53 (CS 815) DGIM

2018

TCP/IP–DESIGN AND IMPLEMENTATION

Paper : CS 815

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **all** questions.*

1. Attempt ***any one*** of the following : 10

   (a) Consider the *queuing delay* in a *router buffer* (preceding an outbound link). Suppose all packets are L *bits*, the *transmission rate* is R *bps*, and that N packets simultaneously arrive at the buffer every LN/R seconds. Find the *average queuing delay* of a packet. (Hint: The queuing delay for the first packet is zero; for the second packet L/R; for the third packet 2L/R. The Nth packet has already been transmitted when the second batch of packets arrives)

(b) Generalize the *end-to-end delay formula* for heterogeneous *processing rates, transmission rates* and *propagation delays.* 10

2. Attempt the following :

(a) *TCP* can be enhanced with *SSL* to provide process-to-process security services, including *encryption.* Does *SSL* operate at the *transport layer* or the *application layer* ? If the application developer wants *TCP* to be enhanced with *SSL,* what does the developer has to do ? 10

(b) 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.* 10

3. (a) Why do *HTTP, FTP, SMTP* and *POP3* run on top of *TCP* rather than on *UDP* ? 4

(b) True ***or*** False ? 8

(i) With *non-persistent connections* between browser and origin server, it is possible for a single *TCP segment* to carry two distinct *HTTP request messages.*

(ii) An user requests a *Web page* that consists of some text and two images. For this page, the client will send one *request message* and receive three *response messages.*

(iii) 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.*

(iv) The **Date :** header in the *HTTP response message* indicates when the object in the response was last modified.

(c) What is the difference between **MAIL FROM :** in *SMTP* and **From :** in the mail message itself ? 8

Or

(a) What is an *overlay network* ? Does it include *routers* ? What are the *edges* in the overlay network ? How is the *query-flooding overlay network* created and maintained ? 10

(b) *Skype* uses *P2P* techniques for two important functions. What are they ? 4

(c) What is a *whois* database ? Discuss why *whois* databases should be made publicly available ? 6

4. (a) Consider a *TCP connection* between Host A and Host B. Suppose that the *TCP segments* traveling from Host A to Host B have *source port number x* and *destination port number* y. What are the *source and destination port numbers* for the *segments* traveling from Host B to Host A ? 2

(b) Is it possible for an application to enjoy *reliable data transfer* even when the application runs over *UDP* ? If so, how ? 4

(c) Suppose you have the following two bytes: 00110100 and 01101001. What is the *1's complement* for these 2 bytes ? For the bytes noted above, give an example where one *bit* is flipped in each of the two bytes and yet the *1's complement* does not change ? Suppose you have the following two bytes: 11110101 and 00101001. What is the *1's complement* for these 2 *bytes* ? 6

(d) Answer true or false to the following statements and briefly justify your answer : 8

(i) The *alternating bit protocol* is the same as the *SR protocol* with a sender and receiver window size of 1.

(ii) With *GBN*, it is possible for the sender to receive an *ACK* for a packet that falls outside of its current window.

(iii) With the *SR protocol*, it is possible for the sender to receive an *ACK* for a packet that falls outside of its current window.

(iv) The *alternating bit protocol* is the same as the *GBN protocol* with a sender and receiver window size of 1.

5. (a) What are the two most important *network layer* functions in a *datagram network* ? What are the three most important *network layer* functions in a *virtual-circuit network* ? 4

(b) Do *routers* have *IP addresses* ? If so, how many ? 4

(c) Suppose an application generates chunks of 40 *bytes* of data every 20*msec*, and each chunk gets encapsulated in a *TCP segment* and then an *IP datagram*. What percentage of each datagram will be overhead, and what percentage will be application data ? 4

(d) Compare and contrast *link-state* and *distance-vector routing* algorithms. 8
