A

BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination : Semester Midterm
Duration: 1 Hour 20 Minutes

Semester: Summer 2022
Full Marks: 60

CSE421 / EEE465 : Computer Networks

Answer all the following **3** questions. (**Pages: 2**)
Figures in the right margin indicate marks.

Name:	**ID:**	**Section:**

Q 1. CO1 **a)** Proxy servers act only as servers [Agree or Disagree]. **Explain** briefly how a proxy server minimizes the access link load to the Internet. **5**

b) **(i)** **Discuss** if an organization's Web server and mail server may have the same alias for a hostname (for example cs.iist.bd.). **3 +**

(ii) A new peer 'Alpha' joins BitTorrent without possessing any chunks. She cannot become a top-four uploader for any of the other peers, since she has nothing to upload. **Discuss** how Alpha will get her first chunk. **2**

c) On the **10th July 2022** at **13:01:22**, **PC B** visited the website **whatanexam.com**. To access the website, the local DNS server replied to **PC B's** DNS request with **(whatanexam.com, 100.3.40.56, A, 24)**, where TTL is given in **hours**. The local DNS server used **iterative DNS lookup**, with an RTT of **50 ms** each, to retrieve the IP address for **PC B**. Next, on the **11th of July** at **10:01:23**, **PC B** visited the same website. **2 + 4 + 4**

I. **Determine** the total RTT for **PC B** to fetch the IP address on the 11th of July.

After fetching the IP address, **PC B** sends the request to the website server (which takes **25ms** to be sent) to open a **non-persistent** HTTP connection with the server and request **12 objects**, including the base HTML page, each requiring **85ms** to be downloaded.

II. **Calculate** the total RTT required to fetch all the objects after retrieving the IP address.

III. **Calculate** the total time **PC B** takes to load the webpage.

Q 2. CO2 **a)** Rifat opens a chrome tab to access his **Daraz** account to buy a laptop. **List** the number and the type of the source and destination port addresses that are being used in the request segment sent via the chrome tab to the Daraz Server. **4**

b) **I.** For connectionless demultiplexing, **list** the addresses required to send a segment to the appropriate socket. **3 +**

II. Given that the value of **HLEN** of the TCP header is **1010(binary)**. **Determine** the header length. **3**

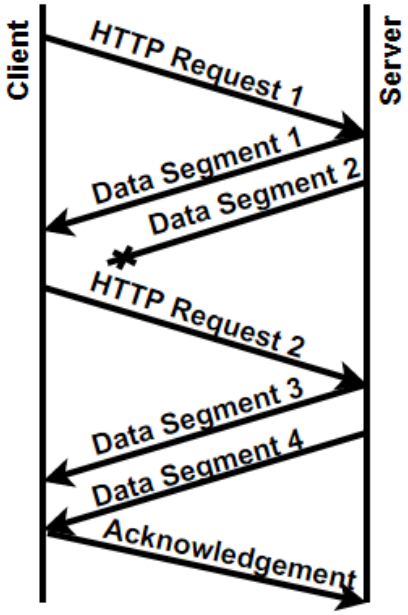
server or client????

c) In a **selective-repeat** TCP connection, client & server have the following values (next page): **4**

I. **Calculate** the **sequence** and **acknowledgment** number of the server's **Data Segment 1** sent to the client. **+ 3**

II. The **2nd** data segment was lost on its way to the client, and the client processed the **1st** data segment as soon as it had received the first segment. **Calculate** the **sequence** number and **rwnd** of the **acknowledgment segment** that the client sends to the server after it receives the **4th** segment. **+ 3**

	Client	Server
ISN (At the start of TCP handshake)	9666	5549
Segments sent	**HTTP Request 1** *(Also the third segment of the 3 way handshake)*: 569 bytes	**Data Segment 1:** 568 bytes **Data Segment 2:** 650 bytes
	HTTP Request 2: 999 bytes	**Data Segment 3:** 266 bytes **Data Segment 4:** 123 bytes
rwnd	8000	7000



