Lab 1: Generation of Basic Signals

Aim: To generate and obtain the output for the basic signals

Software Requirement: SCI Lab

Theory: Signals can be classified as continuous or discrete time. In the mathematical abstraction, the domain of a continuous-time signal is the set of real numbers (or some interval thereof), whereas the domain of a discrete-time (DT) signal is the set of integers (or other subset of real numbers). What these integers represent depends on the nature of the signal; most often it is time.

A continuous-time signal is any function which is defined at every time *t* in an interval, most commonly an infinite interval. A simple source for a discrete-time signal is the sampling of a continuous signal, approximating the signal by a sequence of its values at particular time instants. A signal, of which a sinusoid is only one example, is a sequence of numbers. A continuous-time signal is an infinite and uncountable set of numbers, as are the possible values each number can have between a start and end time, there are infinite possible values for time and instantaneous amplitude.

1. a) Generation of Continuous Signals

Scilab code: Sine wave

```
clc ;
clf ;
clear all;
// Caption: Generation of sine wave
f =0.2;
t =0:0.1:10;
x = sin (2* %pi * t * f ) ;
plot (t ,x ) ;
title ( ' s i n e wave ' ) ;
xlabel ( ' t ' ) ;
ylabel ( ' x ' ) ;
```

Simulation Output:

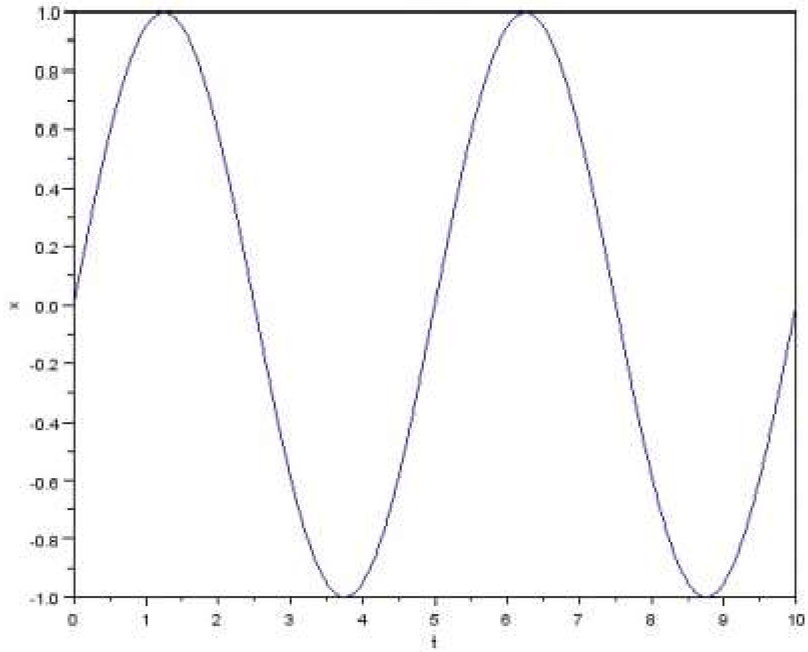

Figure 1.1: sinewave

Scilab code: Cosine wave

```
clc ;
clf ;
clear all;
// Caption: Generation of cosine wave
f =0.2;
t =0:0.1:10;
x = cos (2* %pi * t * f ) ;
plot (t ,x ) ;
title ( ' c o s i n e wave ' ) ;
xlabel ( ' t ' ) ;
ylabel ( ' x ' ) ;
```

Simulation Output:

