

## Homework #2: Cyclic Redundancy Check (CRC)

**Due date: April 18, 2024**

In this homework, you are asked to write a MATLAB program for the cyclic redundancy check (CRC) code, using CRC-32. Please download the data  $M(x)$  (inputdata.mat that contains a binary vector of 12000bits named “packet”) on eLearn.

1. Use the input data  $M(x)$  and the generator of CRC-32

$$C(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} \\ + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$$

to find the transmitted message  $P(x)$  (as a binary vector of 12032 bits). (Note: Do not use the function of CRC32 in MATLAB.)

2. Suppose that you are a middle man and you would like to corrupt the transmitted message  $P(x)$  by adding an undetectable error  $E(x)$  into  $P(x)$ . A trivial way to do this is to let  $E(x)=C(x)$  and add  $C(x)$  to  $P(x)$ . But this will change 15 bits in  $P(x)$  as there are 15 nonzero terms in  $C(x)$ . Can you find an  $E(x)$  that only needs to change at most 10 bits in  $P(x)$ ? Your score for this problem will depend on the number of bits that you need to change in  $P(x)$ .

Upload a compressed files (YourID.rar, e.g., 99064599.rar) that contents your results as two binary arrays  $P(x)$  and  $E(x)$  **in a file** (YourID.mat, e.g., 111064599.mat) that contains two binary vectors of 12032bits named “codepacket” ( $P(x)$ ) and “error”(  $E(x)$  ) and the two source code files (YourID\_1.m, e.g., 111064599\_1.m for generating  $P(x)$  and YourID\_2.m, e.g., 111064599\_2.m for generating  $E(x)$ ) to eLearn.