

EE2025

INDEPENDENT PROJECT

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In this problem we considered $E_b = \frac{T}{2}(\frac{n}{k})$

CHANNEL CODE 1: It's a rate 1/2 linear code with n=8 k=4.

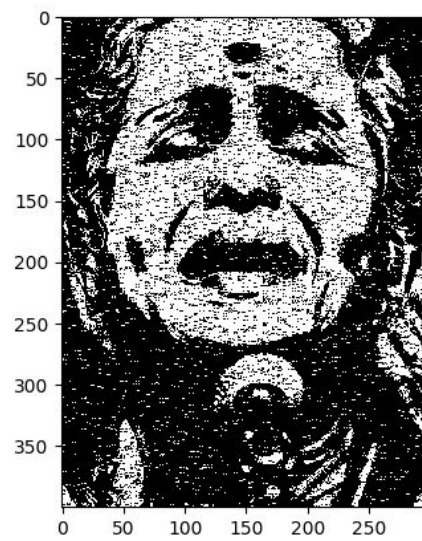
CHANNEL CODE 2: It's a rate 1/3 repetition code.

CHANNEL CODE 3: It's a rate 1/3 linear code with n=12 k=4.

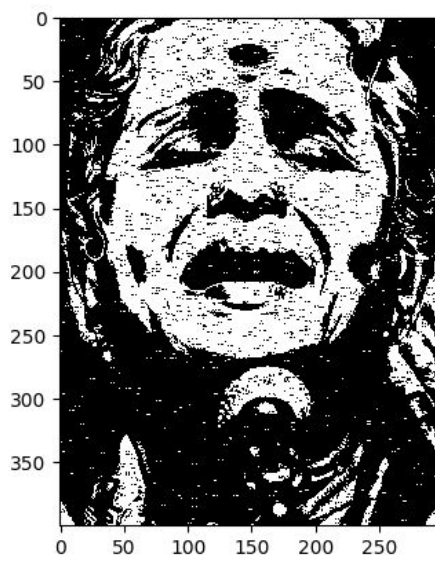
1.Simulating the communication for different values of the noise variance and channel codes

1.1 For Channel-1

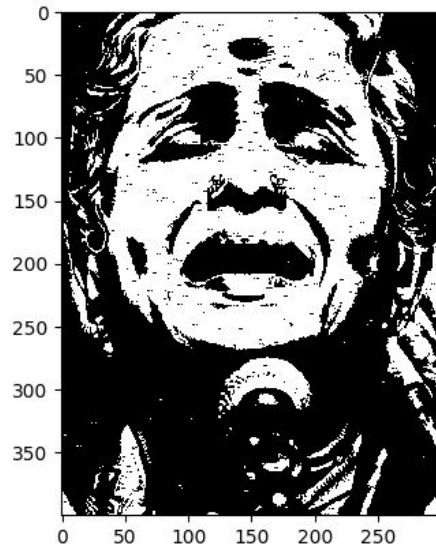
variance	BER	No of error bits
20	0.09	10865
12	0.034	4185
7	0.0059	715
5	0.001025	123



