Week 10 : Theory Solutions

1. The required probabilities may be computed as follows:

$$
\begin{aligned}
\Pr[\text{at least } k \text{ bits get flipped}] &= 1 - \Pr[\text{at most } k \text{ bits get flipped}] \\
&= 1 - \sum_i \Pr[i \text{ bits get flipped}] \\
&= 1 - \sum_i p^i (1-p)^{n-i}
\end{aligned}
$$

2. Since three-qubit code for bit-flip errors can correct at most 1 bit, the required probability is

$$\Pr[\text{at most 1 bit flipped for } n \text{ operations}].$$

   Since each of the operations are independent this equals,

$$\sum_{i=1}^{n} \Pr[\text{at most 1 bit for operation i}].$$

   This in turn equals,

$$\sum_{i=1}^{n} \sum_{j=0}^{1} \Pr[j \text{ bits flipped in operation } i].$$