SECTION A

Answer all the questions in this section.

1. State true or false:
   a. "Congestion control prevents overflowing the receivers". (1 mark)

   TRUE

   0

   b. HTTP response messages never have an empty message body. (1 mark)

   FALSE

   1

   c. Two distinct web pages from the same server can be sent over the same persistent HTTP connection. (1 mark)

   TRUE

   1

2. Which of the following are defined in Transport layer? (1 mark)

   (a, b)

   1

   a. TCP
   b. UDP
   c. FTP
   d. HTTP

3. UDP is called connectionless because (1 mark) (c)

   0

   a. all packets are treated independently by transport layer
   b. it sends data as a stream of related packets
   c. both (a) and (b)
   d. none of the above

4. A user needs to send the server some information. The request line method is ________________. (1 mark)

   (a, d)

   0

   a. GET
   b. HEAD
   c. SEND
   d. POST

5. If there are N routers from source to destination, total end-to-end delay in sending packet P (L → number of bits in the packet, R → transmission rate) will be (1 mark) (C)

   a. N

b. (N*L)/R
c. (2N*L)/R
d. L/R

0

6. The domain name system is maintained by (1 mark)

a. distributed database system
b. a single server
c. a single computer
d. none of the above

(a)

1

7. To deliver a message to the correct application program running on a host, the ________ address must be consulted (1 mark)

(a,c)

1

a. IP
b. MAC
c. Port
d. None of the above

8. The number of objects in a Web page which consists of 4 jpeg images and HTML text is (1 mark)

(c)

1

a. 4
b. 6
c. 5
d. 7

SECTION B

Answer all of the following.

9. TCP is said to be self-clocking. Why? (2 marks)

TCP is reliable and connection-oriented Protocol. It first explicitly setup the connection b/w the client-server. After successful connection only it starts transfering so, it is said to be Self-clocking.

0

10. Consider a 150 Mbps link that is 800 KM long, with a queue large enough to hold 5000 packets. Assume that packets arrive at the queue with an average rate of 40,000 packets per second and that the average packet length is 3000 bits. (2 marks)

a. What is the transmission delay for an average length packet?

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$$\frac{L}{R} = \frac{3000}{150\text{ Mbps}} = \frac{\cancel{300}}{\cancel{150}} \times 10^{-5} = 20\ \mu s =$$

b. What is the traffic intensity?

buffer can hold max 5000 packets.

rate of packets arriving = 40,000 per sec.

0 traffic Intensity = $\frac{40{,}000}{5000} = \underline{\underline{8}}$

11. How does web caching reduce the delay in receiving a requested object? Will it be helpful in reducing the delay for all objects (including objects that are not cached) requested by a user or for only some of the objects? Why? (3 marks)

Due to Vact Internet Networks, the webpages a
Kept in different DNS servers, across the netw
If we store locally the DNS address of object, it dec
the time recieving object by searching all DNS
cannot reduce the delay to all objects, If it is in CP
it de

12. Why should someone use circuit switching in telephone networks? (3 marks)

~~It~~ If we use packet switching in telephone networks, t
due to switching, one cannot have same flo
with the other, he has buffering in the conn
which is not reliable in telephone network
While in circuit switching, it there Resources
not shared, and Reliable in connection b/w two

13. Why is it that voice and video traffic is often sent over TCP rather than UDP in today's Internet. (2 marks)

UDP does not provide "Quality of Service", pack
of data may loss in ~~transmits~~ propagation.

So, as need of Quality of service, voice and

14. In rdt protocols, why did we need to introduce sequence numbers? (2 marks)

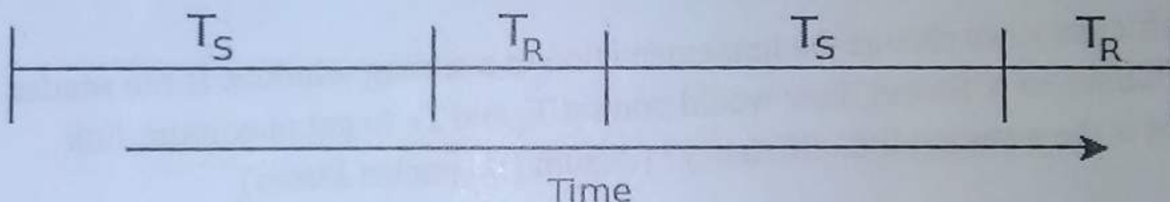
In this case, ~~We~~ that sender do not know to wh
packet, the reciever sent the ACK/NAK's, th
1 Leads to the corruption of data on reciev
and, corruption can also h
in ACK/NAK's b/w reciev

