Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

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Course Title: Digital Signal Processing Sessional

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Submitted to

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Experiment No: 01

Experiment Name:

1. Plotting A Discrete Signal in MATLAB
2. Plotting Two Given Continuous Signal in MATLAB
3. Plotting Two Discrete Signal, Their Addition and Subtraction in MATLAB
4. Plotting Unit Step, Unit Impulse and Unit Ramp Signal Using Conditions in MATLAB

Experiment Date: 20.03.2023

Theory :

Discrete Signal:

A discrete signal is one that can only take on a limited set of values at specific points in time. It is shown as a series of values, where each value represents a different time index.

Continuous Signal:

A continuous signal is one that changes values at every instant of time within a predetermined range. It can have any value within a given range and is shown as a function of time.

Unit Step:

A continuous signal that starts out at zero and then abruptly changes to a value of one is known as a unit step. The unit step function is denoted by u(t) and is defined as:

$u(t) = 0$ for $t < 0$

$u(t) = 1$ for $t \geq 0$

Unit Impulse:

A discrete signal that is zero everywhere save one particular point, where it has a value of one, is referred to as a unit impulse. The unit impulse function is denoted by δ[n] and is defined as:

$\delta[n] = 0$ for $n \neq 0$

$\delta[n] = 1$ for $n = 0$

Unit Ramp:

A unit ramp is a continuous signal that starts at zero and has a slope of one. The unit ramp function is denoted by r(t) and is defined as:

$r(t) = 0$ for $t < 0$

$r(t) = t$ for $t \geq 0$

Software: MATLAB

Code:

1. A Discrete Signal

```
clc;
clear all;
close all;

x=[5, 3, 7, 3, 2, 3, 5];
y=[1 2 3 4 5 6 7];

stem(y,x);
xlim([0, 8]);
ylim([0, 8]);
```

2. Two Given Continuous Signal

```
clc;
clear all;
close all;

t=0:1:7;
u1 = [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,u1);
xlabel('Time');
ylabel('Amplitude');
title('First Signal');
xlim=([0, 8]);
ylim([1, 5]);

t=0:1:6;
u2 = [zeros(1,1) ones(1,5) zeros(1,1)];

subplot(2,1,2);
plot(t,u2);
xlabel('Time');
ylabel('Amplitude');
title('Second Signal');
xlim=([0, 7]);
ylim([0, 2]);
```

3. Two Discrete Signal, Their Addition and Subtraction

```
clc;
clear all;
close all;

t=-10:1:20;
signal_1= t>=0 & t<=10;
signal_2= t>=5 & t<=15;

subplot(4,1,1);
stem(t,signal_1);
title('Signal 1');

subplot(4,1,2);
stem(t,signal_2);
title('Signal 2');

addition = signal_1+signal_2;
subplot(4,1,3);
stem(t,addition);
xlabel('Time');
ylabel('Amplitude');
title('Addition');

subtraction = signal_1-signal_2;
subplot(4,1,4);
stem(t,subtraction);
xlabel('Time');
ylabel('Amplitude');
title('Subtraction');
```

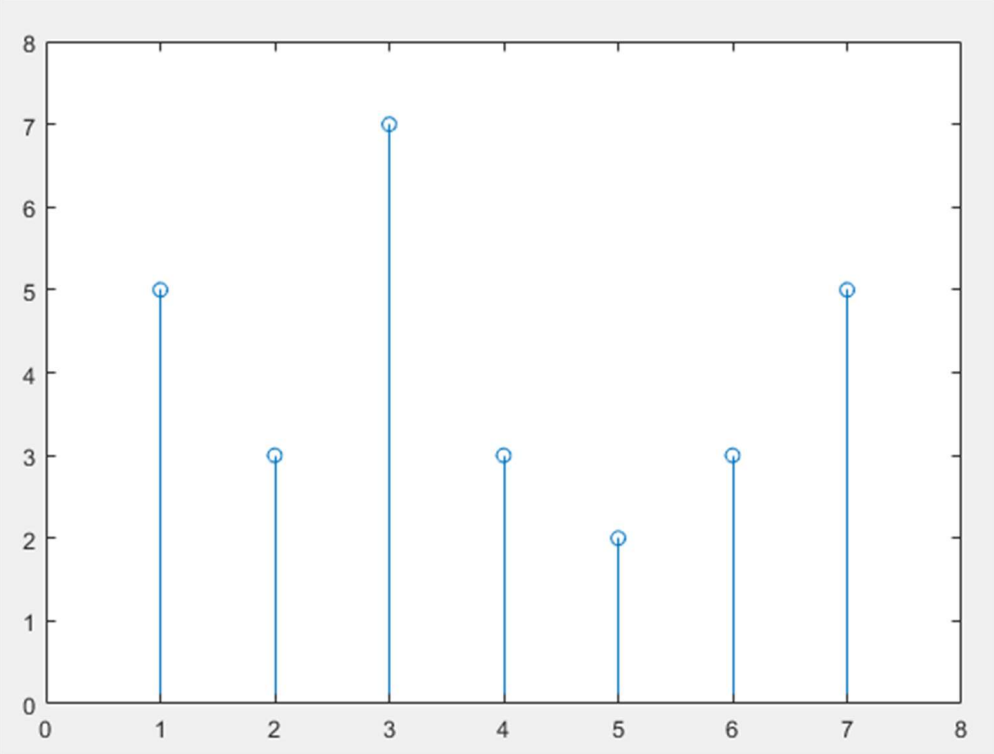
4. Unit Step, Unit Impulse and Unit Ramp Signal Using Conditions

```
clc;
clear all;
close all;

t=-5:0.001:5;
signal_1= t>= 0;
signal_2= t==0;
signal_3= (t>=0).*t;

subplot(3,1,1);
plot(t,signal_1);
xlabel('Time');
ylabel('Amplitude');
title('Unit step');
ylim([-1, 2]);

subplot(3,1,2);
```