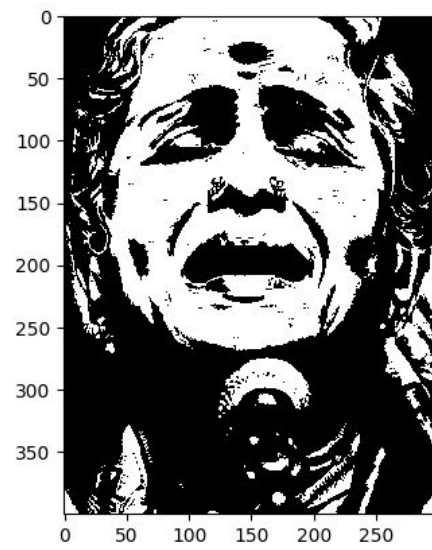
fig(1): Variance = 20



fig(2): Variance = 12



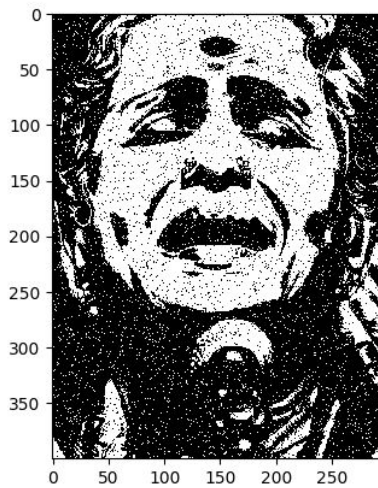
fig(3): Variance = 7



fig(4): Variance = 5

1.2 For Second Channel

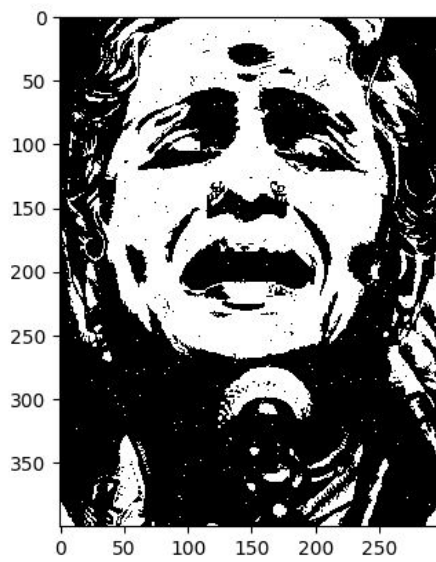
VARIANCE	BER	NO.of Error bits
20	0.0484	5813
12	0.01653	1984
7	0.0026	312
5	0.000575	69



