Homework 3 Solutions

Problem 1:

If there is more than one possible message, and if the length of the code is fixed to $N + M$, then the answer is no. Take one of the encoded messages, then flip all of the bits that differ from the second encoded message and you get the second encoded message. The receiver cannot distinguish between the two scenarios.

If the channel is only used once, then you could send 1 bit for Message 1, 2 bits for Message 2, etc. As the number of bits encodes the message, their contents are irrelevant. However, for this to work, you would need to be able to receive and distinguish the bits at the receiver side and to determine the beginning and the end of the message, making this not a practical solution.

Problem 2:

$x^4 + x^3 + 1$ corresponds to the bit pattern `11001`. The message is 1011011101111. Since the degree of the CRC polynomial is 4 we append the message with four parity bits. We represent them with asterisks and thus obtain `1011011101111****`. We then proceed with division with remainder:

```
  1011011101111****
 +11001
------------------
  0111111101111****
 + 11001
------------------
  0001101101111****
 +   11001
------------------
  0000001001111****
        11001
------------------
  0000000101011****
+        11001
------------------
  0000000011001****
+         11001
------------------
  0000000000000****
```

We therefore set the parity bits equal to zero. The message is now
`10110111011110000`.