



[Winter 2010 CSE3213 Communication Networks](#)

Assignment # 4

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Review chapter 3 (Section 3.9) and chapter 5 (Section 5.2) Garcia before attempting the assignment.

1. Suppose a transmission channel operates at 3 Mbps and that it has a bit error rate of 10^{-3} . Bit errors occur at random and independent of each other. Suppose that the following code is used. To transmit a 1, the codeword 111 is sent; To transmit a 0, the codeword 000 is sent. The receiver takes the three received bits and decides which bit was sent by taking the majority vote of the three bits. Find the probability that the receiver makes a decoding error.

2. Suppose a header consists of four 16-bit words: (11111111 11111111, 11111111 00000000, 11110000 11110000, 11000000 11000000). Find the internet checksum for this code.

3. Let $g(x) = x^3 + x + 1$. Consider the information sequence 1001.
 - a. Find the codeword corresponding to the preceding information sequence.
 - b. Suppose that the codeword has a transmission error in the first bit. What does the receiver obtain when it does its error checking?

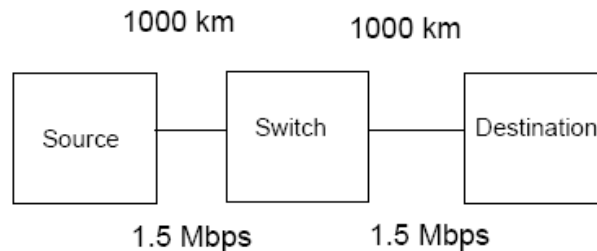
4. A repetition code is an $(n,1)$ code in which the $n - 1$ parity bits are repetitions of the information bit. What is the minimum distance of the code?

Flow Control: ARQ

5. In Stop-and-Wait ARQ why should the receiver always send an acknowledgment message each time it receives a frame with the wrong sequence number?

6. Discuss the factors that should be considered in deciding whether an ARQ protocol should act on a frame in which errors are detected.

7. A 64-kilobyte message is to be transmitted from the source to the destination. The network limits packets to a maximum size of two kilobytes, and each packet has a 32-byte header. The transmission lines in the network have a bit error rate of 10^{-6} , and Stop-and-Wait ARQ is used in each transmission line. How long does it take on the average to get the message from the source to the destination? Assume that the signal propagates at a speed of 2×10^5 km/second.



8. A telephone modem is used to connect a personal computer to a host computer. The speed of the modem is 56 kbps and the one-way propagation delay is 100 ms.

- Find the efficiency for Stop-and-Wait ARQ if the frame size is 256 bytes; 512 bytes. Assume a bit error rate of 10^{-4} .
- Find the efficiency of Go-Back-N if three-bit sequence numbering is used with frame sizes of 256 bytes; 512 bytes. Assume a bit error rate of 10^{-4} .