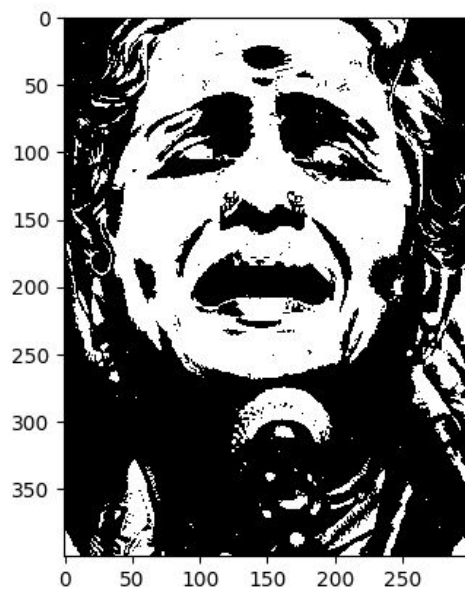
Fig(5): Variance = 20



fig(6): Variance = 12



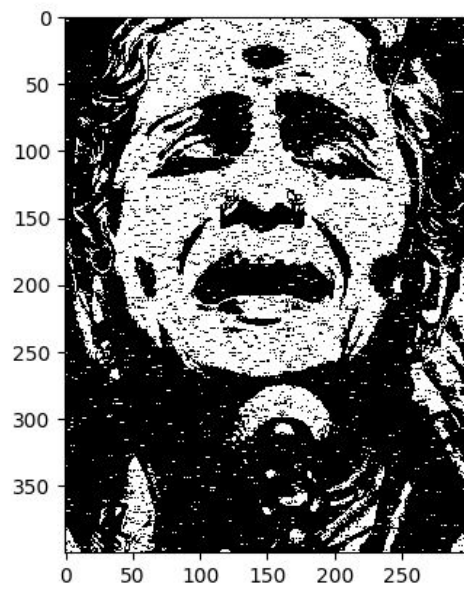
Fig(7): Variance = 7



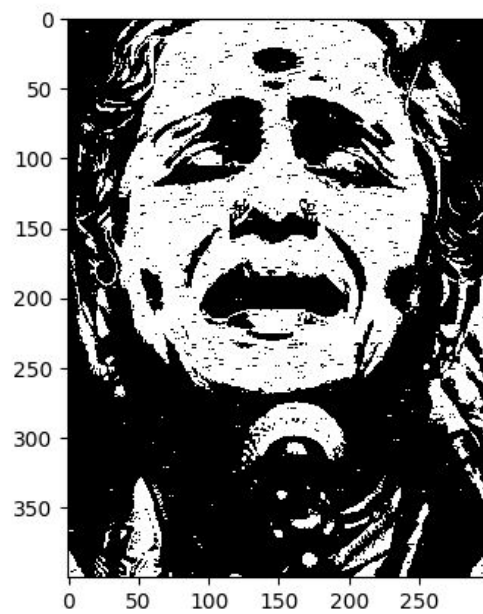
Fig(8): Variance = 5

1.3 For Third Channel Code:

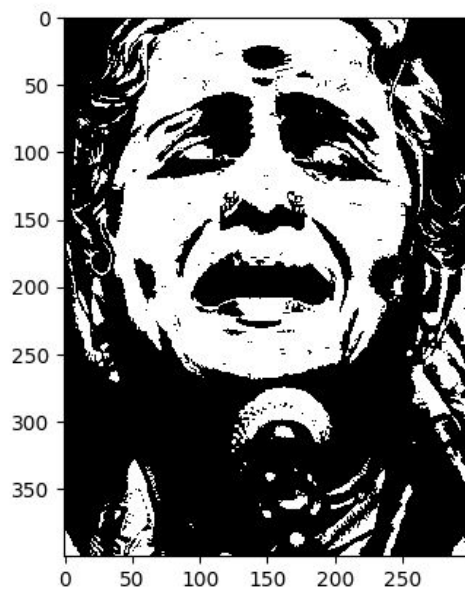
VARIANCE	BER	NO.of Error Bits
20	0.049	5927
12	0.0112	1349
7	0.0009	116
5	9.16×10^{-5}	11