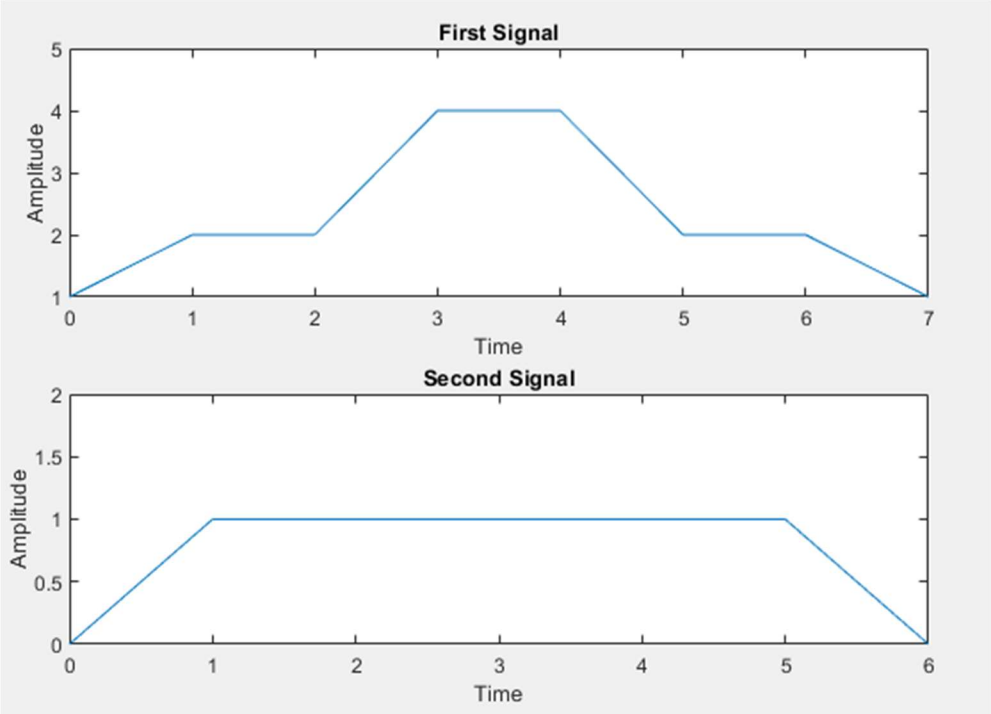
```
plot(t,signal_2);
xlabel('Time');
ylabel('Amplitude');
title('Unit Impluse');
ylim([-1, 2]);

subplot(3,1,3);
plot(t,signal_3);
xlabel('Time');
ylabel('Amplitude');
title('Unit ramp');
ylim([-1, 6]);
```

Output :

