# Part 2 Written Component

***Comparison of the methods (Jacobi and Gauss Seidel). Address the role of n in each case of the decoding algorithms.***

Both the Jacobi and Gauss Seidel methods of iteration are utilized for approximating $A\,\bar{x} = \bar{b}$. These methods are very similar in the sense that they both utilize the equation $S\,\bar{x}_{n+1} = T\bar{x}_n + \bar{b}$ in their approximations. The only differences between the two are what $S$ and $T$ are equal to. For the Jacobi method $S$ is equal to the diagonal of the matrix and $T$ is equal to the negative (lower triangular matrix + upper triangular matrix), while for the Gauss Seidel method $S$ is equal to (lower triangular matrix + diagonal of the matrix) and $T$ is equal to the negative upper triangular matrix. The differences in $S$ and $T$ are what differs the efficiency of these two methods. In general Gauss Seidel is the more effective method of iterations, especially in the case of binary streams.

In the case of binary streams, the matrix $T$in Gauss Seidel will be equal to the negative upper triangular matrix, which will almost always be filled with 0s. For this reason, when using the Gauss Seidel method, approximations are essentially done on $\bar{x}_{n+1} = S^{-1}\bar{b}$ causing convergence after one iteration every time, whereas Jacobi method will take many more depending on the initial matrix.

In the case of decoding algorithms, n plays a role solely in the Jacobi method of iterations. As n increases, the number of iterations required in the Jacobi method increases. However, in the case of the Gauss Seidel method, even as n increases the Gauss Seidel method converges after one iteration.