

1. Compute the CRC for the bits 10101010 using the generator  $G = 1001$ .  
(Answer: 101)
2. **(Modified from KR, Chapter 5, P7)** In this problem, we explore some of the properties of CRC. For the generator  $G = 1001$ ,
  - (a) why can it detect any single bit error in data  $D$ ?
  - (b) can the above  $G$  detect any odd number of bit errors? why? (Hint: any number with odd number of ones cannot be divisible by 11).
3. Nodes  $A$  and  $B$  are accessing the same shared medium using CSMA/CD, with a propagation delay of 245 bit times between them. The minimum frame size is 64 bytes. Suppose node  $A$  begins transmitting a frame and, before it finishes, node  $B$  begins transmitting a frame.
  - (a) What is the minimum possible time taken by  $A$  to finish transmission?
  - (b) When is the latest time, by which  $B$  can begin its transmission?
  - (c) Can  $A$  finish transmitting before it detects that  $B$  has transmitted?

Express all your answers above in the unit of bit time.

4. **(KR, Chapter 5, P19)** Suppose nodes  $A$  and  $B$  are on the same 10 Mbps Ethernet segment, and the propagation delay between two nodes is 245 bit times. Suppose  $A$  and  $B$  send frames at the same time, the frames collide, and then  $A$  and  $B$  choose different values of  $K$  in the CSMA/CD algorithm. Assuming no other nodes are active, can the retransmission from  $A$  and  $B$  collide?

Work out the following example. Suppose  $A$  and  $B$  begin transmission at  $t = 0$  bit times. They both detect collisions at  $t = 245$  bit times. Suppose  $K_A = 0$  and  $K_B = 1$ . At what time does  $B$  schedule its retransmission? At what time does  $A$  begin transmission? (Note that a node must wait for an idle channel after returning to Step 2 – see protocol.) At what time does  $A$ 's signal reach  $B$ ? Does  $B$  refrain from transmitting at its scheduled time?