Q 3. a) CO3

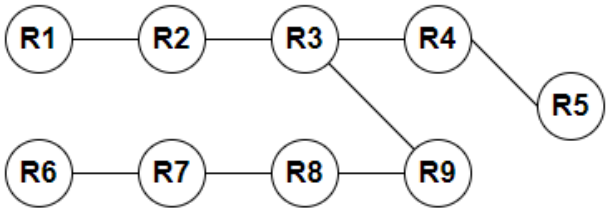
I. Alice is **sending** data to Bob. Alice needs to re-arrange the following tasks in the correct order so that the data can leave her computer. Help her. **Traverse** as per the order in the OSI layers. Just write the numbers in sequence. **3 + 2**

- - - - **1.** The data is transmitted over the medium.
- - - - **2.** Creates a reliable process-to-process connection.
- - - - **3.** Encrypts data.
- - - - **4.** Controls sessions.
- - - - **5.** Alice composes a letter for Bob.
- - - - **6.** Fixes the source and destination IP addresses.
- - - - **7.** Provide hop-to-hop delivery

II. **Identify** the addresses that remain the same at each hop during data transmission.

b) Given, the ping output of Router **R2**. The routers in the topology set the default max TTL value of **123**. Determine if the ping was successful and the router that the **R2** was pinging. **5**

```
Request timed out.
Reply from 10.10.111.10: bytes=32 time=23 TTL=119
Request timed out.
Request timed out.
```



c) Given, a **datagram** of size **28939 bytes** and a **MTU** of **3038**. Also, the header of the packets consumes **38 bytes**. Assume data starts from **0** byte number. **2 +**

I. **How many** packets are required to transfer the whole datagram? **2**

II. **What's** the **MF** of the **3rd last** packet? **+**

III. **What's** the **data** size of the **last** packet? **3**

IV. **What's** the **offset** value of the **2nd** packet? **+**

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END OF QUESTION PAPER **2**

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A

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CSE421 / EEE465 : Computer Networks

Answer **ALL** the following **3** questions. (**Pages: 2**)

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Name:	**ID:**	**Section:**

Q 1. a) CO1	Bob visits a website and inputs his username and password to log-in. He is able to successfully log in. Below is the list of steps that Bob's PC took to send the login request to the server. Re-arrange them in the correct order of the OSI model. *Writing the serial numbers in the correct order is enough for the answer.* 1. Bob's PC identifies the process to send the request 2. Bob's PC identifies the server PC. 3. Bob's session is created 4. The PDU leaves Bob's PC via the Ethernet port 5. Bob's user credentials are encrypted 6. Bob clicks the submit/login button 7. Bob's PC identifies the next hop to send the PDU.	**5**
b)	With 10 peers in the swarm of a given torrent, state if it is possible for a new client to download the torrent successfully. Justify your answer, yes or no.	**3+2**
c)	A client sends a request for a web page which goes to the proxy server. The proxy server has a copy of the requested website. Will the proxy server send a Conditional GET request to the origin server? Explain.	**5**
d)	An 8k video requires **100mbps** bandwidth to view without buffering. Even with a lower access link bandwidth, you can still stream the 8k video with 8k resolution without any buffering. How is it possible?	**5**
Q 2. a) CO2	How do websites track you even if you do not sign up? State how tracking helps the HTTP protocol.	**2+3**
b)	Between iterative and recursive DNS lookup, which one is better overall? Justify briefly.	**5**
c)	Nonte visits www.ahare.com on his web browser on **24th January 2023 at 10:30 AM with a DNS TTL of 5 hours**. On the other hand, Phonte visited the same website on the **24th January 2023 at 4:00 PM** with a **DNS TTL of 10 hours**. Phonte's PC sends the DNS request (taking **23ms** to be sent) to its local DNS server. **I.** Determine the RTT required for Phonte's PC to fetch the IP address.	**3**
	After fetching the IP address, Phonte's PC sends the request to the website server (which takes **39ms** to be sent only) to open a persistent HTTP connection with the server and request **30 objects**, including the base HTML page. Assume each object size is **12 MegaBytes**. Furthermore, the server upload speed is **X Mbps**.	

