Name: Dec. 01, 2021

Student ID:

Q1	Q2	Q3	Q4	Q5	Total

BLG 433E – Computer Communications

2021 – 2022 Fall, Midterm Exam

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Q1. (25pt.) Suppose two hosts, A and B, are separated by 20 000 km distance and connected by a direct link of R=2Mbps. Suppose the propagation speed over the link is 2.5 10^8 meters/sec.

a. Calculate the bandwidth delay product ($R \cdot d_{prop}$)
b. Consider sending a file of 800 000 bit from Host A to Host B. Suppose the file is sent continuously as one large message. What is the maximum number of bits that will be in the link at any given time?
c. What is the width (in meters) of a bit in the link?
d. Derive a general expression for the width of a bit in terms of the propagation speed s, the transmission rate R, and the length of the link m.

Q2. (10pt.) Explain the flaw in the following reasoning:

"Packet switching requires control and address bits to be added to each packet. This introduces considerable overhead in packet switching. In circuit switching, a transparent circuits is established. No extra bits are needed. Therefore, there is no overhead in circuit switching, and, because there is no overhead in circuit switching, line utilization must be more efficient than packet switching."

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Q3. (20pt.) List the theoretical transport service types (in four dimensions/aspects), which a network application may demand. Moreover, explain which of these types of services are provided by the current TCP/IP deployment (Internet).

Q4. (20pt.) Please, answer the following questions.

a. Briefly describe how "Domain Name System" (DNS) works and explain the difference between iterative and recursive service types of DNS.
b. Explain the main differences between persistent and non-persistent HTTP. What would change if non-persistent HTTP was used to transmit 10 objects compared to persistent HTTP. Assume that each object can be transmitted with one packet.

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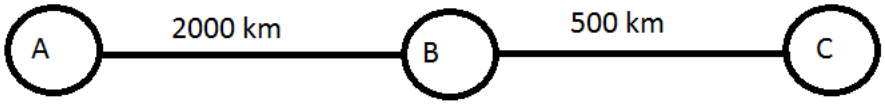
Q5. (25pt.) In the figure below, frames are generated at node A and sent to node C through node B.



Determine the ***minimum transmission rate*** required between nodes B and C so that the frames at node B are not lost, considering the following:

- The data rate between A and B is 100 Kbps.
- The propagation delay on both links is 10 μsec/km.
- The lines are full duplex.
- All data frames are 1000 bits long; ACK frames are separate frames of negligible length.
- Between A and B, the go-back-n protocol with a window size of 4 is used.
- Between B and C, the stop-and-wait protocol is used.
- There is no error, and the processing delay at the nodes is negligible,
- The buffer space at B is limited with the requirements of the protocols.

Show all your work!

100 minutes