**Convolutional Codes**

**Conditions:**

Use the Jacobi and Gauss-Seidel methods to calculate the randomly generated binary vector from its encoded binary outputs and and determine their errors

**Discussion:**

(Gauss-Seidel equation for reference: )

The Gauss-Seidel method consistently takes the same amount of iterations, two, for all lengths of to achieve the error desired. This is due to the fact that the A matrix used is lower triangular, which causes the approximation at each step in Gauss-Seidel to become irrelevant, as it is multiplied by the zero Matrix U. Thus, the equation for Gauss-Seidel is reduced to , which is a simple forward substitution problem that can be completed in one iteration. However, by its nature, Gauss-Seidel requires at least two iterations in order to ensure that the error tolerance restraint is met, which is the reason any and all binary streams take only two iterations with it.

(Jacobi equation for reference: )

The Jacobi method’s number of iterations varies depending on its initial approximation, and its initial length. This is because, unlike the Gauss-Seidel method, the Jacobi method does not zero out the approximation , as the L Matrix is not zero, requiring that the method iterate until an approximation within the stated tolerance is reached, taking fewer iterations if the initial approximation is close to the actual value.

In conclusion, the Gauss-Seidel method’s number of iterations is not affected by the length of the binary stream, since it’s a single forward substitution problem, whereas the Jacobi method is not and will need to iterate through its method multiple times in order to reduce its error tolerance within the set bounds.