LNMIIT
The LNM Institute of
Information Technology

The LNM Institute of Information Technology
Department: CSE
Computer Networks (CSE332)
Exam Type: Mid Term

Time: 90 minutes   Date: 06/03/2019   Max. Marks: 30

Instruction: 1. All the questions are compulsory.
                2. Start each answer on a fresh page.

1. **[6]** Suppose the information portion of a frame contains 10 bytes consisting of the 8-bit unsigned binary representation of the integers 0 through 9.
   (a) Use 16-bit words in computing the checksum for this data. Show all work.
   (b) How does the receiver detect errors with the 1s complement scheme?
   (c) Is it possible that a 1-bit error will go undetected?
   (d) How about a two-bit error?

2. **[4]** In the stop and wait protocol, the sender sends one frame at a time and waits for an acknowledgment (ACK) before sending the next one. To detect corrupted frames, CRC/checksum bits are added to each data frame. This protocol has a flaw that it doesn't account for the possibility that ACK could be corrupted.
   (a) How can a sender determine that the ACK is corrupted?
   (b) What approach should a sender take when it receives corrupted ACK frames?

3. **[2]** Consider the Go-Back-N (GBN) protocol with a sender window size of 3. Suppose that at time t, the next in-order packet that the receiver is expecting has a sequence number of k. What are the possible sets of sequence numbers inside the senders window at time t
   (a) If all the ACKs have been received by the sender
   (b) If none of the ACKs have been received at the sender

4. **[3]** A sender sends frames of size 1KB over a 128Kbps channel. Selective Repeat protocol is used for reliable transmission of frames. One way propagation delay is 150ms. Find the minimum number of bits required for the sequence number field to achieve 100% utilization.

5. **[9]** Assume a 10Mbps Ethernet has two nodes, A and B, connected by a 360m cable with three repeaters in between, and they each have one frame of 1,024 bits to send to each other. Further assume that the signal propagation speed across the cable is $2*10^8$ m/sec, CSMA/CD uses back-off intervals of multiples of 512 bits, and each repeater will insert a store-and-forward delay equivalent to 20-bit transmission time. At time t=0, both A and B attempt to transmit. After the first collision, A draws K = 0 and B draws K = 1 in the exponential back-off protocol after sending the 48 bits jam signal (A signal that carries a bit pattern sent by a data station to inform the other stations that they must not transmit. In CSMA/CD networks, the jam signal indicates that a collision has occurred). What is the one-way propagation delay (including all repeater delays) between A and B in seconds? At what time is A's packet completely delivered at B?

6. **[6]** Answer the following based on the timing diagram shown in Fig. 1.
   (a) Name the transmitter and receiver nodes.

(b) Fig, 2 shows the coverage areas of nodes n_1 and n_3. Name the nodes n_1, n_2, n_3 and n_4 (which one of these is A, B, C, D) based on the timing diagram in Fig 1.

(c) Suppose B wants to communicate with A. What actions will B take after completion of its back off time at t_2? How will A respond? What events take place at B?

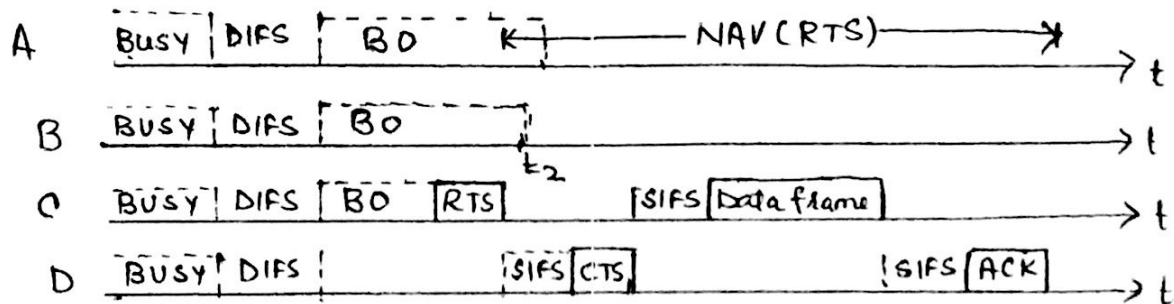(d) Are simultaneous communications between n_2 to n_1 and n_3 to n_4 feasible? Why or why not?
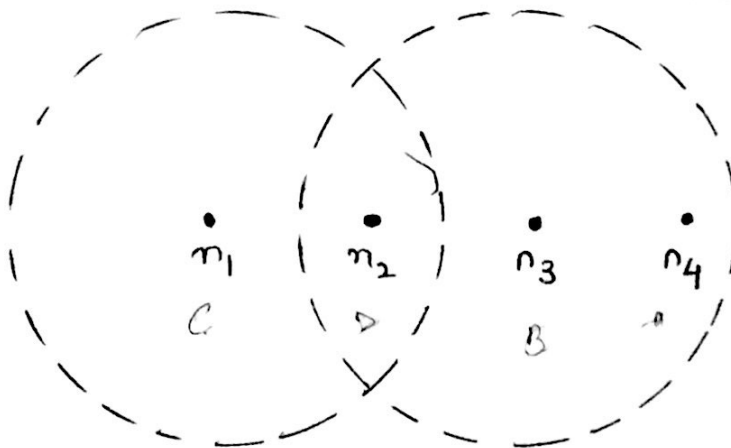

Fig. 1.

BO: Back-off.

Fig. 2