CSM-322: Information and Coding Theory
(Odd Semester 2022-23)
Project Part-II

Programming Tasks

Instructions:- 1. Use any programming language in which you feel comfortable.

2. Submit all your programs along with their outputs as a single pdf file with your name, roll no. and branch name.

Q1. **Linear Codes**
Given a nonempty subset S of $\mathrm{F}_2^{\mathrm{n}}$. Write a program to find a generator matrix and a parity-check matrix for the binary linear code C = <S>.

Q2. Let G be a given generator matrix for a code C (in particular take binary linear code). Write a program to print the parity-check matrix for the given generator matrix.

Q3. Let H be a given parity-check matrix for a code C in particular take binary linear code). Write a program to print the generator matrix for the given parity-check matrix.

Q4. Let G be a generator matrix for the binary linear code C. Write a program to print all the codewords of C.

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 \end{bmatrix}$$

Q5. Write a program to verify whether the following matrix is a parity check matrix for the linear code C = {0000, 1110, 1011, 0101}.

$$H = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 0 & 1 \\ 1 & 1 \end{bmatrix}$$

Q6. **Syndrome Decoding Rule**
For given a binary linear code C, write a program to construct the syndrome look-up table considering complete decoding scheme. Use the syndrome look-up table constructed to decode the received word **w**.

Q7. Write a program to generate Hadamard matrix of order 2^n , where n is an integer. For n=3, print all the codewords of Hadamard Code.