	II. Calculate the total RTT required to fetch all the objects from the point when you inserted the URL in the browser. **III.** Given, the total file transfer time / HTTP Response Time, including the RTT found in (II), is **5344 ms**. Find **X.**	**3 + 4**
Q 3. a) CO3	A web server receives three HTTP requests containing the same port number. Explain if this can be true. How will the server differentiate between the three requests?	**3+ 2**
b)	UDP does not offer reliability, state which fields are not present in the header for that purpose? But every application requires some sort of reliability. Explain where and how that reliability is given when the application uses UDP.	**2 + 3**
c)	In a selective-repeat TCP connection, an HTTP request (**234 bytes** each) is sent for each of the data segments (**889 bytes** each). Like this, a total of **20 data segments** are sent from the server, including the base HTML file. Furthermore, the client has an ISN of **8924** and RWND of **10000 bytes** and the server has an ISN of **203** and a RWND of **23000 bytes**. I. Calculate the sequence and acknowledgment number of the 4th data segment. The **10th data segment** got lost on its way to the client. II. What's the sequence and acknowledgment number of the 13th HTTP request that's sent to the server? III. What's the RWND of the client when it received the 13th data segment? Assume the first 5 segments were processed by the client.	**3 + 3 + 4**

==========**THE END**==========

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Name:	**ID:**	**Section:**

Q 1. CO1 **a)** **State** the name of the layer responsible for process-to-process delivery. **Explain** how it is different from host-to-host delivery. **5**

b) A company or organization can have the same aliased name for its mail server and the web server. Discuss how a DNS Request differentiates between the two servers. **Give an example**. **5**

c) **2 + 3**

Device	Status	Upload Speed	0	1	2	3	4	5	6	7	8	9
A	ON	12		X					X		X	X
B	ON	100	X	X	X	X		X	X	X	X	
C	OFF	60	X		X	X	X					
D	ON	11	X	X	X	X	X	X	X	X	X	X
E	ON	15		X		X		X		X		
F	ON	14	X			X						
G	ON	-										

A BitTorrent protocol allows a client to connect to four clients giving the maximum upload speed. In such case, with reference to the above table:

I. Client G joins the swarm. Identify if client G can successfully download the file from the current top four uploaders.

II. Given, client D's upload increases to 40mbps resulting in re-selection of top four uploaders for client G. What would be the time taken for client G to download the file if the file size is 890 megabit?

d) **State** the benefits that DASH provides to a user. Explain the purpose of a manifest file in a streaming multimedia setting. **5**

Q 2. CO2 **a)** You visit www.daraz.com using Google Chrome browser at 9:30 AM. Later, at 6:00 PM, you revisit the website using the Mozilla Firefox browser. According to the concept of cookies, you should have been able to view your previous searches when you visit the same website. But in this scenario, you did not see anything related to the last time you visited the website. **Identify** the reason behind this. **5**

b) Name the HTTP request method that allows Proxy servers to request the same object, which the Proxy server already has a copy in its cache. This saves time; **explain** how. **5**

c) Aima writes **www.CSE421.com** on her web browser URL box. To access the website, Aima's PC sends a DNS request to its local DNS server. The local DNS server has no information in **2 +**

its cache. The local DNS server used **iterative DNS lookup**, with an RTT of **19 ms** each, to retrieve the IP address for **Aima's PC**. **4 + 4**

I. **Determine** the total RTT for **Aima's PC** to fetch the IP address.

After fetching the IP address, **Aima's PC** sends the TCP request to the website server (which takes **35ms** to be sent only) to open a **persistent** HTTP connection with the server and request **21 objects**, including the base HTML page. It takes the server **5ms** to retrieve each object from the database and prepare it to be sent. Each object takes **125ms** to be downloaded by the client..

