B

BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination : Semester Midterm
Duration: **1 Hour 10 Minutes**

Semester: Fall 2024
Full Marks: **45**

CSE421 / EEE465 : Computer Networks

Answer **ALL** questions. **(Pages: 2)**

Figures in the right margin indicate marks.

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Q1 [CO1] **Identify** which layer of the **OSI model** is responsible for the functionalities of the following scenarios: **3**

I. A device is sending an image, but the image is transmitted as encoded bytes Presentation Layer
II. A process drops data because it is corrupted Transport Layer
III. A device searches for a path to send data to a destination Network Layer

Q2 [CO2] You browse an online clothing store and add a few items to your cart. A few days later, while scrolling through a social media platform, you notice advertisements for the items you viewed earlier on the clothing store's website. **Explain** how the Social Media Platform knew about your choices. **5**

Q3 [CO2] Bob uses an e-mail client (a mail reader) such as Outlook to send an e-mail to Alice, who uses a secure Web-based e-mail account. The IP addresses of all mail servers are initially unknown to all the devices/servers. **Draw a diagram to show** all the transport and application layer protocols used during the sending and receiving process. **5**

Q4 [CO2] You have started a new startup and hosted your webpage www.gamingforall.com at server 200.10.20.7. Now, people may also email to your mail server. **Write** the resource records that must be registered in the DNS server to reach your mail server and webpage. Remember to mention the type of record. **5**

Q5 [CO2] Suppose you are visiting **bracu.ac.bd** from two browser tabs. These two requests reach the BRACU web server. **Explain how** the server differentiates these requests to reply and **state** the destination port of these replies. **3 + 2**

Q6 Asif has requested a webpage using a **persistent HTTP** connection. The webpage has **18 objects, including** the base HTML file, each object **12 MB** in size. Her device takes **12ms** to send a TCP request to the server. HTTP request and response time for an object is **15 ms**. The server has a speed of **42 Mbps**. **3 + 3**

[CO3] I. **Calculate the total RTT** required in ms for all objects.
[CO3] II. **Calculate** the **total file transmission time** in ms for all webpage objects.

Q2. When you visit an online clothing store, it saves information about your activity using cookies. Later when you browse social media, ad networks and data analytics platforms use this stored cookie data to show personalized advertisements. This process is known as targeted advertising.

Q3. A webpage = www.gamingforall.com host = 200.10.20.7

Web_server = www.gamingforall.com, 200.10.20.7, A

alias = ~~www.gamingforall.com~~ gamingforall.com, www.gamingforall.com, CNAME

Local Primary DNS Server = gamingforall.com, dns1.gamingforall.com, NS

Email Server = gamingforall.com, mail.gamingforall.com, Mx

Q5. Each tab opens it's own TCP connection using a different source port. The server distinguishes sessions by the socket-4-tuple. Even if they have the same destination port, and server IP, their source ports differ. so the server keeps them separate.

Q6. persistent HTTP connection:

- Objects = 18
- Size/object = 12MB
- OTT =
- RTT =

I) Total RTT = 12ms + (15ms x 18ms)
= 282ms

Destination: For HTTP, replies come from port 80 on the server to the client's ephemeral port.
For HTTPS, replies come from port 443 on the server to the client's ephemeral port.

I) Server Speed/Link rate = 92Mb/s ∴ Total Size = 18x12 = 216x8 = 1728Mb

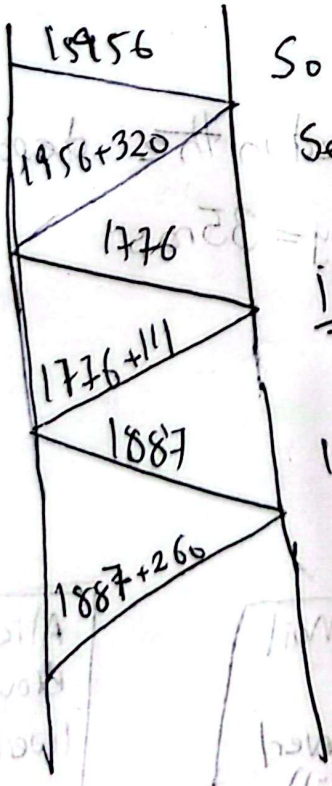
∴ Total file transmission time = $\frac{1728Mb}{92Mb/s}$ = 41192.857ms

Q8

	Server	Client
ISN	1955	2010
RWND	8000	10000

i. In Go-Back-N, if ACK for S1 isn't received (loss/corruption or timeout) the server retransmits S1 (retransmission after timeout or duplicate ACK condition). If C had already gotten S1 ~~ce~~earlier, the resent S1 is a duplicate and is discarded.

ii.



So C3 carries;

Seq = 1887, Ack = 2011

iii. $C_1 + C_2 + C_3 = 320 + 111 + 260$

$= 691$ byte

Initial rwnd (server) = 10000

new rwnd = 10000 − 691

= 9309 bytes

Q2 i) Dept Proxy hit (50%) = 35ms

Bracu Proxy hit (25%) = 35 + 50 = 85ms

Origin (25%) = 35 + 50 + 300 + 200 = 585ms

Average Response Time = 0.5 × 35 + 0.25 × 0.85 + 0.25 × 58.5

= 185ms

ii) Just visited means it's now cached in the department proxy, so time is Dept LAN only = 35ms

Q3