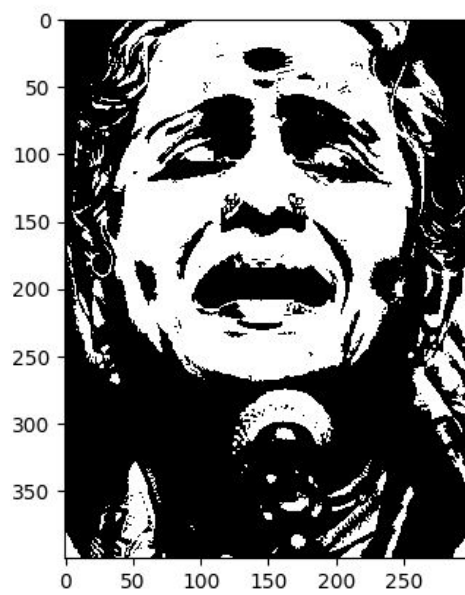
Fig(9): Variance = 20



Fig(10): Variance= 12



Fig(11):Variance = 7

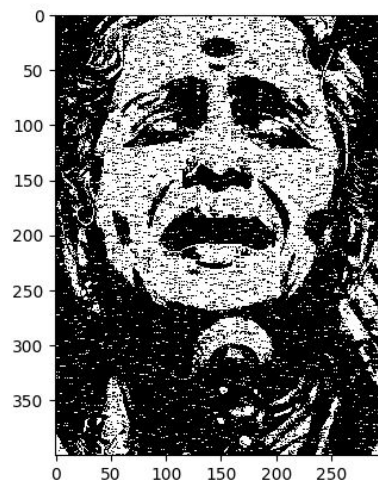


Fig(12): Variance = 5

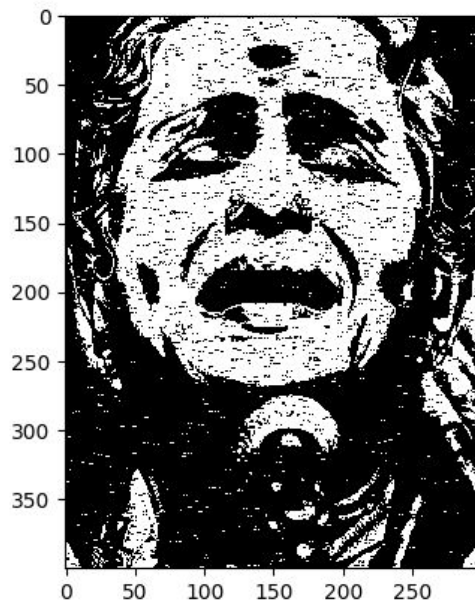
2.Simulating the communication for different values of the $\frac{E_b}{N_o}$ (dB) and channel codes

2.1 For Channel Code 1:

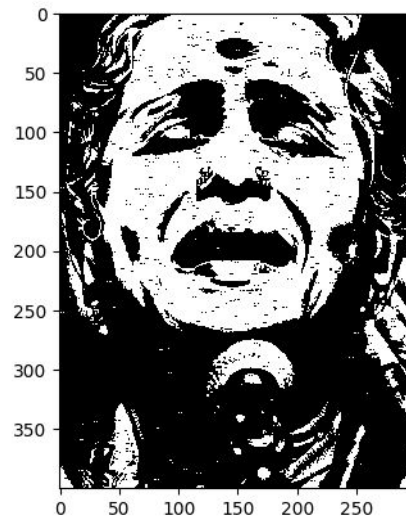
$\frac{E_b}{N_o}$	BER	No.of Error bits
-2	0.1900	22810
0	0.12030	14437
2	0.0591	7094
4	0.0200	2411
6	0.00345	415



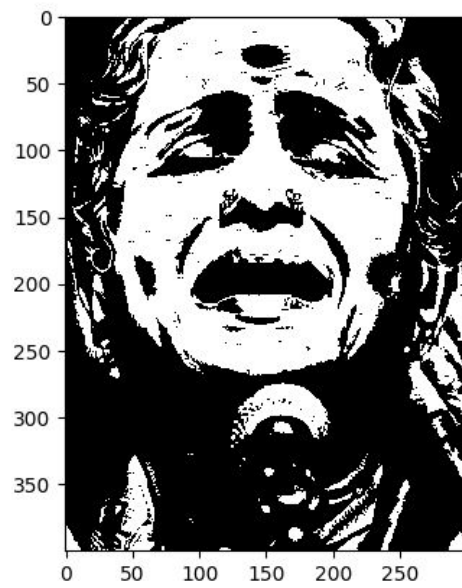
Fig(13): $\frac{E_b}{N_o} = -2\text{dB}$



