Indian Institute of Technology, Guwahati
CS341 - Computer Networks
**ASSIGNMENT 4**

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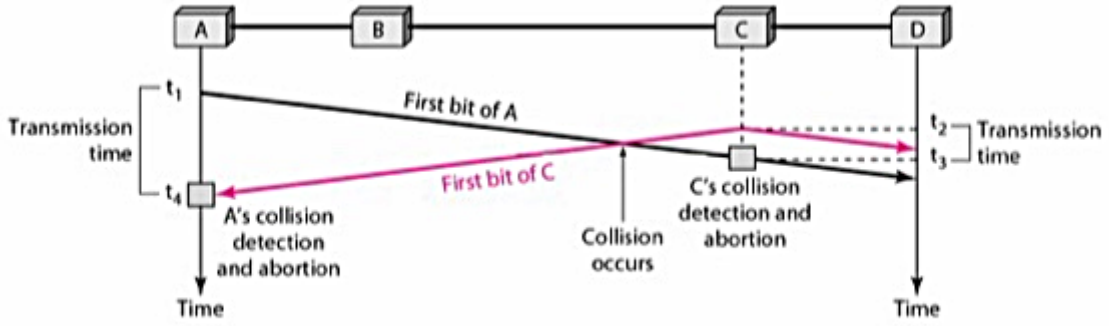
**Answer all questions**

1. Suppose four active nodes A, B, C and D are competing for access to a channel using slotted ALOHA. Assume each node has an infinite number of packets to send. Each node attempts to transmit in each slot with probability p. The first slot is numbered as slot 1, the second slot is numbered as slot 2, and so on.
   (a) What is the probability that node A succeeds for the first time in slot 4?
   (b) What is the probability that some node (either A, B, C or D) succeeds in slot 5?
   (c) What is the probability that the first success occurs in slot 4?
   (d) What is the efficiency of this four-node system?

2. Two CSMA/CD stations are each trying to transmit long (multiframe) files. To send each frame, they contend for the channel, using the binary exponential backoff algorithm. What is the probability that the contention ends on round k, and what is the mean number of rounds per contention period?

3. A router with IPv4 address 125.45.23.12 and Ethernet physical address 23:45:AB:4F:67:CD has received a packet for a host destination with IP address 125.11.78.10. Show the entries in the ARP request packet sent by the router. Assume no subnetting. Show the entries in the ARP packet sent in response.

4. In the figure below, the data rate is 10 Mbps, the distance between station A and C is 2000 m, and the propagation speed is 2 x $10^8$ 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 ($t_3$)

(b) The time when station A hears the collision ($t_4$)

(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.

5. Let's consider the operation of a learning switch in the context of a network in which 6 nodes labeled A through F are star connected into an Ethernet switch. Suppose that

   (a) B sends a frame to E,

   (b) E replies with a frame to B,

   (c) A sends a frame to B,

   (d) B replies with a frame to A.

   The switch table is initially empty. Show the state of the switch table before and after each of these events. For each of these events, identify the link(s) on which the transmitted frame will be forwarded, and briefly justify your answers.

**Best wishes**