packet.

(d) Certain response code that indicates that the response message doesn't have a body.

(e) In response to a certain specific type of request (e.g. conditional Get), the response message may not have a body.

_____**6.** The following are true for Web caching:

(a) Web caching can bring the desired content "closer" to the user.
(b) Web caching can reduce the delay for all objects, even for objects that are not found in cache, since caching reduces the traffic on links.
(c) Web caching can be placed at the client, ISP or server.
(d) Web caching should ensure that the referenced objects are fresh (up-to-date).
(e) All the above

_____**7.** How many TCP connections does FTP use to list the remote directory and transfer 3 files ?

(a) **1** (b) **2** (c) **3** (d) **4** (e) **5**

_____**8.** The following are true for Webmail system such as Gmail:

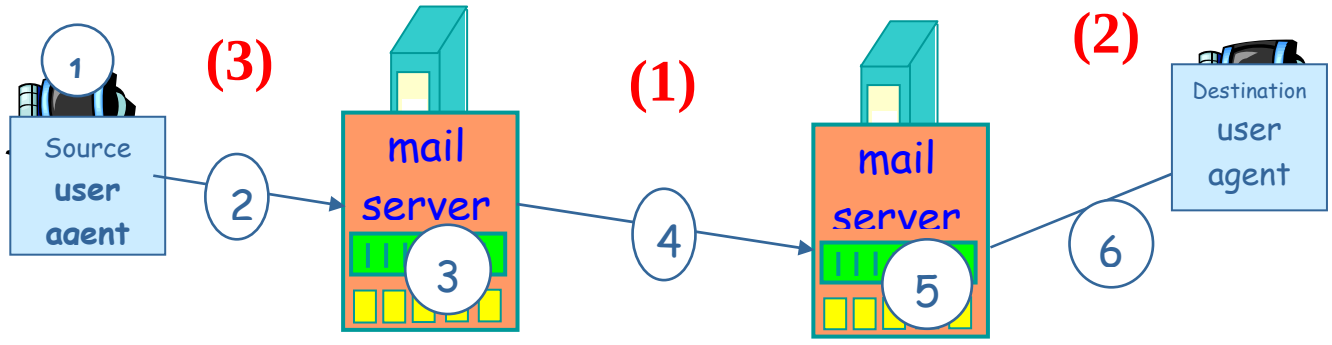
(a) The user agent is the web browser
(b) HTTP is used by the user agent (web browser) to retrieve emails from the mail server

(c) SMTP is still used for email transfer between the (source and destination) mail servers.
(d) All of the above
(e) None of the above

_____**9.** The following application is **elastic**, **loss-tolerant** and tends to use **TCP**:
(a) File transfer
(b) E-mail
(c) Web downloading
(d) Realtime audio/video
(e) DNS
(f) None of those

_____**10a.** Indicate if the following protocols belong to (1), (2) and/or (3) in the figure below
For each protocol, check (1), (2) and/or (3) as applied to the protocol:

(A) SMTP:	_____ **(1)**	_____ **(2)**	_____ **(3)**
(B) HTTP (Web mail):	_____ **(1)**	_____ **(2)**	_____ **(3)**
(C) Pop/IMAP:	_____ **(1)**	_____ **(2)**	_____ **(3)**



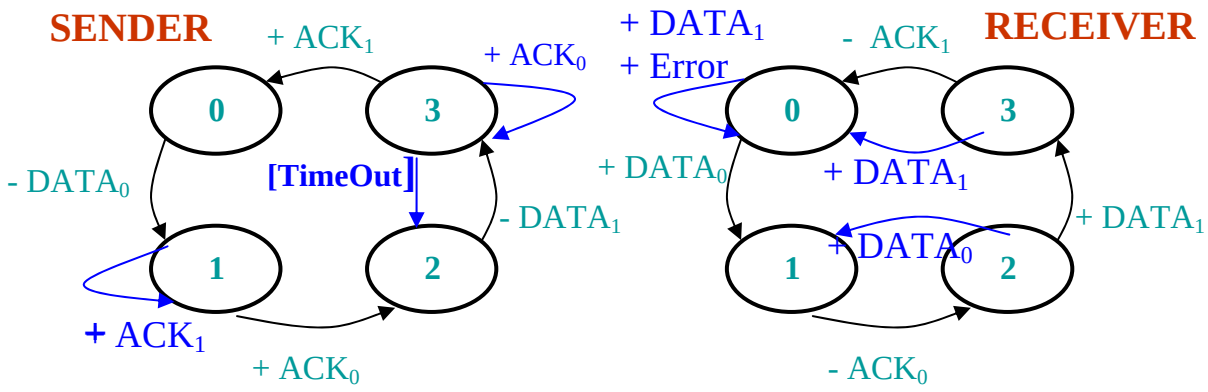
_____**10b.** Indicate if the following alternating bit protocol contains the following syntactic errors. **Specify (explain briefly the occurrence of) such an error of each type if any**:

(a) Unspecified reception (similar to missing code):_____

(b) Non-executable interaction (similar to dead code): _____

(c) State deadlock or livelock (useless progress): _____

(d) All of the above
(e) None of the above



Web Cache Delay Analysis

Consider a typical web access system (we've seen in class) as shown in the figure below. Assume the following:

- the average object size = **100,000 bits**.
- average request rate from institution's browsers to origin servers = **99.999** requests per sec,
- delay from the edge router to any origin server and back to router = **1 sec**
- the LAN is **100 Mbps** and the access link is **10 Mbps.**
- the (institutional and edge) routers are modelled as M/M/1 queuing systems.

(11) What is the estimated average delay $\mathbf{T_r}$ going through the Edge Router (assuming it is modeled as a M/M/1 system) ?

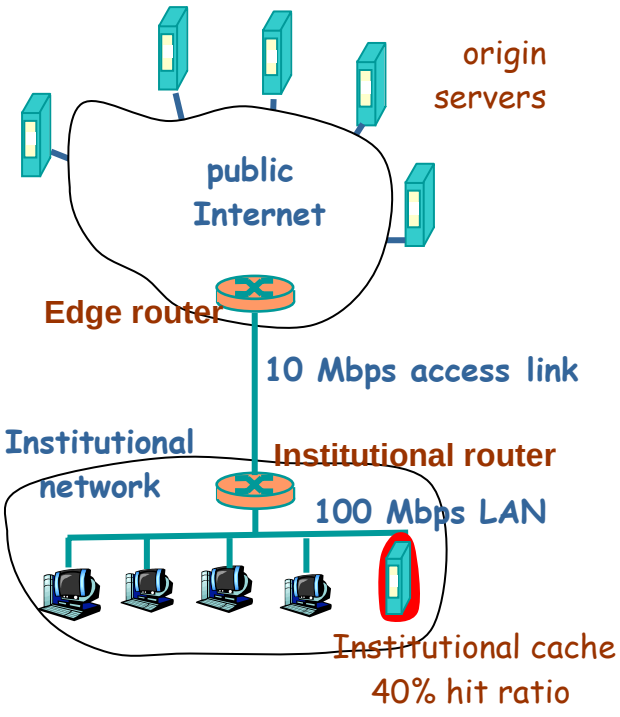
(a) 1 s **(b)** 10 s **(c)** 100 s **(d)** 1000 s **(e)** None of those

(12) What is the minimum buffer size needed at the edge router ?

(a) 100 KB **(b)** 15 MB **(c)** 125 MB **(d)** 1.25 GB **(e)** None of those

(13) Now **Cache** is used achieving a hit rate of 40 %. Calculate the estimated total average response time for each request (Select the closest answer):

(a) 0.2 s **(b)** 0.6 s **(c)** 1.4 s **(d)** 12 s **(e)** None of those



Sliding Window Protocol

Two stations A and B communicate using a sliding window protocol and a 1 Mbps satellite channel. The data frame size is 1KBytes, including header and trailer. End-to-end (station-to-station) propagation delay for the (hub-based) satellite channel is assumed 540 ms.

(14) What is the maximum **efficiency** of the protocol if a 4-bit sequence number and the **Go-Back-N** mode are used in this protocol? Assume that the sizes of the header, trailer and of the ack frame are insignificant.

(a) 2 % **(b)** 6 % **(c)** 11 % **(d)** 27 % **(e)** None of those

(15) How many bits should the sequence number field for this protocol be extended to in order to achieve the full channel utilization (assuming the **Go-Back-N** mode is used)

(a) 6 bits **(b)** 8 bits **(c)** 9 bits **(d)** 10 bits **(e)** 11 bits