SECTION C

Answer the following

To catch duplicate

15. Consider a half-duplex link with a one-way propagation delay of P seconds and a bandwidth of B bits/sec. The sender and the receiver decide to share the link using Time Division Multiplexing,i.e, the sender sends for T_s time and then the receiver sends for T_R time and so on. Refer to the figure below. Assume that the sender sends data in packets of size F bits and receiver sends ACK in packets of size A bits. (10 marks)



a. Suppose you are implementing the stop and wait protocol. Let $T_s = P+F/B$ and let $T_R = P+A/B$. What is a natural value for sender timeout for retransmission? Explain your answer.

Natural timeout = $T_s + T_R$

b. Does the sender need to number the packets? Explain why or why not.

Yes the sender need to number the packets, be
Time Division Multiplexing, ~~...~~ sender does not k
What happening on recieverside while sender

explanation

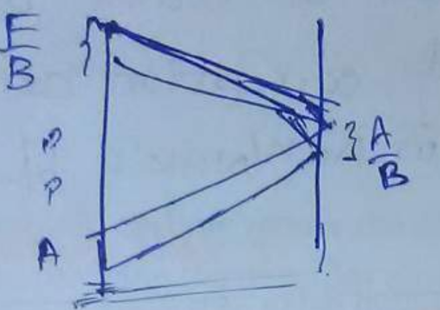
c. Does the receiver need to number the ACKs? Explain why or why not.

[Contd.....Page

~~ACKs~~, because it does not know what happens on sender side while it is waiting.

d. What is the efficiency of this system in terms of link usage, i.e., effective throughput? In other words, if this reliability is being implemented at the transport layer, how many bits of application layer data are you able to get across from sender to receiver per second. (Assume no packet losses)

Here



In time of $T_S + T_R$ the sender is sending F bits to reciever, So,

efficiency of This System $\frac{F}{T_S + T_R}$

=

e. To improve efficiency, we change the implementation to a sliding window. If the sender window size is limited to X frames, how would you set T_s and T_R to get maximum link efficiency? What is the resulting link-efficiency? (Assume no packet losses).

Window size X. = ⇒ Sender send X*F bits ~~...~~ ...

$T_S = X(P + F/B)$ ✗ $\qquad T_R = X(P + A/B)$ ✗

$T_S = \frac{XF}{B} + P$

link efficiency $= \frac{F}{T_S + T_R}$ ✗

$T_R = \frac{A}{B} + P$

=

16. Suppose a 128 kbps peer-to-peer link is set up between earth and a rover on mars. The distance from the earth to mars (when they are the closest together) is approximately 55 Gm (55 x 10^9 m), and data travels over the link at the speed of light 3 x 10^8 m/s. (6 marks)

a. Calculate the minimum Round Trip Time (RTT) for the link.

Min. RTT = 2. Propagation = $2 \cdot \frac{d}{s} = 2 \cdot \frac{55 \times 10^9}{3 \times 10^8} = \frac{550}{3}$ =

$\frac{9}{14}$
$\frac{12}{2}$

b. Calculate delay- bandwidth product (delay x bandwidth) of the link.

delay of link = Propagation delay of link = $\frac{d}{s}$ = $\frac{55 \times 10^{9}}{3 \times 1}$

bandwidth = 128 Kps (Given)

delay x bandwidth = $\frac{550}{3} \times 128 \times 10^{3} = \frac{704}{3} \times 10^{5} = 234.66$

· 2.34
23.4

c. A camera on the rover takes pictures of its surroundings and sends these to the earth. How quickly can it reach Mission Control earth? Assuming that each image is 5Mb in size.

image size = 5Mb = 5×10^{6} bits.

band width = R = 128 Kbps

transmission delay = $\frac{5Mb}{R} = \frac{5 \times 10^{6}}{128 \times 10^{3}} = \frac{5}{128} \times 1$

$= \frac{500}{12}$

$= \frac{625}{16}$

$= 39$

Propagation delay = $\frac{d}{s} = \frac{550}{3} = 183.33$ sec.

As it can reach the earth, atleast in

2

$= d_{trans} + d_{prop}$

$= 39.06 + 183.33 = 242.39$ sec

22