

UIT2403 – Data Communication and Networking

UNIT II: PHYSICAL LAYER AND MEDIA ACCESS

Tutorial – I

Multiple Access Protocols

Pure ALOHA, Slotted ALOHA and CSMA/CD

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1. A group of N stations share a 56-kbps pure ALOHA channel. Each station outputs a 1000-bit frame on average once every 100 sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum value of N ?
2. An ALOHA network uses an 18.2 kbps channel for sending message packets of 100 bits long size. Calculate the maximum throughput.
3. An ALOHA network uses 19.2 kbps channel for sending message packets of 100 bits long size. Calculate the maximum throughput for ALOHA network. Represent the same in packets/sec.
4. A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces 1000 frames per second?
5. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system (all stations together) produces 500 frames per second.
6. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system (all stations together) produces 250 frames per second.

7. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200-kbps bandwidth. Find the throughput if the system (all stations together) produces 1000 frames per second.
8. A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the requirement to make this frame collision-free?
9. A network using CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time (including the delays in the devices and ignoring the time needed to send a jamming signal, as we see later) is $25.6 \mu\text{s}$, what is the minimum size of the frame?
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. What is the minimum size of a frame in the network in bytes?
11. Consider a CSMA/CD network that transmits data at a rate of 100 Mbps (10^8 bits per second) over a 1 km (kilometer) 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?
12. A network with CSMA/CD protocol in the MAC layer is running at 1 Gbps over a 1 km cable with no repeaters. The signal speed in the cable is 2×10^8 m/sec. What is the minimum frame size for this network?
