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Tutorial 8

Ans1:

ALOHA	Slotted ALOHA
• Any station can transmit data at any time.	• Any station can transmit data at the beginning of any time slot.
• The time is continuous and not globally synchronized.	• The time is discrete and globally synchronised.
• Vulnerable time in which collision may occur = $2 \times T_t$	• Vulnerable time in which collision may occur = T_t
• Probability of successful transmission of data packet = $G \times e^{-2G}$	• Probability of successful transmission of packet = Ge^{-G}.
• Maximum efficiency = 18.4 %.	• Maximum efficiency = 36.8 %.

Ans2: In CSMA/CD, for a station to get surety of successful transmission the contention interval should have at least 2t slots where t is the time signal to propagate between two farthest stations, i.e., there must be enough time for the front of the frame to reach the end of the cable and then for an error message to be sent back to the start before an entire frame is transmitted.

As a result for a 1 km cable, one-way propagation time

$= 5\ \mu s \left(\frac{1}{200000}\right)$.

So, both ways would be = 10 μs.

At 1 Gbps, all frames shorter than 10000 bits can be completely transmitted in under 10μs, so the minimum frame is 10000 bits or 1250 bytes.

$10^9 \times 10 \times 10^{-6} = 10^4$ bits

Ans 3: Given,
distance = 2 km
Bandwidth = 10^7 bps
Mode = CSMA/CD
Signal Speed = 2×10^8

Let RTT = Transmission time = $2\left(\frac{d}{v}\right) = 2 \times \left(\frac{2000}{2 \times 10^8}\right)$

$= 2 \times 10^{-5} = 20$ μs

RTT = $\frac{\text{Length of packet}}{\text{Bandwidth}}$

⇒ Packet Size = RTT × Bandwidth = $20\mu s \times 10^7$
= 25 bytes

Ans 4: Given,
Data rate = 10^8 bps
Minimum Frame size = 1250 bytes = 10000 bits
Signal Speed = 2×10^8

Then, length of cable is given by,

$\frac{\text{length of packet}}{\text{Bandwidth}} = \frac{2 \times \text{distance}}{\text{Signal Speed}}$

⇒ Distance = $\frac{10^4}{10^8} \times \frac{2 \times 10^7}{2}$

⇒ Distance = 1000 m

⇒ Cable length = 1 km

Ans5: CSMA/CD is a wired network protocol and hence it cannot be used in satellite transmissions.
For satellite transmissions, CSMA/CA is preferred.

Ans6: In CSMA/CD,
the collision detection technology detects collision by sensing transmissions from other stations.
On detection of collision, the station stops transmitting, sends a jam signal and then waits for a random time interval before retransmission.