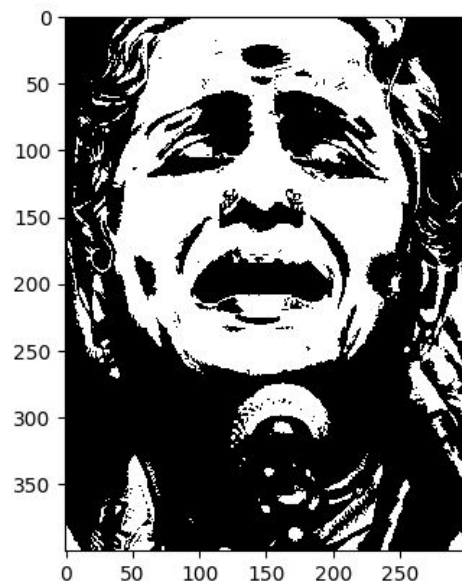
Fig(14): $\frac{E_b}{N_o} = 0\text{dB}$



Fig(15): $\frac{E_b}{N_o} = 2\text{dB}$



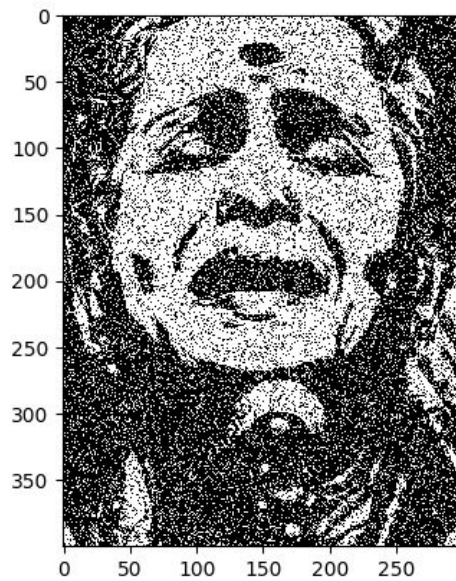
Fig(16): $\frac{E_b}{N_o} = 4\text{dB}$



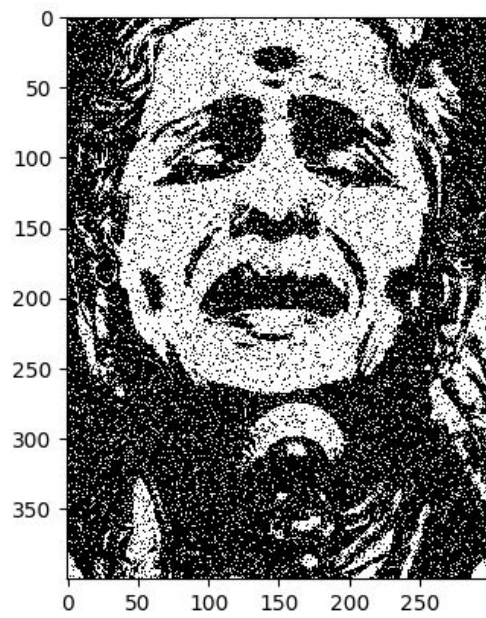
Fig(17): $\frac{E_b}{N_o} = 6\text{dB}$

2.2 For Channel Code 2

$\frac{E_b}{N_o}$	BER	No.of Error bits
-2	0.165	19907
0	0.111	13423
2	0.06122	7347
4	0.02624	3149
6	0.0077	928



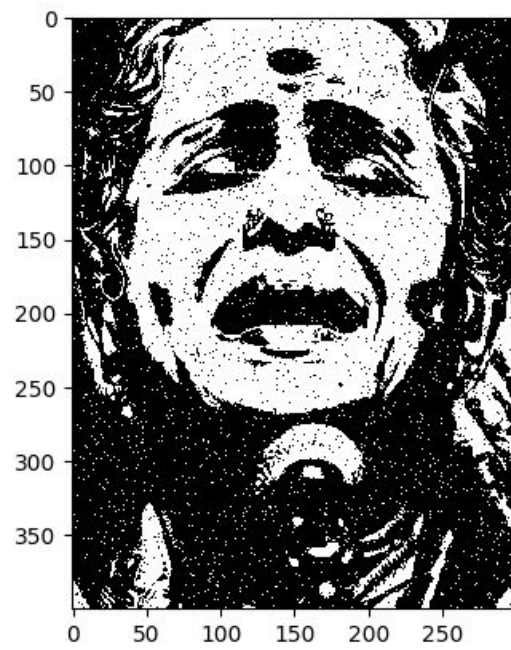
Fig(18): $\frac{E_b}{N_o} = -2\text{dB}$



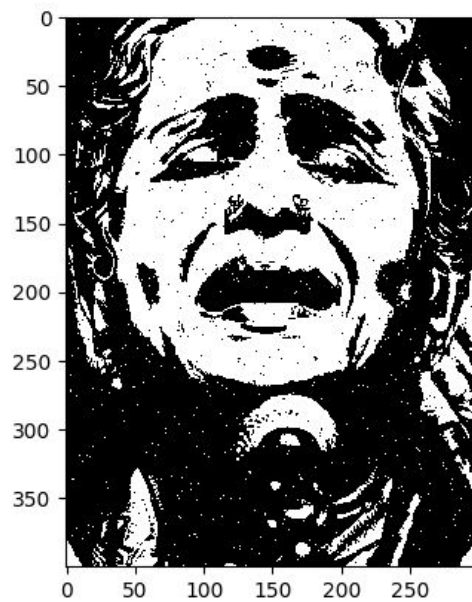
Fig(19): $\frac{E_b}{N_o} = 0\text{dB}$



Fig(20): $\frac{E_b}{N_o} = 2\text{dB}$



Fig(21): $\frac{E_b}{N_o} = 4\text{dB}$



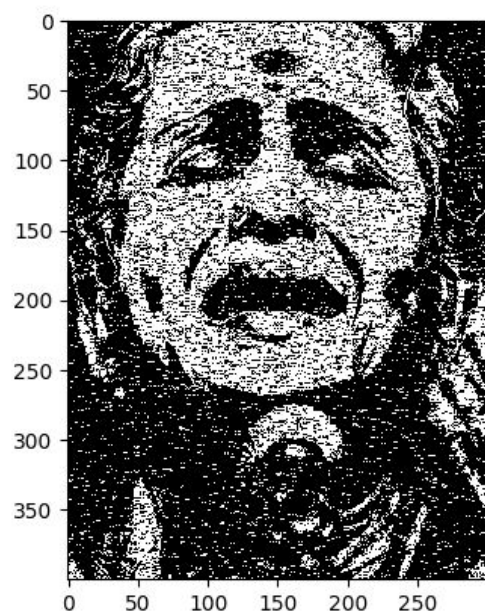
Fig(22): $\frac{E_b}{N_o} = 6\text{dB}$

2.3 For Channel Code 3

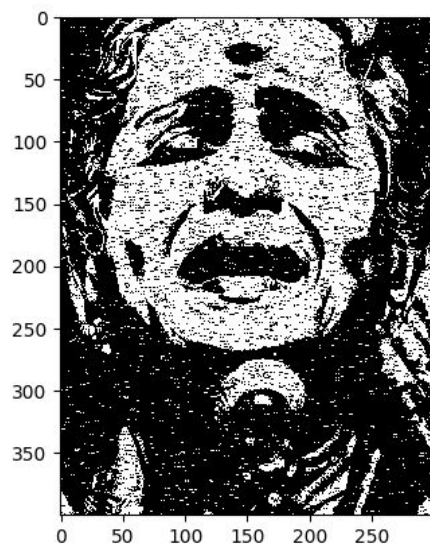
$\frac{E_b}{N_o}$	BER	No.of Error bits
-2	0.2066	24797
0	0.137	16529
2	0.0696	8356
4	0.0234	2816
6	0.004116	494



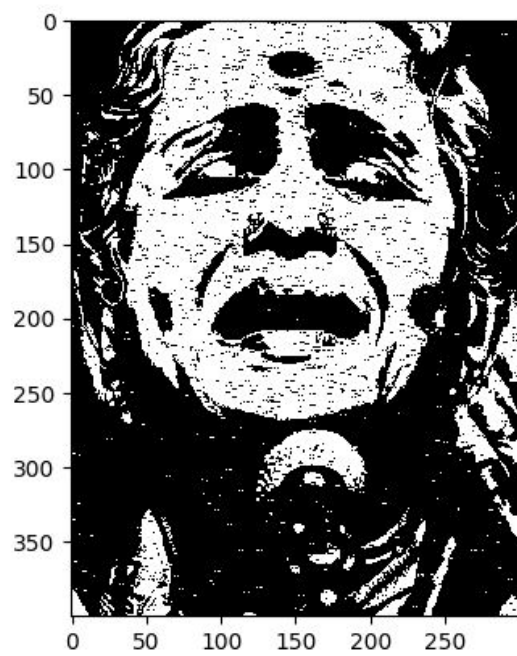
Fig(23): $\frac{E_b}{N_o} = -2\text{dB}$



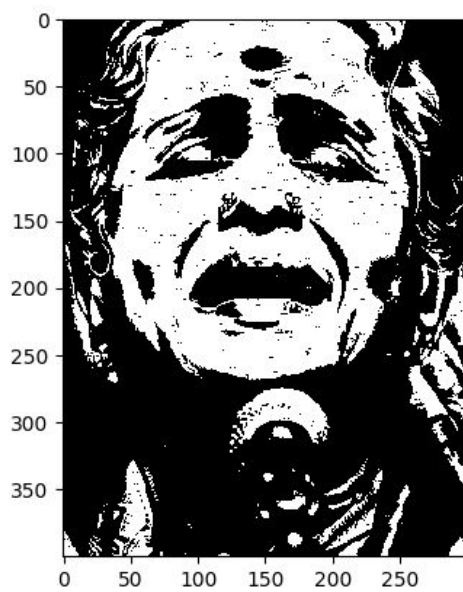
Fig(23): $\frac{E_b}{N_o} = 0\text{dB}$



Fig(24): $\frac{E_b}{N_o} = 2\text{dB}$



Fig(25): $\frac{E_b}{N_o} = 4\text{dB}$



Fig(26): $\frac{E_b}{N_o} = 6\text{dB}$

2.4 Without Channel Code and $\frac{n}{k} = 2$

$\frac{E_b}{N_o}$	BER	No.of Error bits
-2	0.2128	25546
0	0.15885	19062
2	0.1034	12417
4	0.0555	6667
6	0.0230	2765

2.5 Without Channel Code and $\frac{n}{k} = 3$

$\frac{E_b}{N_o}$	BER	No.of Error bits
-2	0.2588	31064
0	0.206	24783
2	0.150	18047
4	0.0974	11697
6	0.0521	6252

For $\frac{n}{k} = 2$

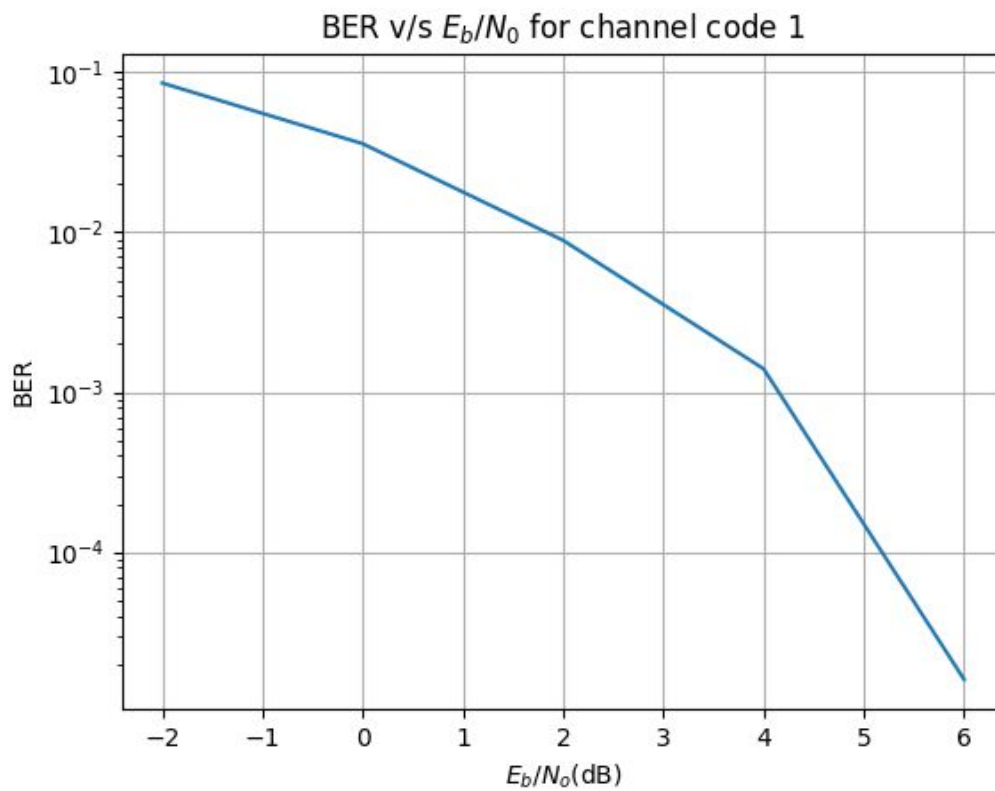
From the values in tables 2.1 and 2.4 we can observe that because of channel coding there is a huge decrease in bit error rate and no.of error bits.

