Problems

Problem 1

- A BCH code of length 31 correcting 2 errors is used for transmitting messages. The primitive polynomial \( p(x) = x^5 + x^2 + 1 \) was used for constructing the code. At the output of the BSC we observe the sequence \( y = 0100000000010101010011001111001 \). Find the decoded codeword by using the Peterson-Gorenstein-Zierler algorithm.

Problem 2

- A BCH code of length 31 correcting 2 errors is used for transmitting messages. The primitive polynomial \( p(x) = x^5 + x^2 + 1 \) was used for constructing the code. At the output of the BSC we observe the sequence \( y = 0100000000010101010011001111001 \). Find the decoded codeword by using the Berlekamp-Massey algorithm.

Problem 3

- Find the GCD \( D \) of two integers \( a = 264 \) and \( b = 105 \) by using the Euclidean algorithm.

- Find representation of the found GCD \( D = la + jb \), where \( l \) and \( j \) are integers.

- Find the GCD of two polynomials with coefficients in GF(3), \( a(x) = x^3 + x^2 + 2x + 2 \) and \( b(x) = x^3 + 2 \).

- Find the representation of the GCD in the form \( l(x)a(x) + j(x)b(x) \), where \( l(x) \) and \( j(x) \) are polynomials with coefficients in GF(3).

Problem 4.

- A BCH code of length 31 correcting 2 errors is used for transmitting messages. The primitive polynomial \( p(x) = x^5 + x^2 + 1 \) was used for constructing the code. At the output of the BSC we observe the sequence \( y = 0100000000010101010011001111001 \). Find the decoded codeword by using the Euclidean algorithm.
Problem 5

- Let consider a (15,9)-RS code over GF(2^4), where the field is constructed modulo the primitive polynomial $x^4 + x + 1$. Let the syndrome polynomial be $S(x) = \alpha^{13} + \alpha^4 x + \alpha^8 x^2 + \alpha^2 x^3 + \alpha^3 x^4 + \alpha^8 x^5$ and the error locator polynomial be $\Lambda(x) = 1 + \alpha^3 x + \alpha^{11} x^2 + \alpha^9 x^3$.

  Find the error magnitude polynomial

- Find error values by Forney’s algorithm

- Write down the error polynomial