# Questions on ALOHA and CSMA

1. What is the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of 2 μs and a processing time of 1 μs. The length of the link is 2000 Km. The speed of light inside the link is 2 x 108 m/s. The link has a bandwidth of 5 Mbps. Which component of the total delay is dominant? Which one does dominant the transmission time?

2. We have a pure ALOHA network with 100 stations. If $T_{fr} = 1\mu s$. what is the number
   of frames/s each station can send to achieve the maximum efficiency.

3. One hundred stations on a pure ALOHA network share a l-Mbps channel. If frames are 1000 bits long, find the throughput if each station is sending 10 frames per second.

4. In a *CDMA/CD* network with a data rate of 10 Mbps, the minimum frame size is found to be 512 bits for the correct operation of the collision detection process. What should be the minimum frame size if we increase the data rate to 100 Mbps? To 1 Gbps? To 10 Gbps?

5. In Figure, the data rate is 10 Mbps, the distance between station A and C is 2000 m, and the propagation speed is 2 x 10⁸ *m/s*. Station A starts sending a long frame at time $t_1 = 0$; station C starts sending a long frame at time $t_2 = 3$ μs. The size of the frame is long enough to guarantee the detection of collision by both stations. Find:
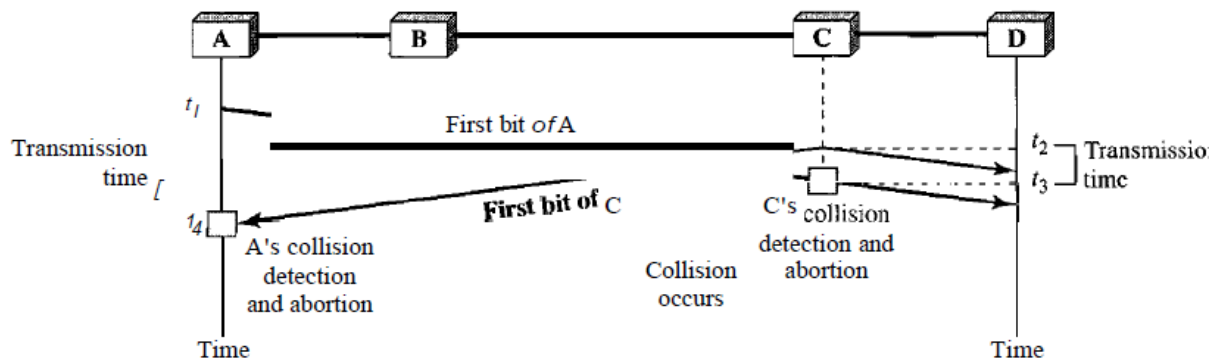
    a. The time when station C hears the collision *(t3)'*

    b. The time when station A hears the collision *(t4)'*

    c. The number of bits station A has sent before detecting the collision.

    d. The number of bits' station C has sent before detecting the collision

6. Repeat Exercise 2 for slotted ALOHA.

7. One hundred stations on a pure ALOHA network share a l-Mbps channel. If frames are 1000 bits long, find the throughput if each station is sending 10 frames per second.

8. Repeat Exercise 7 for slotted ALOHA.

9. In a CDMA/CD network with a data rate of 10 Mbps, the maximum distance between any station pair is found to be 2500 m for the correct operation of the collision detection process. What should be the maximum distance if we increase the data rate to 100 Mbps? To 1 Gbps? To 10 Gbps?

10. A network has a data transmission bandwidth of 20×10^6 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. The minimum size of a frame in the network is _____ bytes **(GATE 2016)**

11. The minimum frame size required for a CSMA/CD based computer network running at 1 Gbps on a 200m cable with a link speed of 2×10^8 m/s is **(GATE-2008)**