Ans of 1

(a)

I disagree with that statement. Cookies are stored on the user's local device not on a dedicated web server. If computer is formatted locally stored cookies are deleted and the website will not retain that data.

(b)

i) File size = 1.5 GB = (1.5 × 1024)MB = 1536 MB

Chunks needed = 1 MB × 1536 = 1536 Chunks

Two peers are ON, they provide = 2 × 512
$$= 1024 \text{ Chunks}$$

To complete download, the peer needs 1536 Chunks but only 1024 chunks are available. So, new peer can't download only two of three peers are ON.

ii) The 4k video file had already been downloaded and saved by the proxy server at an earlier time. Clicking the video, the browser would request the video and the proxy server recognized it had a copy. Instead of fetching it from the internet, the proxy served the file to the user from its local storage over fast local network.

(c)

i) Total DNS RTT (PC-A) $= 55 + 3 \times 55$
$$= 220 \text{ ms}$$

ii) Total RTT $= 70 \text{ ms} + (70 \text{ ms} \times 21)$
$$= 1540 \text{ ms}$$

iii) Total time to load webpage
= DNS lookup time + RTT + Download time
$$= 220 \text{ ms} + 1540 \text{ ms} + (21 \times 125 \text{ ms/obj})$$
$$= 4385 \text{ ms}$$

Ans of 2

a) Outlook (Client) $\longrightarrow$ Gmail (Server)

Source Port	Destination Port
Type: Dynamic	Type: well-known port
Num : 50000	Num : 587

Gmail (Server) $\longrightarrow$ Yahoo (Server)

Source	Destination
Type: Dynamic	Type: well-known port
Num : 50000	Num : 25

b) i) Data sent but not yet acknowledged

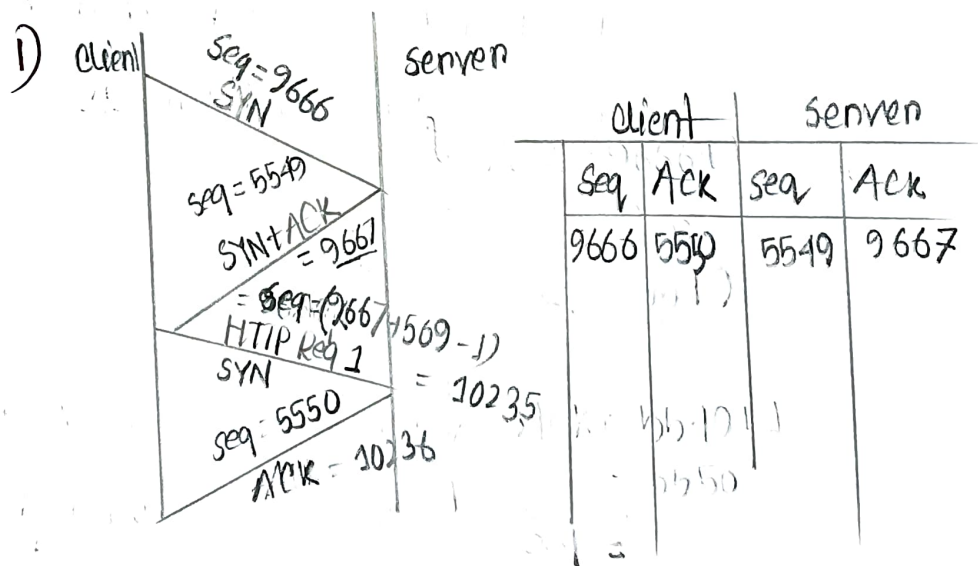$$= S_n - S_f = 151 - 100 = 51 \text{ bytes}$$

Remaining sendable data

$$= S_w - (S_n - S_f)$$

$$= 100 - 51 = 49 \text{ bytes}$$

ii) If the ack gets lost, the sender will not receive confirmation within the timeout period and will retransmit the same data. The receiver will discard duplicates and send the ack again, ensuring reliable delivery but causing a slight delay in communication.

(c)

1)

Client		Server	
Seq	ACK	Seq	ACK
9666	5549	5549	9667

So, sequence number = 5550

Acknowledgement number = 10236

(ii) Server to client :

Seq = 5550

Data = 568 bytes $\Big\}$ Data segment 2 = ~~568 B~~ 650 bytes

After processing 1st segment ∴ seq = 5500 568-1

= ~~6617~~ 6117 ~~6117~~

The client receives this segment and all data upto 6117 bytes.

∴ ACK = 6118 from client

As data segment 2 is lost it won't receive further segments.

Client to server	Server to client :
seq = 10236	seq ⇒ data segment
ack = 6118	lost

So, acknowledgment num = 6118

Sequence number = 11235

rwnd = 8000

a) i) 1 → physical layer

2 → Transport Layer

3 → Presentation Layer

4 → Session Layer

5 → Application

6 → Network Layer

7 → Data link Layer

5 → 3 → 4 → 2 → 6 → 7 → 1

ii) MAC / physical address.

b) Traceroute increments the TTL value for each successive packet to discover the path, hop by hop.

A router must decrement the TTL of any packet it forwards. If a router receives a packet with TTL=1 it decrements it to 0 discards the packet and sends an ICMP "Time exceeded" message back to originator.

The origantor knows it has reached the destination when it receives an ICMP "Destination Unreachable" message instead of a 'Time Exceed' message.

c) ⓘ Given,

Total data unit = 21739 bytes

MTU = 2038 bytes

Header size = 46 bytes

Max data per packet = MTU − Header size

$$= 2038 - 46 = 1992 \text{ bytes}$$

$$\text{packets} = \frac{\text{Total data}}{\text{Max data per packet}}$$

$$= \frac{21739}{1992} \approx 10.92 \approx 11 \text{ packets}$$

(ii) MF bit is 1 for all packets except the last one. It signals that this is final fragment.

$$\therefore MF = 0$$

(iii) Data in first ten packets $= 10 \times 1992 = 19920$ bytes

Data in last packet $= 21739 - 19920$
$$= 1819 \text{ bytes}$$

Total size of last packet $= 1819 + 46$
$$= 1865 \text{ bytes}$$

(iv) 3rd last packet $= 9$

Starting byte $= 9 \times 1992 = 15936$ bytes

offset value $= \dfrac{15936}{8}$
$$= 1992 \text{ bytes}$$