Name: _____

ID: _____

Network Architecture I: Exam 1

- Put your name and student id.
- The exam is closed book and closed note.
- You have 75 minutes to complete the exam.
- There are 4 pages, 10 problems and 70 points total.
- Answer all the questions directly on the exam papers (back page included). If you need additional sheets, let the instructor know.
- *Be brief, but do not omit necessary details.*
- If the problem appears to be ambiguous to you, write your assumptions along with your answer.
- Enjoy and Good luck!

1. (5 pt) Answer ‘true’ or ‘false’ to the following questions.

T or F

a) Statistical multiplexing is most useful when traffic is bursty.

b) A DNS RR (resource records) (umkc.edu, smtp1.umkc.edu, MX) is stored in the authoritative DNS server.

c) Web caching enables stateful tasks such as shopping cart over stateless HTTP protocol

d) SMTP uses an out-of-band control connection.

e) Go-Back-N sender needs timer for each segment sent.

2. (3 pt) Which of the following is *not* true about port numbers in UDP/TCP? (Ans:____)

(a) The port numbers are used to indicate which application process has to handle the packet.
(b) The same source port numbers can be used for two application processes within a host at the same time.
(c) The same source port numbers can be used in different hosts.
(d) The same destination port numbers can be used in different hosts.

3. (3 pt) Which of the following is not correct about layering? (Ans:____)

(a) Routers only implements up-to network layer and do not implement application and transport layers
(b) Some services are redundantly implemented in multiple layers
(c) It provides modularity making it simple to implement
(d) Each layer implements a service relying on services provided by layer above

4. (3 pt) Which of the following protocol uses a different transport layer protocol? (Ans:____)

(a) FTP
(b) HTTP
(c) DNS
(d) SMTP

5. (3 pt) Which of the following case, a TCP receiver may not send ACK immediately ?
(Ans:____)

(a) Arrival of in-order segment with expected seq #. One other segment has ACK pending

(b) Arrival of in-order segment with expected seq #. All data up to expected seq # already ACKed

(c) Arrival of out-of-order segment higher-than-expect seq. # . Gap detected

(d) Arrival of segment that partially or completely fills gap

6. (3 pt) Which of the below is *least* related to TCP congestion control? (Ans:____)

(a) Retransmission of lost packets
(b) Slow Start
(c) Fast retransmission
(d) AIMD

7. (10 pt) Discuss the advantage and disadvantage of circuit switching and packet switching briefly.
   - Circuit switching:
     + advantage:
     - disadvantage:
   - Packet switching:
     + advantage:
     - disadvantage:

8. (15 pt) Suppose within your Web browser you click on a link to obtain a web page. The IP address for the associated URL is cached in your local host, so a DNS look-up is not necessary to obtain the IP address. Further suppose that the base web page associated with the link references three very small objects on the same server. Let RTT_0 denote the RTTs between the local host and one of the object. Assuming zero transmission time of the object, how much time elapses from when the client clinks on the link until the client receives the full web page with:

   a. Nonpersistent HTTP with no parallel TCP connections?

   b. Persistent HTTP without pipelining?

   c. Persistent HTTP with pipelining?

9. (10 pt) What is the minimum sequence number necessary for selective repeat and Go-Back-N protocols with window size ‘N’?

   - Selective repeat

   - Go-Back-N

10. (15 pt) Answer the following questions on TCP congestion control?

    (a) (5 pt) You are downloading a web page with no embedded objects over TCP. Congestion threshold is 8. The length of the page is 40 segments. The round trip time to server is 1 sec. Assume no losses and neglect all other overheads. How many seconds you expect the download to take?
    (b) (5 pt) Briefly explain AIMD and slow start.
    (c) (5 pt) How does a TCP sender perceive congestion?

THE END