For $\frac{n}{k} = 3$

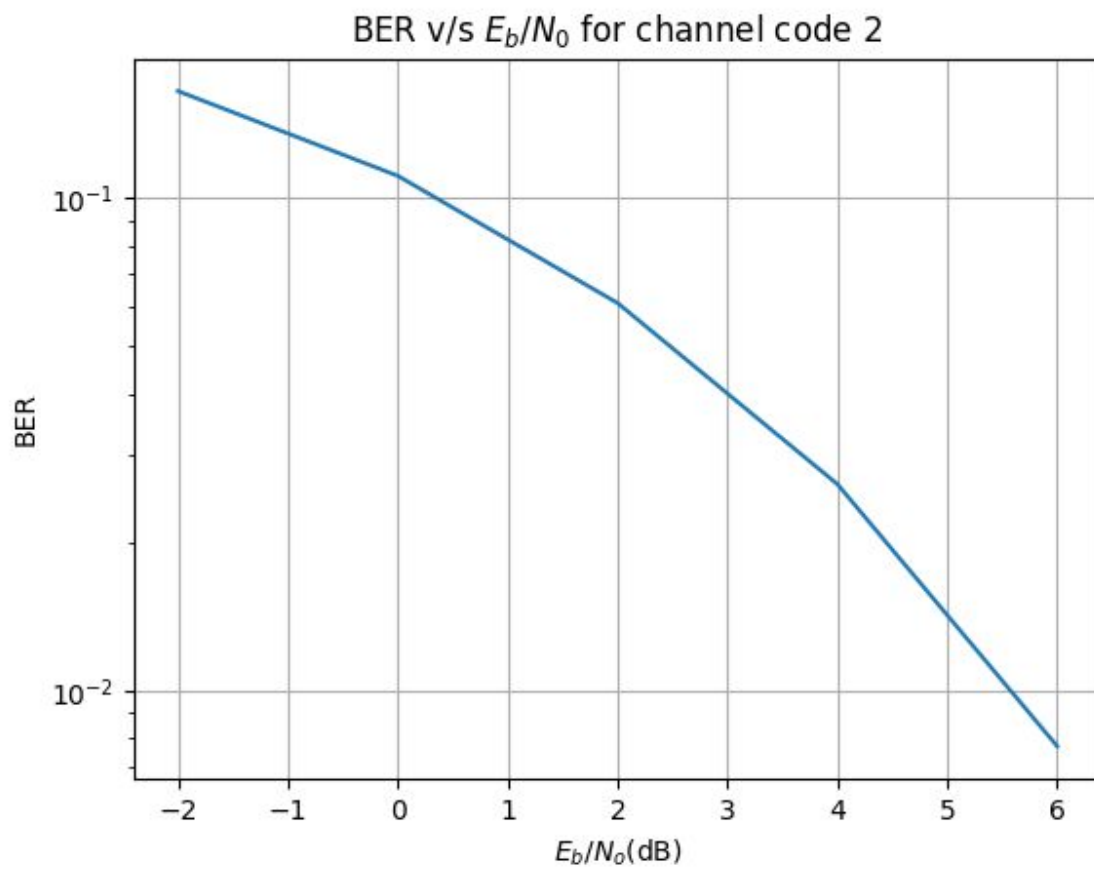
From the values in tables 2.3 , 2.2 and 2.5 we can observe that because of channel coding there is a huge decrease in bit error rate and no.of error bits.

3. Plots of BER vs $\frac{E_b}{N_o}$ for different channel codes

3.1 For Channel Code 1:



3.2 For Channel Code 2:



3.3 For Channel Code 3:

