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Answer to the Question no. 1

(a)

6 → 5 → 3 → 1 → 2 → 7 → 4 (top to bottom)

6 (Submit/login button clicking) → Application layer (7)

5 (Credential encryption) → Presentation (6)

3 (Session Creation) → Session (5)

1 (Process identification) → Transport (4)

2 (Server PC identification) → Network (3)

7 (Next hop finding) → Data-link (2)

4 (PDU leaving ethernet) → Physical (1)

(b) ~~If any of the peer~~ If the 10 peer collectively has the full ~~piece~~ file, its ~~theoretically~~ possible.

(c) If the cached copy is fresh (not expired) the proxy will directly return the cached website.

If the cached data is old, the proxy will send a conditional-get to the origin.

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(d) Its possible if the video is compressed using a efficient codec. It is also possible to do this if the media is cached in any local network.

Ans to the Ques no. 2

(a) HTTP is stateless, so its not possible for the protocal ~~to~~ to track users accross websites. Cookies are used for this purpose. Server sets a small identifier on the browser. Browser sends this back while sending request. Thus it can be tracked accross various sites.

(b) Recursive lookup is better.

As servers are many times powerful than personal devices and generally have access to higher bandwidth and speed. it is faster if the server does all the dns lookup for client. If iterative lookup is used, it increases latency for clients.

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(c)

(i) RTT = (client → DNS) 23ms + (DNS → client) 23ms

= 23ms × 2 = 46ms

(ii) Total RTT = DNS RTT + Connection RTT + per object RTTs

= (23×2 + 39×2 + 39×2×30) ms

= 2464 ms

(iii) 5344 − 2464 = 2880ms

2880ms was needed to transfer data

Total data transferred = 30 × 12 = 360MB

= (360×8) Mb = 2880Mb

~~$\frac{x}{2880} = 2.8$~~

$\frac{2880}{x} = 2.8$ ∴ x = 1000 Mbps = 1 Gbps

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Ans. to the Question no. 3

(a) ~~The server~~ This can be true.

The server will use socket to differentiate between them. Socket is created using the combination of ip and port, so the 3 connections will have 3 different socket

(b) fields not present in UDP

1. Sequence number
2. Acknowledgement Number
3. window size
4. Flags (Syn / Ack / FIN etc.)

Reliability is provided on application layer. Application adds syn/ack of its own. Also checksum are done at application layer if designed by the developer.

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(c)

(i) $ISN_s = 1 + 203 = 204$

4th data segment has 3 sent before it.

Servers Sequence no. $= 204 + 3 \times 889$

$= \boxed{2871}$

$ISN_c = 1 + 8924 = 8925$

Servers Ack no. $= 8925 + 4 \times 234$

$= \boxed{9861}$

(ii) Clients,

Sequence Number $= 8924 + 1 + 12 \times 234 = \boxed{11733}$

Ack Number $= 203 + 1 + 9 \times 889 = \boxed{8205}$

As, the 10th data segment is lost, the client still expects for it in the ack number.

(iii) 1st five was processed, so they are not in the buffer.

Only the 6th, 7th, 8th, 9th, 11th, ~~12th~~ and 13th in buffer.

they are in buffer because of selective repeat TCP

$\therefore$ RWND $= 10000 - 7 \times 889 = \boxed{3777 \text{ bytes}}$

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