CS5222 Computer Networks and Internets

Tutorial 11 (week 11), 2024

1) A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1. Show the actual bit string transmitted. Suppose the third bit from the left is inverted during transmissions. Explain how this error is detected at the receiver's end.

2) Three users X, Y and Z use a shared link to connect to the Internet. Only one of X, Y or Z can use the link at a given time. The link has a capacity of 1 Megabit/s. Suppose that TDMA is used. Each frame is divided into 3 equal time slots, one for each user. Will TDMA work fine for the following two cases? Justify your answers.
   a) X, Y and Z send a 40 Kbytes file every 1sec.
   b) X sends a 80 Kbytes file every 1sec, while Y and Z send a 10 Kbytes file every 1sec.

3) Suppose that there are 4 nodes in a network using slotted ALOHA. Each node has a large number of packets to send. Suppose that each node will have probability ¼ to retransmit a packet after a collision happens. What will be the efficiency of the network?

4) Suppose that there are three nodes seeking access to a shared medium using slotted Aloha, where each packet takes one slot to transmit. Assume that each node has a lot of packets to send, and that node i has probability p_i of sending a packet in each slot, for i = 1, 2, 3. Suppose that we assign the sending probabilities so that $p_1 = 2p$ and $p_2 = p_3 = p$.
   a) What is the efficiency of the shared medium?
   b) What are the probabilities that maximize the utilization and what is the corresponding utilization?

5) Give an example where the two-dimensional parity scheme detects but cannot correct a double-bit error.