

## Tutorial 7 Solution

### Question 1

Receiver makes a decoding error if 2 or more out of the 3 bits are in error

$$P_{error} = 3p^2(1 - p) + p^3 \approx 3(10^{-6})$$

### Question 2

(a)

$$k - 1 = 5, n - k = 3, n = 9, x^3 i(x) = q(x)g(x) + r(x), i(x) = x^5 + x^4 + x^2 + x$$

$$110110000 = 100011 \times 1101 + 111$$

$$\text{codeword} = 110110111$$

(b)

Single errors can be detected. Because  $g(x)$  has more than 1 term.

### Question 3

(a)

$$k - 1 = 4, n - k = 3, n = 8, x^3 i(x) = q(x)g(x) + r(x), i(x) = x^4 + x^3 + x + 1$$

$$11011000 = 11111 \times 1011 + 001$$

$$\text{codeword} = 11011001$$

(b)

$$10011001 = 10100 \times 1011 + 101$$

$$r(x) = 101$$