

# Practice 2.1: Signal Analysis: ASK simulation in Matlab

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**Abstract**—In this practice we shall implement a CRC error detection with multiple polynomials  $P(x)$  in order to detect errors in a telecommunication system based on ARDUINO.

$F = (n - k)$ -bit FCS, the last  $(n - k)$ bits of  $T$   
 $D = k$ -bit block of data, or message, the first  $k$ bits of  $T$   
 $T = n$ -bit frame to be transmitted

## I. MOTIVATION

It is important to understand and identify the components in each of the layers of the OSI model as it is the model of reference from long ago. Thus, it is really necessary to know the functions and applications of each layers not only theoretically but in real practices, an example of these components is the CRC that is used constantly in telecommunications systems and standards.

## II. OBJETIVES

- Implement a CRC (Cyclic Redundancy Check) in the basic 433MHZ ASK RF telecommunication system done in practice 2.3

## III. INTRODUCTION

### Cyclic Redundancy Check (CRC)

One of the most common, and one of the most powerful, error-detecting codes is the cyclic redundancy check (CRC), which can be described as follows. Given a  $k$ -bit block of bits, or message, the transmitter generates an sequence, known as a frame check sequence (FCS), such that the resulting frame, consisting of  $n$  bits, is exactly divisible by some predetermined number. The receiver then divides the incoming frame by that number and, if there is no remainder, assumes there was no error.<sup>3</sup> To clarify this, we present the procedure in three equivalent ways:

- Modulo 2 arithmetic
- Polynomials
- Digital logic

The methods seen in class where the first two.

### Modulo 2 arithmetic

Modulo 2 arithmetic uses binary addition with no carries, which is just the **exclusive-OR (XOR)** operation. Binary subtraction with no carries is also interpreted as the XOR operation.

Now define

$$T = 2n - kD + F$$

Where:  $P$  = pattern of  $n - k + 1$  bits; this is the predetermined divisor