II. **Calculate** the total RTT required to fetch all the objects after retrieving the IP address

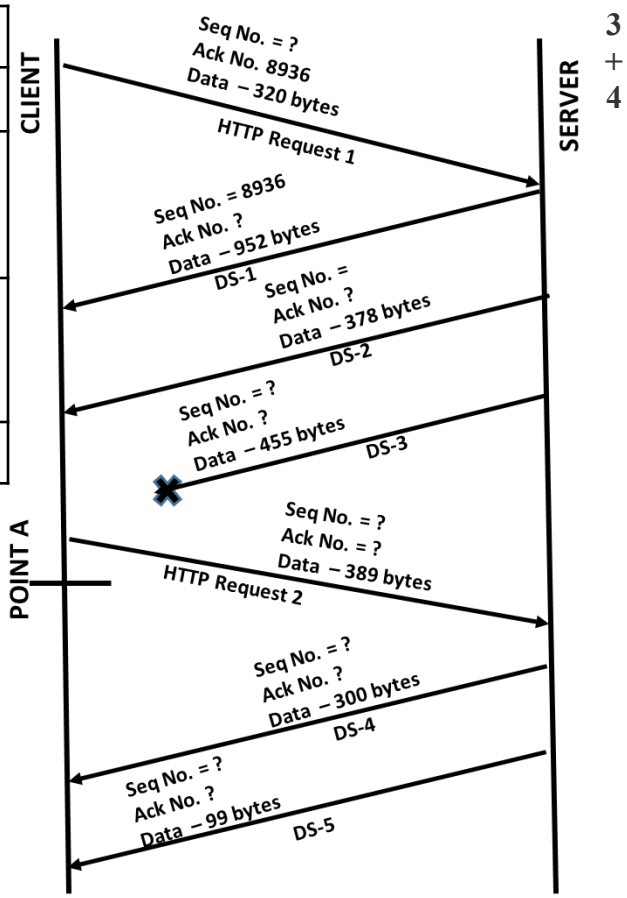
III. **Calculate** the total time **PC A** takes to load the webpage.

Q 3. a) CO3 The UDP header has a field called checksum. **Explain** what this field does. **4**

b) PCA sends data of 1800 bytes starting from sequence number 3001 to PCB. PCA wishes to indicate that 700 bytes of data have to be processed urgently. **Discuss** how PCA will inform this to PCB. **5**

c) In a **go-back-n** TCP connection, the client & server have the following values and flow: **4 + 3 + 4**

	Client	Server
ISN	**2045**	**8935**
Segment Sizes DS - Data Segment	**HTTP Request 1:** *(Also the third segment of the 3 way handshake)*: 320 bytes	**DS 1:** 952 bytes **DS 2:** 378 bytes **DS 3:** 455 bytes
	HTTP Request 2: 389 bytes	**DS 4:** 300 bytes **DS 5:** 99 bytes
RWND	**3020**	**6450**



I. **Calculate** the sequence and acknowledgment number of the server's HTTP Request 2 sent to the server.

II. The client sends all the received segments to the upper layers at point A. **Determine** the rwnd of the client after the client receives DS-5?

III. **What** are the sequence number and acknowledgment number of the client after receiving DS-4?

==========THE END==========

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Q.1. a) [CO1] **Identify** which layers are responsible for adding addresses to the data? **Identify** the address that changes on each hop. **2+2**

b) [CO2] **Differentiate** between CNAME resource records and NS resource records. **4**

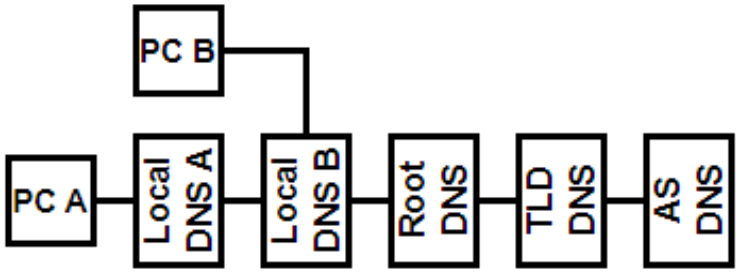
c) [CO2] With the current four top uploaders (all peers), a new peer is not able to download a file fully due to missing chunks. However, the new peer was able to download the file successfully soon after. **Justify** how this may be possible. **5**

d) [CO2] DASH helps us to watch seamless video content, i.e., no buffering while watching a video on the internet. **Explain** how and what needs to be done by the content server. **7**

Q.2. a) [CO2] BRACU Proxy server has the webpage of ***www.techno.com*** downloaded in its cache dated 12th June 2023. You send a request for the above same webpage from a Lab PC on 15th of June 2023. **Explain** if you will get the latest version of the webpage or not. Let's assume the page was updated with new values on the 14th of June 2023. **5**

b) [CO2] **Explain** how HOL (Head of Line) blocking creates a problem in HTTP/1.1. **5**

c) From the below figure, PC-B visits abedu.ac.bd on 13th July at 5:30 AM and gets an RR of (abedu.ac.bd, 172.69.99.13,A,24) where the TTL is given in hours. On the same day, PC-A later visits the same website. Given, each DNS lookup requires 25ms. **3 + 4 + 3**



[CO3] **I.** **Calculate** the RTT (in ms) to fetch the IP address for PC-A.

