

## **Practical work of Signal processing**

### **Practical work N° 01 : Generation and Display of Signals**

#### **1. Introduction**

This section aims to familiarize students with MATLAB, which integrates numerical analysis and matrix computation. MATLAB (MATrix LABoratory) is powerful matrix computation software. Indeed, all variables are introduced in the form of matrices. This lab should enable every student to master the software environment in order to work independently and more precisely in the field of signal processing.

#### **2. Goal of the practical work**

The objective of this lab is to generate signals: step, sign, rectangular, pulse, triangular, ramp, sinusoidal, and cardinal sine.

#### **3. Manipulations**

##### **3.1. Basic MATLAB Programs**

###### **3.1.1. Step unit signal**

```
t=-10:.001:10;  
u=Heaviside(t);  
plot(t,u), axis([-10 10,-2 2]), grid
```

###### **3.1.2. Sign Signal**

```
t=-10:.001:10;  
sgn=sign(t) ;  
plot(t,sgn), axis([-10 10,-2 2]), grid
```

### 3.1.3. Impulse of Dirac

```
t=-10:.001:10;
dira = dirac(t);
idx = dira == Inf;
dira(idx) = 1;
plot(t,dira), axis([-10 10,-2 2]), grid
```

### 3.1.4. Sine and Cardinal Sine signals

```
t=-2*pi:pi/10:2*pi;
y0=sin(t) ;
y1=sinc(t);
subplot(1,2,1), plot(t,y0), grid
subplot(1,2,2), plot(t,y1,'r'), grid
```

## 3.2. Preparation work

### Exercise N°1

Write a MATLAB program to represent the sign and step functions using the second form:

$$\text{Sgn}(t) = t/|t| \quad \text{et} \quad u(t) = 1/2 + 1/2 * \text{sgn}(t)$$

The axes (time and amplitude) should be limited to  $([-10, 10], [-2, 2])$ .

### Exercise N°2

Write a MATLAB program to display:

1. A rectangular signal with amplitude of 1 between the times -1 and 1.
2. A ramp signal.
3. A triangular signal with a window width of 2, i.e., between the times -1 and 1.

The axes (time and amplitude) should be limited to  $([-3, 3], [-3, 3])$ .

### Exercise N°3

Write a MATLAB program to reconstruct and display the signal  $x(t)$  from the figure below based on the step and ramp functions.

