National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Computer Networks	Course Code:	CS3001	29
Degree Program:	BS (CS)	Semester:	Fall 2022	
Exam Duration:	60 Minutes	Total Marks:	35	28.5
Paper Date:	26-September-2022	Weight	15%	
Section:	ALL	Page(s):	5 + 1 (Rough Page)	
Exam Type:	Mid-1			

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Instruction/Notes:
- Attempt all questions on the provided question paper.
- Space for rough work is provided at the end of the paper.
- Even if you do use rough sheets, they should NOT be attached with final paper.

A wow

Problem 1: Answer the following multiple-choice questions by filling the following table. [1+1+1+1+1 = 5 Marks]

4

Any answers outside the table will NOT be marked.

1	A
2	B
3	C
4	D
5	D X C

1.1. If we are using non-persistent HTTP (without parallel requests), and the webpage we are requesting contains a total of 8 jpeg images, and end-to-end RTT is 10 milliseconds (ms), then the total response time would be at least:

A. 160 ms + file transmission time
B. 10 ms + file transmission time
C. 20 ms + file transmission time
D. 80 ms + file transmission time

1.2. The issue of stale copy of an object in a Web Cache may be resolved via.

A. Cookies
B. Conditional Get
C. Pipelining
D. Can't be resolved

1.3. _____transfers messages from senders' mail servers to the recipients' mail servers.

A. Simple Network Management Protocol
B. Hyper Text Transfer Protocol
C. Simple Mail Transfer Protocol
D. Transmission Control Protocol

1.4. Socket is a tuple comprising of

A. IP Address, Ethernet Address
B. Ethernet Address, Port Number
C. MAC Address, Port Number
D. IP Address, Port Number

1.5. FTP is called an out of band protocol because

A. It employs FDM
B. It uses only persistent TCP connections
C. It uses separate connections for control and data traffic
D. None of the above

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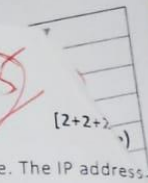

[2+2+2]

Problem 2: Solve and answer the following questions:

(A) Suppose within your Web browser you click on a link to obtain a Web page. The IP address
URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address.
DNS servers are visited before your host receives the IP address from DNS; the successive visi
(round-trip time) of 20ms, 10ms, 25ms, 15ms and 30ms respectively for DNS servers. Suppose t
page associated with the link contains exactly one object, consisting of a small amount of HTM
incurs an RTT of 20ms between the local host and the server containing the object.

(I) Assuming zero transmission time of the object, how much time elapses from when the client on the link until the client receives the object? [2]

Total time = delay of DNS servers + 2RTT + file transmission size

= (20ms + 10ms + 25ms + 15ms + 30ms) + 2(20ms)

= 100ms + 40ms = 140ms = 140×10^{-3} = 0.14s

(II) Keeping in view this scenario, what application layer protocol(s) is(are) required? What is(are) related transport layer protocol(s) used by each application layer protocol? [1+1 =2]

First of all HTTP is required as app layer protocol, Then for transport layer HTTP uses TCP protocol. Now, for DNS, UDP will be used.

(B) Refer to the same scenario as in Part (A), now suppose that the base HTML file (incurring RTT as 20 ms) references 5 small objects on the same server. The reference objects incur the same amount of RTT as the base html file between the local host and the server containing the object. Neglecting transmission times, how much time elapses with

I. Non-persistent HTTP with no parallel TCP connections? [2]

For non-persistant $n(2RTT)$ + file trans missio size

$t = 6(2 \times 20ms) + 0$

$t = 12 \times 20ms$

$t = 240ms$

$t = 240 \times 10^{-3}s$ + 100 (DNS)

$t = 0.24s$

II. Non-persistent HTTP with the browser configured for 3 parallel connections? [2] 1.5

For non-persistent HTTP with 3 parallel: 2RTT
// first three objects using parallel, t = 2RTT+2RTT+2RTT
// then last 2 objects using parallel t = 6RTT
// makes it 2RTT+2RTT t = 6(20ms)
100+ (DNS) t = 120 ms
t = 0.12s [2]