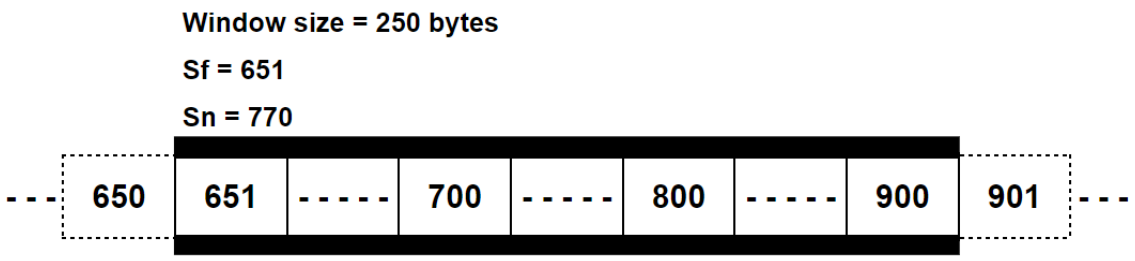
Upon receiving the IP address, PC-A with unlimited download speed opens a persistent connection with the web-server. It takes PC-A 48ms to send a packet, while the server requires 50ms to send the packet to PC-A. Also given, the website has a total of 18 objects including the base html file each requiring 123ms to load.

[CO3] **II.** **Calculate** the total RTT (in ms) for the client to receive all the objects after fetching the IP address.

[CO3] **III.** **Calculate** the total time (in ms) required to view the whole page from the point of requesting the website on your browser.

Q3. a) [CO2] You have opened 3 tabs of Chrome Browser and the WhatsApp application. Name the kind of port numbers that will be issued for these applications you have opened. Explain if they can have the same port numbers or not. **2 + 3**

b) [CO3] **3 + 2**



Refer to the above figure, it represents the window of a receiver PC-A. A few seconds later, PC-A receives an acknowledgement segment, from Server-B, with the acknowledgement number of **731** and the **RWND** number of **200 bytes**. After receiving this acknowledgement segment, **estimate** the Sf, Sn, and start and end byte number of RWND of PC-A.

c) **3 + 2 + 3 + 2**

After requesting certain data segments, the Client sends the FIN segment, with the sequence and acknowledgement number of **1025** and **8765** respectively and the FIN flag on.

[CO3] **I.** **Determine** the sequence and acknowledgement number of the first ACK segment that the server sends as shown in the figure.

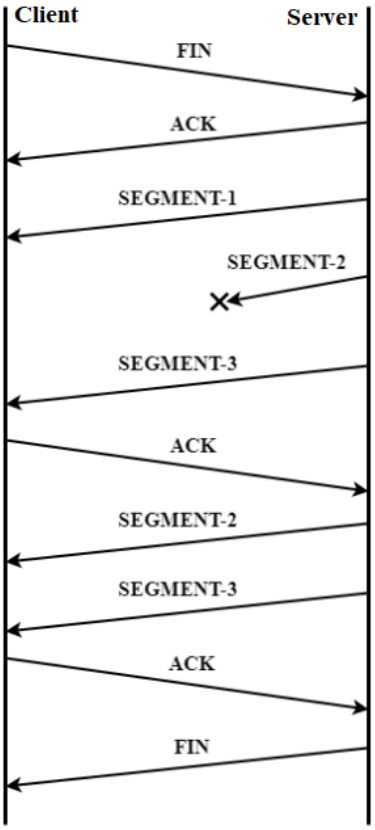
The server sends 3 data segments carrying **125**, **286** and **456** bytes respectively. The 2nd segment gets lost in transmission.

[CO3] **II.** **Determine** the sequence number of the first ACK segment sent by the client as shown in the figure.

The lost segment is retransmitted using the Go-Back N ARQ method.

[CO3] **III.** **Determine** the acknowledgement number of the FIN segment sent by the server.

[CO2] **IV.** **Name** the type of TCP connection termination being used here.



==========THE END==========