Experiment Number: 01
Experiment Name: Introduction to Octave online software and study of a basic unit step function.

Objectives:

- To get familiarize with the Octave online software.
- To know the importance and limitations of the software.
- To know briefly about the unit step function.
- To develop and plot the unit step function on Octave online.

Apparatus:

- Computer or mobile phone.
- MS word.
- Octave Online software
- Pen or pencil etc.

Theory:

Octave Online is a web UI for GNU Octave, the open-source alternative to MATLAB. Thousands of students, educators, and researchers from around the world use Octave Online each day for studying machine learning, control systems, numerical methods, and more.

In engineering applications, there are functions whose values change abruptly at specified values of time *t*. One common example is when a voltage is switched on or off in an electrical circuit at a specified value of time *t*.

The switching process can be described mathematically by the function called the Unit Step Function (otherwise known as the Heaviside function after Oliver Heaviside).

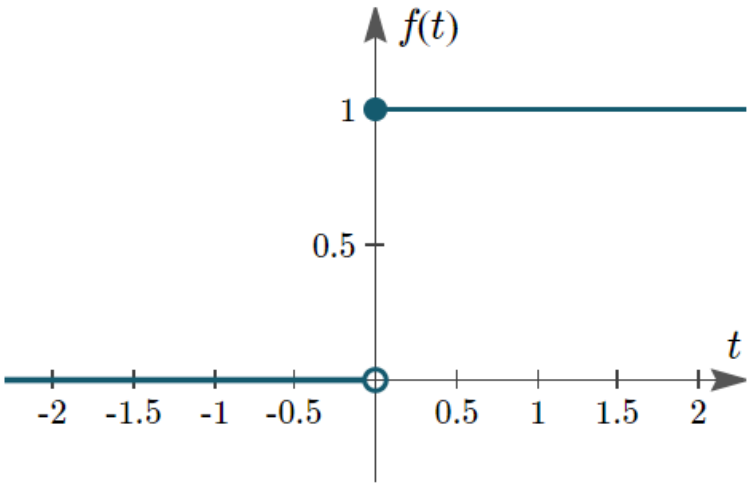
The step signal or step function is that type of standard signal which exists only for positive time and it is zero for negative time. In other words, a signal x(t) is said to be step signal if and only if it exists for $t \geq 0$ and zero for $t < 0$. The step signal is an important signal used for analysis of many systems.

If a step signal has unity magnitude, then it is known as unit step signal or unit step function. It is denoted by u(t).

In practice, the unit step signal is used as a test signal because the response of a system for the unit step signal gives the information about how quickly the system responds to a sudden change in the input signal.

$$u(t) = \begin{cases} 0 & t < 0 \\ 1 & t \geq 0 \end{cases}$$

We would indicate the discontinuity on our graph like this:



Graph of $f(t) = u(t)$, the unit step function, with $f(0) = 1$.

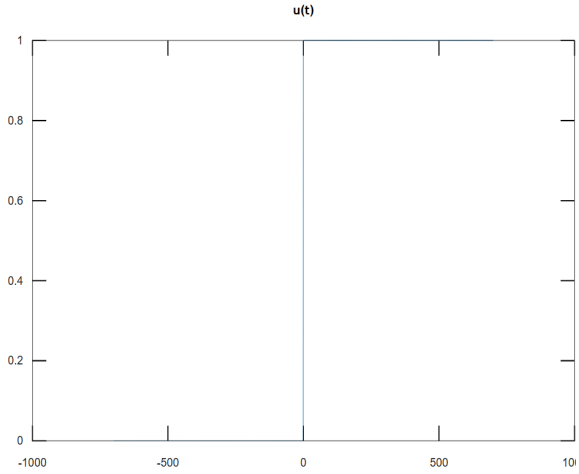
Code:for a t = -700 to 700

```
clc; close all; clear all;
for t = -700:700;
n = t+701;
x(n) = t;
if t >= 0
   u(n) = 1;
else
   u(n) = 0;
end
end
plot (x,u);
title ('u(t)');
```

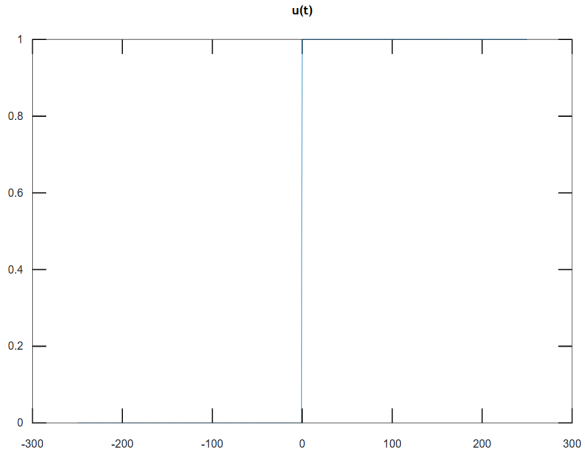
Code:for a t = -250 to 250

```
clc; close all; clear all;
for t = -700:700;
n = t+701;
x(n) = t;
if t >= 0
   u(n) = 1;
else
    u(n) = 0;
end
end
plot (x,u);
title ('u(t)');
```

Graph:



graph for t = -700 to 700



graph for t = -250 to 250

Discussion:

1.Understanding Octave Online:

Octave Online provides an easy-to-use interface for executing mathematical computations without installing any software. It is widely used for simulations and analysis in engineering applications.

2.Significance of the Unit Step Function:

The unit step function is essential in control systems and signal processing, as it helps analyze system responses to sudden changes. Its simplicity makes it a fundamental test signal in system analysis.

3Graphical Representation and Observations:

The plotted unit step function clearly demonstrates the transition from 0 to 1 at t=0t = 0t=0. The graph confirms that the function remains zero for negative time and one for positive time, aligning with theoretical expectations.