III. Persistent HTTP with pipelining? 1.5

For persistent HTTP with pipelining = 3RTT + file transmission size
t = 3(20ms) + 0
t = 60ms + 100 DNS
t = 0.06s

Problem 3: Suppose you start a new company called **Fast Burgers** and you decide to have an online presence. People typing either the URL **FastBurgers.com** or **FastBurger.com**, both should land on your webserver. Your employees can be reached via email in the format, i.e. **someone@fastburgers.com**
For this, you install multiple machines (servers etc.) providing different services as listed below: **[2+3+5 = 10 Marks]** 6

Sr #	Host Name (Server / Domain Name)	Type	IP Address
1	fastburgers.com	Webserver	20.21.22.23
2	smtp.fastburgers.com	Email Server	20.21.22.24
3	authoritative.fastburgers.com	Authoritative Name Server	20.21.22.25
4	database.fastburgers.com	Backend Database (Containing customer and employee information)	20.21.22.26

In order to get your online network operational and accessible over the internet, please answer the following questions. (**Note**: Please use the following format for resource record (RR) & ignore the TTL field.)
RR Format: (name, value, type)

(A) List the DNS resource records (RRs) to be added to the root name servers? [2] 2

RR('fastburgers.com', 'fastburgers.com', 'CNAME')
RR('mail.fastburgers.com', 'smtp.fastburgers.com', 'MX')

(B) List the DNS resource records (RRs) to be added to the TLD name servers? Who does that? [3] 3

RR('fastburgers.com', 'authoritative.fastburgers.com', 'NS')
~~RR('@fastburgers.com', 'smtp.fastburgers.com', 'MX')~~

This is done by the company who provides DNS sewice like GoDaddy.etc

RR('authoritative.fastburgers.com', '20.21.22.25', 'A')
RR('smtp.fastburgers.com', '20.21.22.24', 'A')

3

(C) List all the DNS resource records (RRs) to be added to your authoritative name server?

~~RR('authoritative.fastbuges.com', '20.21.22.25','A')~~

~~RR('smtp.fastbuges.com', '20.21.22.24','A')~~

RR('database.fastbuges.com', '20.21.22.26','A')

RR('fastbuges.com', '20.21.22.23','A')

Problem 4: Calculate the latency (total delay from first bit sent to last bit received) for the following: [2+2 = 4 Marks]

(A) Sender and receiver are separated by two 1-Gbps (1 Gbps = 1 x 10^9 bps) links and a single switch. The packet size is 5000 bits, and each link introduces a propagation delay of 10 microseconds. Assume that the switch begins forwarding immediately after it has received the last bit of the packet and the queues are empty. [2]

Delay of one link = dt + dp

$$= \frac{L}{R} + 10\,\mu s$$

$$= \frac{5000\ bits}{1 \times 10^9} + 10\,\mu s$$

$$= 5 \times 10^{-6}\,s + 10\,\mu s = 15\,\mu s$$

Now, delay from sender to receiver = $2 \times 15\,\mu s$ = 30μs

(B) Same as (A) above but now three switches and four links. [2]

Delay of one link = 15μs

Delay from sender to receiver = $4 \times 15\,\mu s$

= 60μs

10-Novemb

ALL

Mid-II

shi Roll No. 20L-1219 Section: BCS-3

all questions on the provided question paper.

r rough work is provided at the end of the paper.

you do use rough sheets, they should NOT be attached with final paper.

2	3
7	7
3	7
1	

Q5: Kindly answer the following questions with a single number / Layer name only.

[1 x 5 = 6 Marks]

6

tories or sentences.)

following mu

A. Minimum number of TCP connections needed by an FTP interaction?

2

B. Minimum number of UDP interactions needed by an HTTP interaction?

0

C. Minimum number of UDP interactions needed by a DNS interaction?

1

D. Number of layers in the Internet protocol stack?

5

E. The name of layer of internet stack in which packet is s referred as a segment?

Transport layer

F. The name of layer of internet stack in which packet is s referred as a frame?

& Data link layer / Link layer