LNMIIT
The LNM Institute of Information Technology

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## Department: Computer Science and Engineering

## Advanced Computer Networks

**Exam Type: Mid Term**

**Time: 2:00 to 3:30 PM** **Date: 27/02/2019** **Max. Marks: 30**

**Answer all the following questions.**

Q1. (2 marks) What is the difference between pull and push network protocols? Explain the difference by using two example protocols.

Q2. (2 Marks) Consider DNS protocol. Sketch the main architecture of domain name servers currently used for the internet. You should include a client, a server and different types of DNSs.

Q3. (3 Marks) Determine the maximum length of the cable (in km) for transmitting data at a rate of 500 Mbps in an LAN with frames of size 10,000 bits. Assume the signal speed in the cable to be 2,00,000 km/s.

Q4. (3 Marks) Define bandwidth-delay product in the context of network performance. What is the importance of the bandwidth-delay product for networks? Give an example of a system that has large bandwidth-delay product.

Q5. (5 marks) Suppose within your web browser you click on a link to obtain a Web page. The IP address of the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose N DNS servers are visited before your host receives the IP address from DNS: the successive visits incur an RTT of $RTT_1, \ldots, RTT_n$. Further suppose that the webpage associated with the link contains exactly one object consisting of a small amount of HTML text. Let $RTT_0$ denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object?

Q6. (5 Marks)Consider a short, 10-meter link, over which a sender can transmit at a rate of 150 bits/sec in both directions. Suppose that packets containing data are 100,000 bits long, and packets containing only control (e.g., ACK or handshaking) are 200 bits long. Assume that N parallel connections each get 1/N of the link bandwidth. Now consider the HTTP protocol, and suppose that each downloaded object is 100 Kbits long, and that the initial downloaded object contains 10 referenced objects from the same sender. Would parallel downloads via parallel instances of non-persistent HTTP make sense in this case? Now consider persistent HTTP. Do you expect significant gains over the non-persistent case? Justify and explain your answer.

Q7. (10 marks) Find the optimum segment length $n_f$ that maximizes transmission efficiencies for a channel with random bit errors by taking the derivative and setting it zero for the following protocols.

(a) Stop and wait
(b) Go Back N
(c) Selective repeat
(d) Find the optimum segment length for a 1 Mbps channel with 10 ms reaction time 25 byte overhead 25 byte ACK and $p = 10^{-4}, 10^{-5}$ and $10^{-6} = p_f$

"To the ***Optimist***, the glass is half-full. To the ***Pessimist***, the glass is half empty. To the ***Engineer***, the glass is twice as big as it needs to be"