ELL714 - Programming Assignment on Polarization

This is a programming assignment which requires you to encode and decode binary message bits using polar coding

Objective:

- To familiarize yourself with the concept of polarization on binary erasure channels (BEC).

Channel:

- You are given a BEC with erasure probability $\alpha = 0.7$.

Computing Environment:

- Matlab/Python

Tasks:

1) Apply polarization principles on N copies of the BEC and compute the mutual information values of the N equivalent channels. Use $N = 2, 4, 16, 32, 64, \ldots, 2^{11}$.
2) For each value of N,
   - Plot the mutual information values against the channel index values.
   - Compute the fraction of channels with mutual information values close to 1 and 0.
3) Based on the polarization values for each N, encode information bits using polar coding. The number of information bits to encode is your choice.
4) Apply successive cancellation decoder (using maximum-likelihood approach) at the receiver to recover the transmitted bits.
5) Repeat the above encoding/decoding steps several times to compute the average bit-erasure-rate (BER).
6) Plot the average BER as a function of N