Experiment No: 01

Experiment Date: 20.03.2023

Experiment Name: Presentation of some signals using MATLAB.

1. Plot unit step, unit impulse and unit ramp signal using conditions.
2. Plot a discrete signal.
3. Plot two discrete signals, their addition and subtraction.
4. Plot two gives continuous signal.

Theory: We used both continuous and discrete signals in the experiment. A continuous-time signal is one that changes smoothly and continuously across time. These signals signify an amount of interest that is affected by an outside factor, typically time. A discrete-time signal is a sequence of interesting values, where the values in the sequence correspond to some relevant physical parameter and the integer index can be viewed as a time index.

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. 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).

The unit impulse signal has zero amplitude everywhere except at t = 0. At the origin (t = 0) the amplitude of impulse signal is infinity so that the area under the curve is unity. It is denoted by δ(t).

A ramp function, often known as a ramp signal, is a kind of standard signal that begins at time zero and climbs linearly through time. The ramp function's slop is one unit. R serves to indicate it (t).

With MATLAB, any signal can be plotted. Applying the conditions to meet the requirements is necessary in order to plot any given signal.

Required software: MATLAB Code:

Code 1: Unit step, unit impulse and unit ramp-

```
clc;
clear all;
close all;
t=-5:0.001:5;
step1= t>= 0;
step2= t==0;
8. step3= (t>=0).*t;
subplot(3,1,1);
plot(t,step1);
xlabel('Time');
ylabel('Amplitude');
```

```
12. title('Unit step');
13. 15. ylim([-0.1, 1.1]);
14. subplot(3,1,2);
15. plot(t,step2);
16. xlabel('Time');
17. ylabel('Amplitude');
18. title('Unit Impluse');
19. 22. ylim([-0.1, 1.1]);
20. subplot(3,1,3);
21. plot(t,step3);
22. xlabel('Time');
23. ylabel('Amplitude');
24. title('Unit ramp');
25. ylim([-0.5, 5.5]);
```

Code 2: Discrete signal -

```
1.  clc;
2.  clear all;
3.  close all;
4.  x=[2, 0, -2, 3, 1, 4, 6];
5.  n=[1 2 4 5 6 8 3];
6.  stem(n,x);
7.  xlabel('n');
8.  ylabel('x');
9.  xlim([0, 9]);
10. ylim([-3, 7]);
```

Code 3: Two different signals, their addition and subtraction-

```
1.  clc;
2.  clear all;
3.  close all;
4.  t=-10:1:20;
5.  step1= t>=0 & t<=10;
6.  step2= t>=5 & t<=15;
7.  subplot(4,1,1);
8.  stem(t,step1);
9.  xlabel('Time');
10. ylabel('Amplitude');
11. 13. title('Signal 1');
12. subplot(4,1,2);
13. stem(t,step2);
```

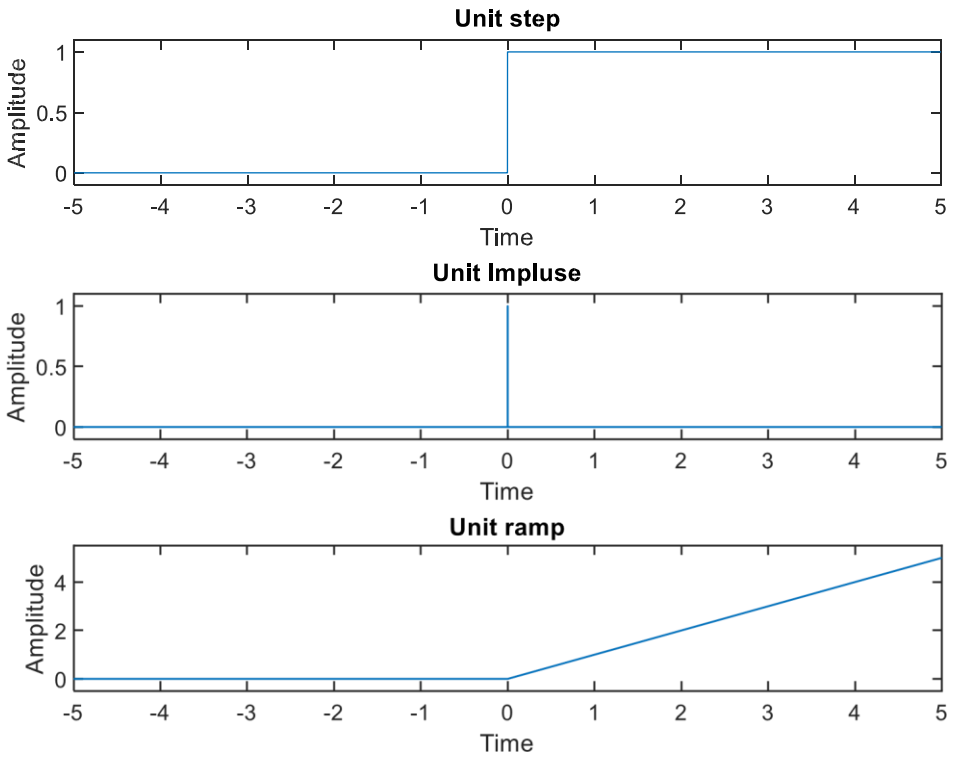
```
xlabel('Time');
ylabel('Amplitude');
title('Signal 2');
step3 = step1+step2
subplot(4,1,3);
stem(t,step3);
xlabel('Time');
ylabel('Amplitude');
title('Addition');
step4 = step1-step2
subplot(4,1,4);
stem(t,step4);
xlabel('Time');
ylabel('Amplitude');
title('Subtraction');
```

