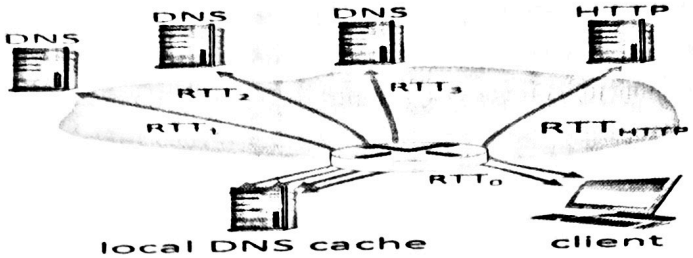
National University of Computer and Emerging Sciences, Lahore Campus

Course:	Computer Networks	Course Code:	CS3001
Program:	BS (Computer Science)	Semester:	Fall 2025
Due Date:	18th Sep, 2025	Roll No.	[redacted]
Section:	H		
Quiz #	2		

Q1: Refer to the diagram below: **(4 * 3 = 12 Marks)**



In your web browser you enter a URL to obtain a Web page. The IP address for the associated URL is not cached, so a DNS lookup is necessary to obtain the IP address. Suppose that 4 DNS servers are visited before your host receives the IP address from DNS. The 1st DNS server visited is the local DNS, with an RTT delay of RTT_0 = 10 msecs. The 2nd, 3rd & 4th DNS servers contacted have RTTs of 43, 55 & 8 msecs respectively. Initially, let's suppose that the Web page associated with the link contains exactly one base object consisting of some HTML text. Suppose the RTT between the local client and the HTTP Web server is RTT_{HTTP} = 85 msecs.

(i) Assuming zero transmission time for the HTML object (base file), how much time (in msec) elapses from when the client clicks on the link until the client receives the object? (Assume processing and queuing delays are also zero.)

Total time = $RTT_0 + RTT_1 + RTT_2 + RTT_3 + 2RTT_{HTTP}$

$= 10 + 43 + 55 + 8 + 2(85) =$ **286 ms**

(ii) Now suppose the HTML object (base file) references 15 very small objects on the same server. Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 15 additional referenced objects are received from web server to the client, assuming non-persistent HTTP and no parallel TCP connections and no pipelining? (Assume processing and queuing delays are also zero.)

Total time = $286 + 15 \times 2RTT_{HTTP}$

$= 286 + 15 \times 2 \times 85$

$=$ **2836 ms**

(iii) Suppose the HTML base object references 15 very small reference objects on the same server but assume that the client is configured to support a maximum of 7 parallel TCP connections with non-persistent HTTP (no pipelining.) Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 15 additional referenced objects are received from web server to the client? (Assume processing and queuing delays are also zero.)

Total time $= 286 + 3 \times 2RTT_{HTTP}$

$= \boxed{796 \text{ ms}}$

(iv) Suppose the HTML base object references 15 very small reference objects on the same server but assume that the client is configured to support a maximum of 7 parallel TCP connections with persistent HTTP (no pipelining.) Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 15 additional referenced objects are received from web server to the client? (Assume processing and queuing delays are also zero.)

Total time $= 286 + 3\ RTT_{HTTP}$

$= \boxed{541 \text{ ms}}$