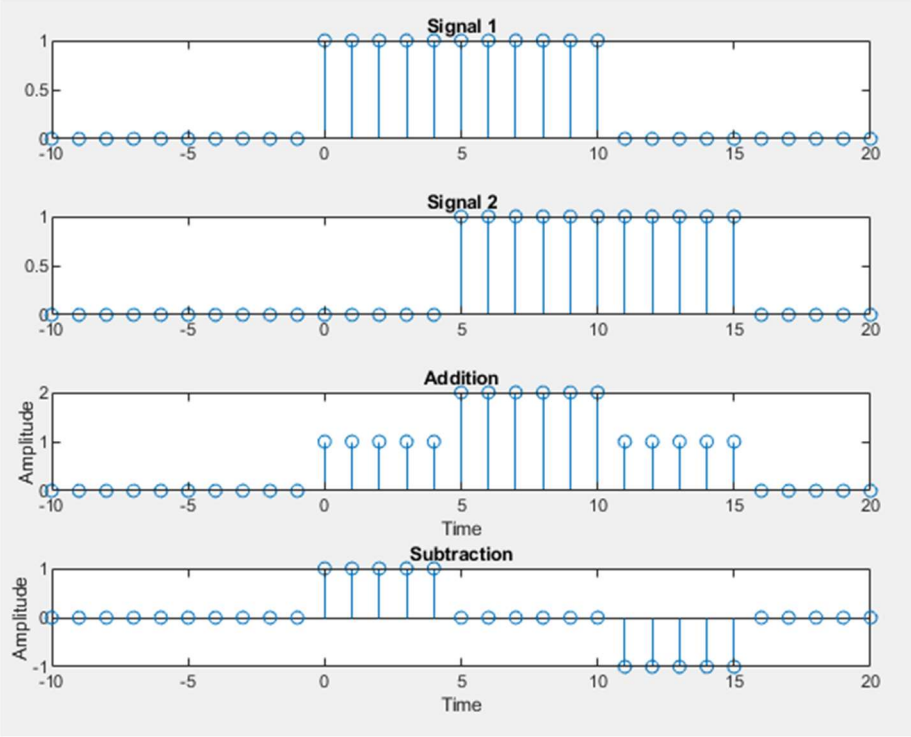
1. A Discrete Signal



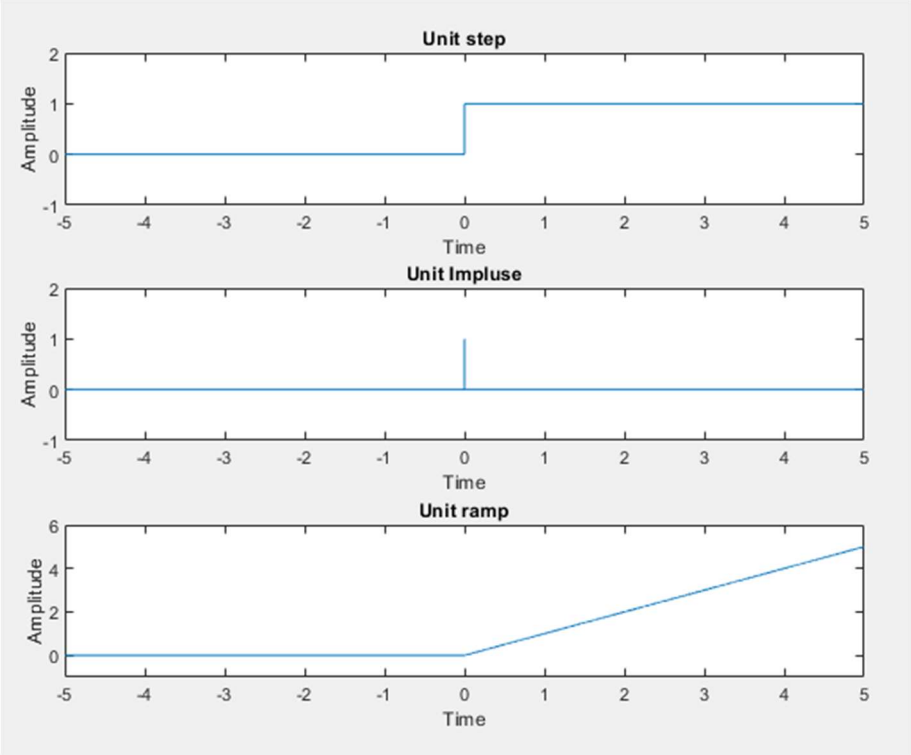
2. Two Given Continuous Signal



3. Two Discrete Signal, Their Addition and Subtraction



4. Unit Step, Unit Impulse and Unit Ramp Signal Using Conditions



Discussion : In this experiment, we used stem to create the discrete plot. Two separate signals were used, and we added and subtracted them using steps. We plotted two continuous signals also. 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.

Conclusion : All the graphs we got were as expected. The codes worked as intended and were executed without any errors. So, we can come to a conclusion that the experiments were done successfully.