

# Data Communications: Final Exam

1. Assume that the stations generate isochronous traffic such as voice traffic. Communication is composed of three phases: connection setup, data transfer, connection release. During the data transfer phase, a station generates one packet periodically. Assume that the channel time is divided into a time interval with fixed-length, which is equal to the packet generation period, and each time interval is again subdivided into time slots. The slot length is fixed and a packet can be transmitted during one time slot. Each station can transmit only at the start of a slot, like in Slotted-ALOHA. Design a medium access control scheme that can efficiently support for isochronous traffic transmission. There is no centralized controller such as AP of WLAN. (20)
2. One approach to adaptive routing, called backward learning, requires every packet to carry its destination address, its source address, and a running hop count which is set to 0 at source and incremented at each node. Each node in the network maintains a routing table which specifies the next node and the remaining number of hops for each possible destination. Explain how the packet information can be used to update the table. (15)
3. In the 802.11 DCF, a station contends for acquiring a channel whenever it transmits a frame. Redesign the basic 802.11 DCF so that a station efficiently transmits a long (multiframe) file. (15)
4. The binary exponential backoff algorithm is defined by IEEE 802 as follows. "The delay is an integral multiple of slot time. The number of slot time to delay before  $n$ th retransmission attempts is chosen as a uniformly distributed random integer  $r$  in the range  $0 < r < 2^n$ , where  $n \leq 14$ ." Slot time is roughly, twice the round-trip propagation delay. Assume that two stations always have a frame to send. What is the mean number of retransmission attempts before one station successfully transmits. (15)
5. (a) Explain the reason why the flooding is a good routing strategy in ad-hoc networks (10)  
(b) Under which traffic characteristic is the flooding an effective routing strategy for a virtual circuit? Why? (5)
6. (a) Explain how the network congestion is controlled in TCP/IP networks (10)  
(b) Compare the token bucket and leaky bucket in viewpoint of rate regulation (10)