**LDPC ENCODING**

**STEPS FOR EXECUTING LDPC ENCODING:**

1. Generate identity matrix I of N x N dimension. (Here N = 5), I or 0 =

1 0 0 0 0

0 1 0 0 0

0 0 1 0 0

0 0 0 1 0

0 0 0 0 1

1. Find the circular right shift of above generated identity matrix 4 times and store it as I1,I2,I3,I4 or 1,2,3,4

I1 or 1 = 0 1 0 0 0

0 0 1 0 0

0 0 0 1 0

0 0 0 0 1

1 0 0 0 0

I2 or 2 = 0 0 1 0 0

0 0 0 1 0

0 0 0 0 1

1 0 0 0 0

0 1 0 0 0

I3 or 3 = 0 0 0 1 0

0 0 0 0 1

1 0 0 0 0

0 1 0 0 0

0 0 1 0 0

I4 or 4 = 0 0 0 0 1

1 0 0 0 0

0 1 0 0 0

0 0 1 0 0

0 0 0 1 0

1. Find I1\_LF i.e. circular left shift by 1 of I matrix, I1\_LF =

0 0 0 0 1

1 0 0 0 0

0 1 0 0 0

0 0 1 0 0

0 0 0 1 0

1. Generate a matrix of all zero entries, Z\_Mat or call it as -1 =

0 0 0 0 0

0 0 0 0 0

0 0 0 0 0

0 0 0 0 0

0 0 0 0 0

1. Generate 4 random message bits of length 1 x 5 as msg1, msg2, msg3, msg4.
2. Concatenate all the messages into a single array of dimension 1 x 20.

message = [msg1, msg2, msg3, msg4];

1. Generate parity check matrix of size (20 x 40) as given below (using base matrix with expansion factor 5)

H\_Parity\_Mat = 1 -1 3 1 2 0 -1 -1

2 0 -1 3 -1 0 0 -1

-1 4 2 0 1 -1 0 0

4 1 0 -1 2 -1 -1 0

1. Find the parity bits by multiplying message bits with H\_Parity\_Mat matrix. Find Parity\_1 (5 x 1) by adding all the terms after multiplication as Parity\_1\_shift and doing I1\_LF\*Parity\_1\_shift. And Parity 2, Parity 3 and Parity 4 using other parity equations.
2. Cluball the above generated parity matrices into a single dimension matrix of 1 x 20.

Parity = [Parity\_1', Parity\_2', Parity\_3', Parity\_4'];

1. Generate Code (1 x 40) by clubbing message and parity into a single matrix as shown below.

Code = [message, Parity];

1. Calculate Syndrome (20 x 1) by multiplying H\_Matrix with transpose of code generated.

Syndrome = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

1. Perform sum of all the elements of syndrome.

sum (Syndrome) = 0