FACULDADE DE COMPUTAÇÃO – FACOM
GBC056 – Arquitetura de Redes de Computadores

“Design and Validation of Computer Protocols” - Gerard Holzmann

Problems extracted of the Text Book
Chapter 03 – Error Control

3.1 - A phone company recently considered running new 56 Kbit/sec data lines at an end-to-end data rate of 9600 bits/sec, using the extra bandwidth to enhance reliability. The method chosen was to transmit each single byte five times in succession. By a majority vote, comparing the five successive bytes and choosing the most frequent one from each set, the receiver would then decide which byte had been transmitted. Comment on the code rate and the protection against burst errors.

3.2 - A simple error control scheme has the receiver retransmit all the messages it receives back to the sender. Each message then has to survive two successive transmissions to be accepted. Try to build a protocol that works this way.

3.3 - The protocol of Exercise 3-2 is modified to have the receiver merely return a CRC check-sum field to the sender by way of acknowledgment. The checksum is returned for every message received, distorted or not, and is used by the sender to decide upon retransmission. Comment upon this improvement.

3.5 - The message 101011000110 is protected by a CRC checksum that was generated with the polynomial x 6 + x 4 + x + 1. The checksum is in the tail (the right side) of the message. (a) How many bits is the checksum? (b) If no transmission errors occurred, what would the original data be? (c) Were there any transmission errors?

3.6 - List the circumstances under which an error-correcting code with a code rate of 0.1 can be more attractive than an error-detecting code with feedback error control? Consider error rates and roundtrip message propagation delays.

3.8 - CRC checksum polynomials that contain the factor x + 1 catch all odd numbers of bit errors. Think of a method to catch all even numbers of bit errors as well, for instance, by deliberately introducing a bit error in a second transmission, and comment upon this scheme. Consider the code rate as well.