

CSE160: HW1-8

2.15: Want to send the message 11001001 and protect it from errors using the CRC polynomial $x^3 + 1$

a) 11100011000

$$\begin{array}{r}
 1001 \downarrow \\
 01110 \\
 1001 \downarrow \\
 \hline
 01110 \\
 1001 \downarrow \\
 01111 \\
 1001 \downarrow \\
 \hline
 01101 \\
 1001 \downarrow \\
 01000 \\
 1001 \downarrow \\
 \hline
 000100
 \end{array}$$

$$R(x) = 100$$

b) The original message is 1110001100. Inverting the first 6 bits of the transmission gives 0110001100. When dividing by 1001, this gives a remainder of 10, which is not equal to 0. So, the receiver knows that an error has occurred.

2.20: a) $20 \text{ km} = 10 \cdot 10^3 \text{ m}$

$$\text{delay} = \frac{\text{length of link}}{\text{Speed of signal}} = \frac{10 \cdot 10^3 \text{ m}}{2 \cdot 10^8 \text{ m/s}} \Rightarrow 5 \cdot 10^{-5} = 50 \cdot 10^{-6}$$

$$50 \mu\text{s}$$

b) The round trip would be 100 μs and the suitable timeout time would be twice the roundtrip, which is 200 μs . A reasonable timeout value could be decreased but it should not be less than the roundtrip time, otherwise the retransmission of the packets would be very frequent due to timeout.