Tutorial#07 [CO5]

1. Sixteen-bit messages are transmitted using a Hamming code. How many check bits are needed to ensure that the receiver can detect and correct single bit errors? Show the bit pattern transmitted for the message 1101001100110101. Assume that even parity is used in the Hamming code.

2. An 8-bit byte with binary value 10101111 is to be encoded using an even-parity Hamming code. What is the binary value after encoding?

3. One way of detecting errors is to transmit data as a block of n rows of k bits per row and adding parity bits to each row and each column. The lower-right corner is a parity bit that checks its row and its column. Will this scheme detect all single errors? Double errors? Triple errors?

4. What is the remainder obtained by dividing $x^7 + x^5 + 1$ by the generator polynomial $x^3 + 1$?

5. A bit stream 10011101 is transmitted using the standard CRC method described in the text. The generator polynomial is $x^3 + 1$. Show the actual bit string transmitted. Suppose the third bit from the left is inverted during transmission. Show that this error is detected at the receiver's end.

6. Data link protocols almost always put the CRC in a trailer rather than in a header. Why?

7. A CRC is constructed to generate a 4-bit FCS for an 11-bit message. The generator polynomial is $X^4 + X^3 + 1$.

a.) Encode the data bit sequence 10011011100 using the generator polynomial and give the codeword

b.) Now assume that bit 7 (counting from the leftmost bit) In codeword is in error and show that the detection algorithm detects the error

8. A receiver receives the code 11001100111. When it uses the Hamming encoding algorithm, the result is 0101. Which bit is in error? What is the correct code?