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Department of Computer Science Engineering & IT

Computer Networks

Assignment-1 (Spring-2022)

Note: Date of Submission: 3rd April 2022.

Q1: A network has a data transmission bandwidth of 20 X 106 bits per second. It uses CSMA/CD in the MAC layer. The maximum signal propagation time from one node to another node is 40 microseconds. What is the minimum frame size for this network in bytes?

Q2: Consider a CSMA/CD network that transmits data at a rate of 100 Mbps over a 1 KM cable with no repeaters. If the minimum frame size required for this network is 1250 bytes, what is the signal speed (km/sec) in the cable?

Q3: A network with CSMA/CD protocol in the MAC layer is running at 1Gbps over a 1 km cable with no repeaters. The signal speed in the cable is 2 x 10^8 m/sec. The minimum frame size for this network should be.

Q4: The minimum frame size required for a CSMA/CD based computer network running at 1Gbps on a 200 meter cable with a link speed of 2 x 10^8 m/s is?

Q5: A 2km long broadcast LAN has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 2x10^8 m/s. What is the minimum packet size that can be used on this network?

Q6: If the packet is 5000 bits, the rate of the channel is 4 kbps and the distance between hosts is 20 km. The speed of propagation over the transmission media is 200 m/s. Calculate the link utilization for stop and wait flow control mechanism.

Q7: Consider an Ethernet technology where all the stations can send their own size data with fixed size of the header. Then what is the percentage of bits in a frame that belongs to the header for both the largest and the smallest Ethernet frames?

Q8: A Go-Back-N ARQ and Selective Repeat ARQ use a window of size 31. The number of bits needed to define sequence numbers respectively are.

Q9: A channel has a bit rate of 1 Mbps and a propagation delay of 270 msec. The frame size is 125 bytes. Acknowledgement is always piggybacked into data frames. Four bit sequence number is used. Ignore header size. What is the maximum achievable channel utilization for Selective Repeat?

Q10: Consider two hosts, A and B, connected by a single link of bandwidth 512 Mbps. Suppose that both hosts are separated by distance “m” meters, and the propagation speed along the link is

2 x 10^9 meters/sec. Host A is to send a packet of size 1 kb to Host B. What will be the distance "m" so that propagation delay is equal to transmission delay?

Q11: Consider a scenario where a communication link has a bandwidth of 10 Mbps with 20 routers and each router having a 3 microsecond queuing delay and 2 microsecond processing delay. The length of the cable is 3000 Km and the speed inside the link is equal to the speed of light. Then what is the total delay to send a packet of size 25 million bits? Ignore transmission delay at the routers.

Q12: Assuming that you are designing the sliding window protocol for a 1Mbps point-to-point link to the moon, which has a one-way latency (Delay) of 1.25 seconds. Assume that each frame carries 2 KB data. What is the minimum number of bits needed for the sequence number?

Q13: Consider a LAN with the sender and receiver are 30 km apart and the link works at the speed of light. Suppose a packet of size 2 KB needed to be transferred, at what data rate does the round-trip delay equal the transmission delay of the packet?

Q14: A channel has a bit rate of 4 Kbps and one-way propagation delay of 20 msec. The channel uses stop & wait protocol. The transmission time of the acknowledgement frame is negligible. To get a channel efficiency of at least 75%, the minimum frame size should be.

Q15: A Selective Repeat ARQ is using 8 bits to represent the sequence numbers. What is the maximum size of the window?

Q16: A building running CSMA/CD protocol has a bandwidth of 512 Mbps and a distance of 2 km then determine the minimum data size in order to detect a collision. Assume that the signal speed is 200000 km/sec.