

An $(n, k) = (3, 1)$ binary block code is used over a BSC with crossover probability ϵ . The encoder and decoder are given as follows:

X	$\alpha(X)$
0	000
1	111

Z	$\beta(Z)$
000	0
001	0
010	0
100	0
110	1
101	1
011	1
111	1

- (4 pts)** Determine the conditional bit error probability given that $X = 0$, $\Pr\{\hat{X} \neq X | X = 0\}$, as a function of ϵ .
- (3 pts)** Determine the overall bit error probability, $\Pr\{\hat{X} \neq X\}$, as a function of ϵ .
- (2 pts)** Assume that X is uniformly distributed and $\epsilon = 0.01$, calculate the probability that $Z = 011$.
- (1 pts)** Assume that X is uniformly distributed and $\epsilon = 0.01$, calculate the probability that $\beta(Z) = 1$.