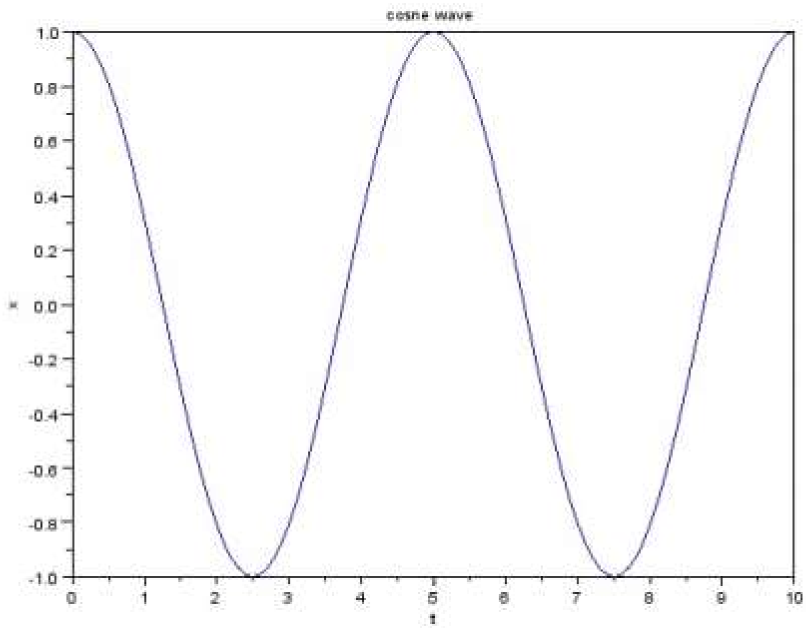

Figure 1.2: cosine wave

Scilab code: Triangular wave

```
clc ;
clf ;
clear all;
// Caption: Generation of Triangular wave
a =8;
t =0:( %pi /4) :(4* %pi ) ;
y = a *sin (2* t ) ;
a = gca () ;
a . x_location =" mi d dl e "
plot (t ,y ) ;
title ( ' t r i a n g u l a r wave ' ) ;
```

```
xlabel ( ' t ' ) ;
ylabel ( ' y ' ) ;
```

Simulation Output:

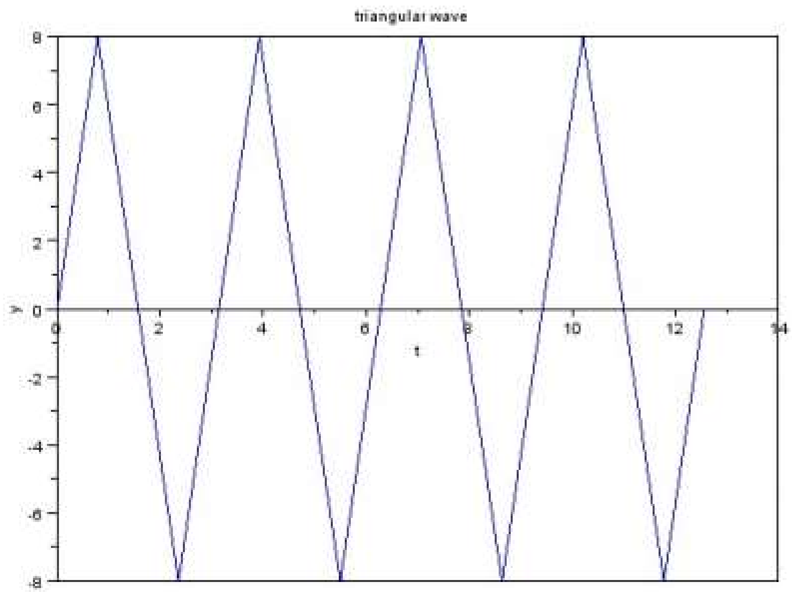

Figure 1.3: triangular wave

Scilab code: Exponential wave

```
clc ;
clf ;
clear all;
// Caption: Generation of Exponential wave
t = -2:0.1:2;
x = exp (t ) ;
plot (t ,x ) ;
title ( ' e x p o n e n t i a l wave ' ) ;
xlabel ( ' t ' ) ;
ylabel ( ' x ' ) ;
```

Simulation Output:

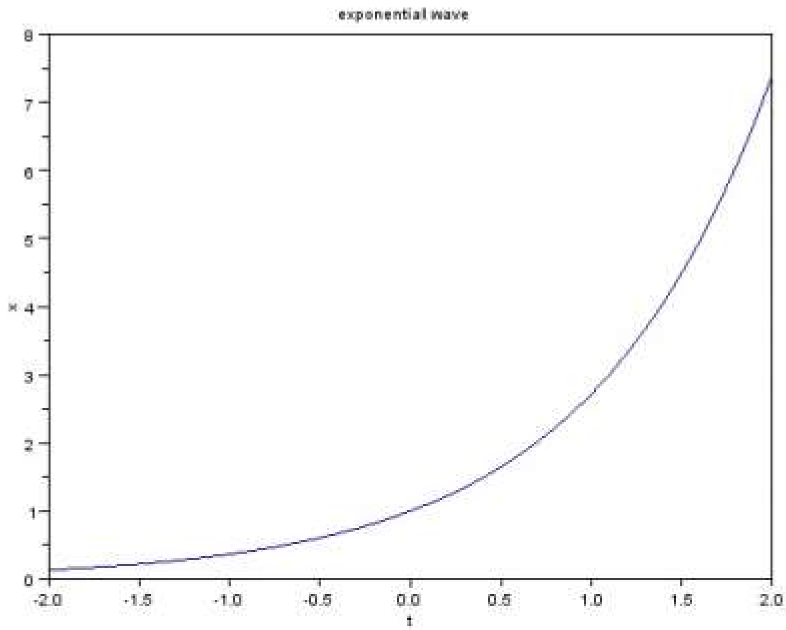

Figure 1.4 : Exponential wave

1. b) Generation of Discrete Signals

Scilab code: Unit impulse signal

```
clc ;
clf ;
clear all;
// u n i t I m p u l s e
L =5;
n = - L : L;
x =[ zeros (1 , L ) ,ones (1 ,1) ,zeros (1 , L ) ];
a = gca () ;
a . y_location =” mi d dl e ”
plot2d3 (n ,x ) ;
title ( ’ u n i t I m p u l s e ’ ) ;
```

Simulation Output:

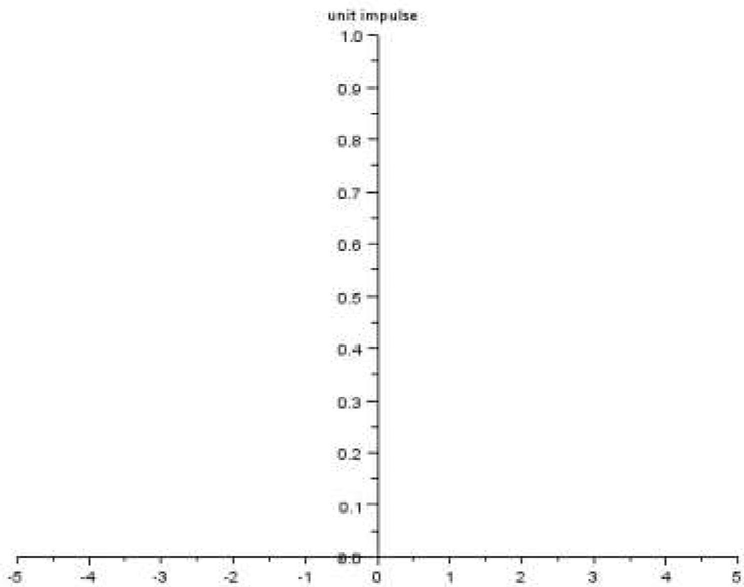

Figure 1.5 : unit impulse signal

Scilab code: Unit step signal

```
clc ;
clf ;
clear all;
L =5;
n = - L : L;
x =[ zeros (1 , L ) ,ones (1 , L +1) ];
a = gca () ;
a . y_location =” mi d dl e ”;
plot2d3 (n ,x ) ;
title ( ’ u n i t s t e p ’ ) ;
xlabel ( ’ n ’ ) ;
ylabel ( ’ x ’ ) ;
```

Simulation Output:

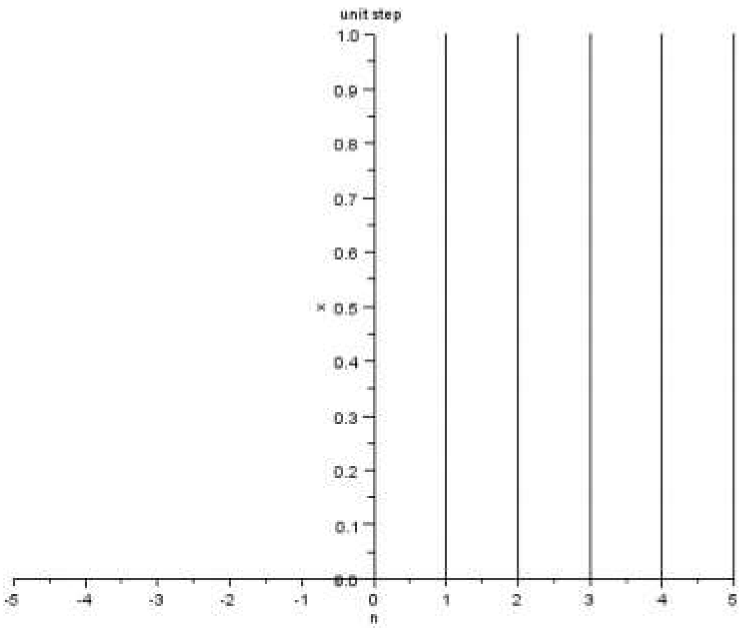

Figure 1.6 : unitstepsignal

Scilab code: Unit ramp signal

```
// u n i t ramp
clc ;
clf ;
clear all;
L =5;
n = - L : L;
x =[ zeros (1 , L ) ,0: L ];
a = gca () ;
a . y_location = ' mi d dl e ' ;
plot2d3 (n ,x ) ;
xtitle ( ' u n i t ramp s i g n a l ' ) ;
xlabel ( '−−−>n ' ) ;
ylabel ( '−−−>x ( n ) ' ) ;
```

Simulation Output:

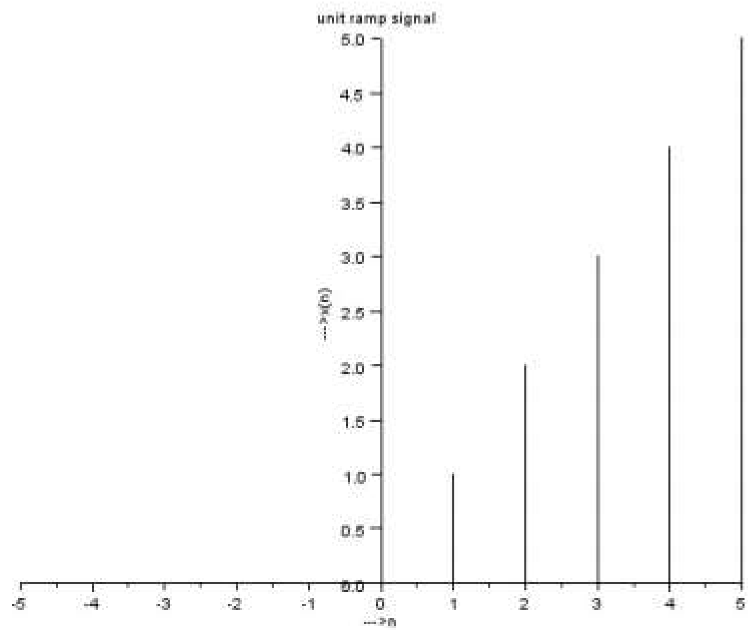

Figure1.7 : unit ramp

Pre-lab questions:

1. What is continuous signal and discrete signal?
2. What are the properties of a signal?
3. How is a signal generated?
4. What is the difference between analog and digital signals?
5. Which signal is more reliable analog or digital?

Post-Lab questions:

1. Derive the code and show the output for signum function.
2. Derive the code and show the output for sinc function.
3. Derive the code and show the output for discrete exponential wave.

Result: