King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering
Department of Computer Engineering

COE 344 – Computer Networks (T082)

Major Exam # 01

Date & Time: Tuesday April 14, 2009 (08:30 AM – 09:45 AM)

- **This is a CLOSED books, CLOSED notes exam.**
- **Show all your work. NO credit will be given if work is not shown.**
- **Answer ALL problems.**

Problem #	Mark	Score
1	6	
2	5	
3	24	
4	15	
Total	**50**	

Problem # 1 (6 points; 1 point each): Mark the following with TRUE or FALSE:

	Statement	*TRUE/FALSE*
1.	Increasing the bandwidth of the outgoing link on a router decreases the link's propagation delay.	
2.	A handshaking phase prior to the exchange of data between two hosts guarantees that the data is delivered reliably between the two hosts.	
3.	A network implements either a client/server model or a peer-to-peer model but not both.	
4.	The IP address of the host on which the process runs is not sufficient for identifying the process.	
5.	In Web caching, the user agent directs all requests to a local proxy server. If the proxy server does not have the requested object it directs the user agent to contact the origin server directly.	
6.	A network application using UDP as a transport layer implies that the application ***cannot*** guarantee reliability.	

Problem # 2 (5 points; 1 point each): For each of the following questions select the most appropriate answer:

    i.   Connection-oriented service <u>guarantees</u> _____.
- a. handshaking
- b. reliable data transfer
- c. congestion control
- d. both a. and b.
- e. both a. and c.
- f. both b. and c.
- g. all of a., b., and c.
- h. none of the above

   ii.   A *datagram* network is suitable to provide _____.
- a. connectionless service
- b. connection-oriented service
- c. predictable end-to-end delays
- d. both a. and b.
- e. both a. and c.
- f. both b. and c.
- g. all of a., b., and c.
- h. none of the above

   iii.   A resource record for a hostname will <u>always</u> be found in _____ DNS name server.
- a. local
- b. root
- c. authoritative
- d. both a. and b.
- e. both a. and c.
- f. both b. and c.
- g. all of a., b., and c.
- h. none of the above

   iv.   _____ can be used as a mail access protocol.
- a. HTTP
- b. SMTP
- c. POP3
- d. both a. and b.
- e. both a. and c.
- f. both b. and c.
- g. all of a., b., and c.
- h. none of the above

   v.   To <u>*guarantee*</u> a reduction in the total end-to-end delay along a path, _____.
- a. shorten the distance between every pair of routers along the path
- b. increase the transmission rate of the links along the path
- c. reduce the size of the packets transmitted along the path
- d. both a. and b.
- e. both a. and c.
- f. both b. and c.
- g. all of a., b., and c.
- h. none of the above

Problem # 3 (24 points; 8 points each):

Consider **two hosts** connected to the same router. <u>Each host</u> sends a file of $F = M * L$ bits to the same destination host over a path of Q links. Each link transmits at R bps. The network is lightly loaded so that there are no queuing delays. Both propagation and processing delays are negligible. Packet switching is used and the $M * L$ bits are broken up into M packets, each packet with L bits. Assume that the transmissions of the two hosts alternate on each of the Q links of the path (i.e. on each link, the transmission of a packet of the first host is always followed by the transmission of a packet of the second host).

a. Suppose the network is a packet-switched virtual-circuit network. Denote the VC set-up time by t_s seconds. Suppose to each packet the sending layers add a total of h bits of header. How long does it take to send the file from each source to destination?

b. Suppose the network is a packet-switched datagram network, and a connectionless service is used. Now suppose each packet has $2h$ bits of header. How long does it take to send the file from each host?

c. Repeat (b), but assume <u>message</u> switching is used (i.e., $2h$ bits are added to the message, and the message is not segmented).

Problem # 4 (15 points):

As an experienced network engineer and as part of investigating a network problem, you asked a new trainee to draw a message flow for the case when two users request the same web page. The trainee should assume the following:

  a. The second user requests the web page immediately after the first user finishes receiving the requested web page.
  b. The IP address of the server hosting the requested web page is initially <u>not</u> known to the web browser of <u>both</u> users.
  c. If needed, a <u>recursive</u> DNS query is used. The IP address of the requested web page is currently <u>cached</u> by the TLD DNS server.
  d. Both users are configured to use the same local DNS server and that the local DNS server initially contains <u>no</u> resource records.
  e. The local proxy server is used by both users. The requested web page is initially <u>not</u> cached.
  f. Persistent HTTP with pipelining is used.

By examining the submitted message flow diagram you identified many message flow errors in the diagram. ***Identify all errors*** by encircling incorrect arrows <u>as well as</u> adding and labeling any missing arrows to the diagram.