Code 4: Presentation of two signals-

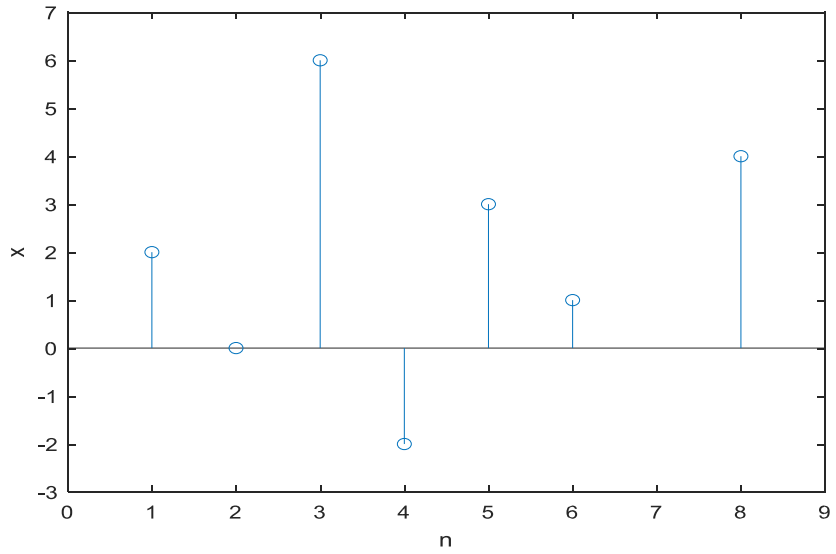
```
clc;
clear all;
close all;

t=0:1:7;
u = [ones(1,1).*1 ones(1,2).*2 ones(1,1).*4 ones(1,1).*4 ones(1,2).*2
ones(1,1)];
subplot(2,1,1);
plot(t,u);
xlabel('Time');
ylabel('Amplitude');
title('Signal 1');
xlim=([0, 8]); 13. ylim([1, 5]);

t=0:1:6;
u1 = [zeros(1,1) ones(1,5) zeros(1,1)];
subplot(2,1,2);
plot(t,u1);
xlabel('Time');
ylabel('Amplitude');
title('Signal 2');
xlim=([-0, 7]);
ylim([0, 1.1]);
```

Output Graph:

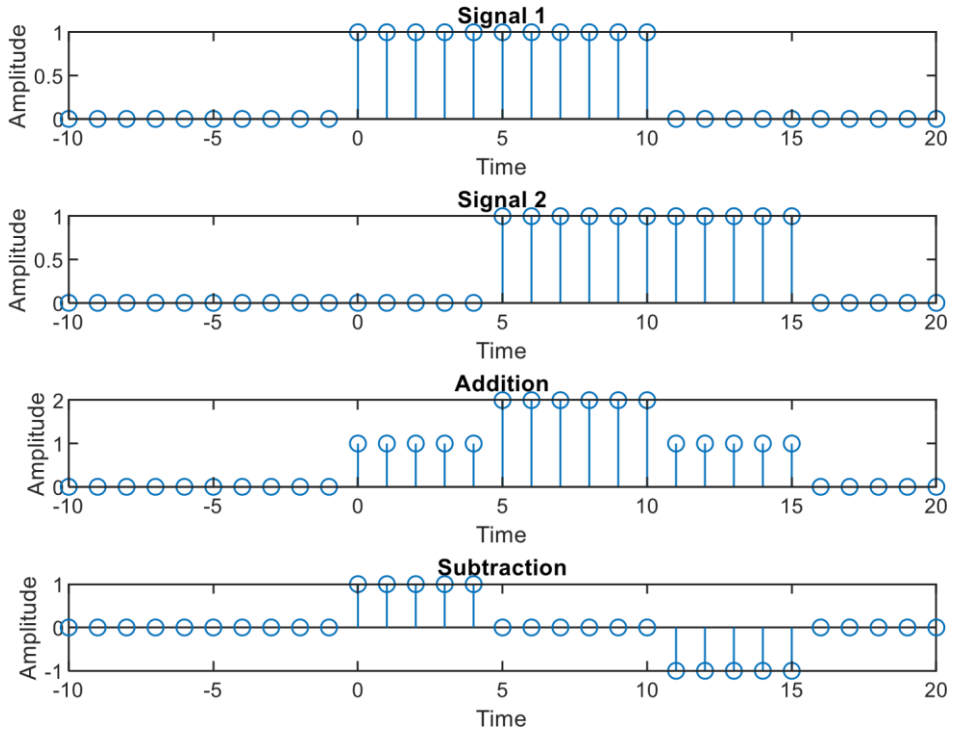
Output 1: Unit step, unit impulse and unit ramp-



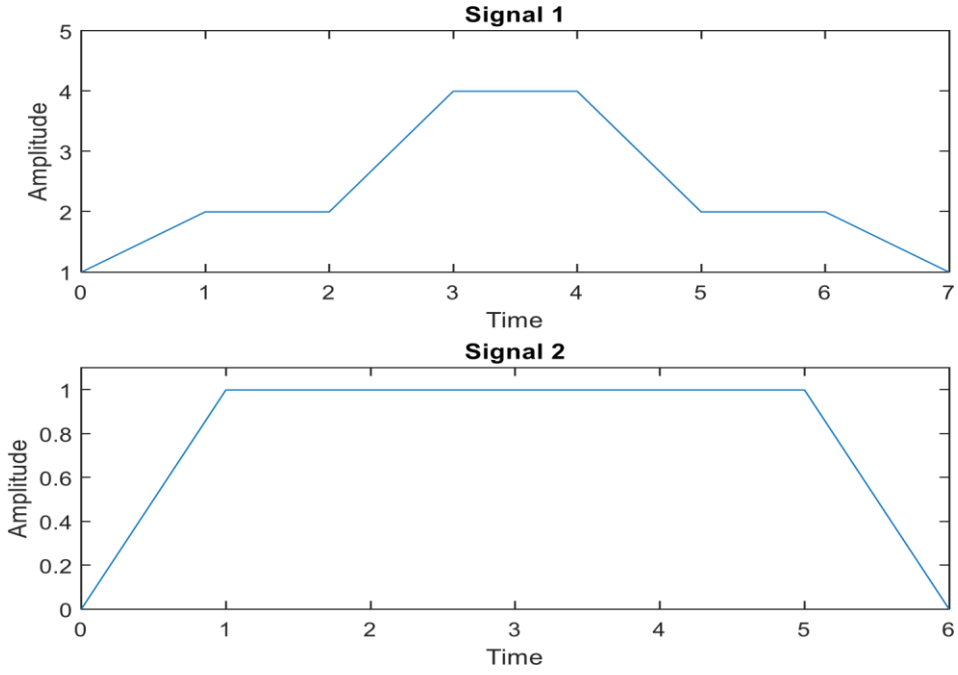
Output 2: Discrete signal –



Output 3: Two different signals, their addition and subtraction-



Output 4: Presentation of two signals-



Discussion: First, in this experiment, we used conditions rather than the built-in functions to work with the unit step, unit impulse, and unit ramp signals. Before time zero, all values for a unit step are zero, and after time zero, all values are one. Only one value at zero for impulse; all other values are zero. Stem function was used to create the discrete plot.

Two separate signals were used, and we added and subtracted them using steps. We utilized ones and zeros to build functions in the last piece of code that plots the two provided signals. The first plot in code 4 was close to the one provided but not exact. The second performed similarly to the one that was specified.

Conclusion: We plotted many continuous and discrete functions during the experiment. The algorithms produced accurate output graphs that matched the provided functions and theoretical reasoning.