Rajshahi University of Engineering and Technology

DEPT. of Electrical and Computer Engineering

Course No.: ECE 4124

Submitted by:

NAME: **RAISA TARANNUM**

ROLL: **1810049**

SERIES: **18**

Submitted To:

Hafsa Binte Kibria

Lecturer

Department of Electrical and Computer Engineering

RUET.

Experiment No: 01

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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 signal, their addition and subtraction.
4. Plot two given continuous signal.

Theory: In the experiment, we worked with continuous and discrete signals. A signal that varies smoothly and continuously over time is referred to as a continuous-time signal. These signals represent a quantity of interest that is influenced by an independent variable, usually considered as time. A discrete-time signal is a sequence of values of interest, where the integer index can be thought of as a time index, and the values in the sequence represent some physical quantity of interest.

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 or ramp signal is a type of standard signal which starts at $t = 0$ and increases linearly with time. The unit ramp function has unit slop. It is denoted by r(t).

Any signal can be plotted using MATLAB. To plot any given signal the conditions should be applied to fulfill the given criteria.

Required software: MATLAB

Code:

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

```
1.  clc;
2.  clear all;
3.  close all;
4.
5.  t=-5:0.001:5;
6.  step1= t>= 0;
7.  step2= t==0;
8.  step3= (t>=0).*t;
9.
10. subplot(3,1,1);
11. plot(t,step1);
12. xlabel('Time');
```

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

Code 2: Discrete signal -

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

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

```matlab
1.  clc;
2.  clear all;
3.  close all;
4.
5.  t=-10:1:20;
6.  step1= t>=0 & t<=10;
7.  step2= t>=5 & t<=15;
8.
9.  subplot(4,1,1);
10. stem(t,step1);
11. xlabel('Time');
12. ylabel('Amplitude');
13. title('Signal 1');
14.
15. subplot(4,1,2);
16. stem(t,step2);
17. xlabel('Time');
18. ylabel('Amplitude');
19. title('Signal 2');
```

```matlab
20.
21. step3 = step1+step2
22. subplot(4,1,3);
23. stem(t,step3);
24. xlabel('Time');
25. ylabel('Amplitude');
26. title('Addition');
27.
28. step4 = step1-step2
29. subplot(4,1,4);
30. stem(t,step4);
31. xlabel('Time');
32. ylabel('Amplitude');
33. title('Subtraction');
```
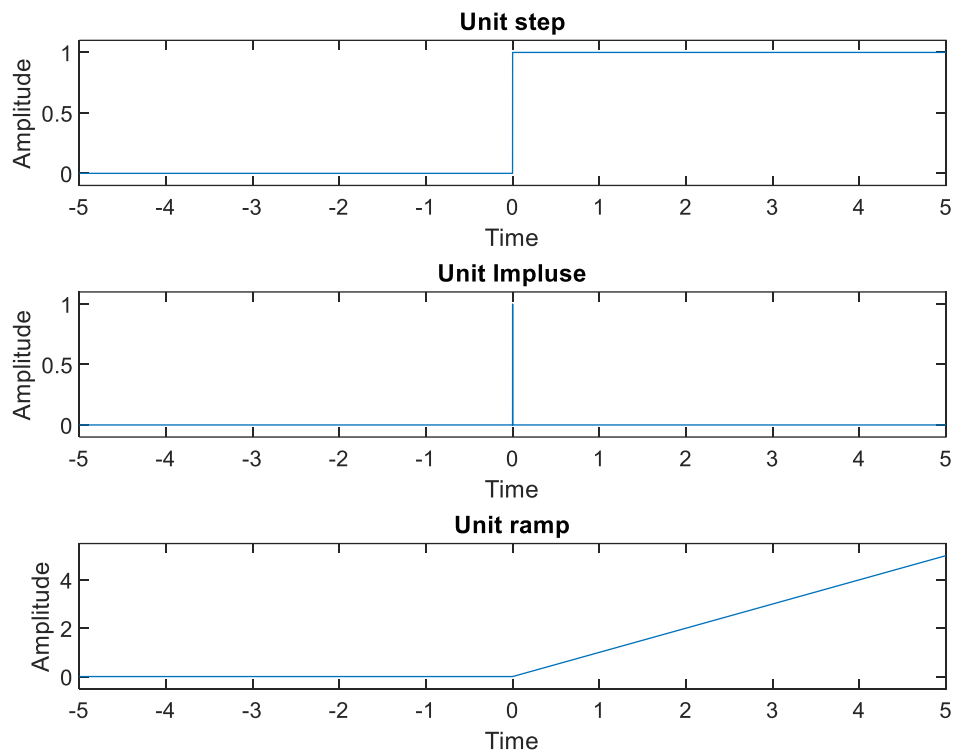
Code 4: Presentation of two signals-

```matlab
1.  clc;
2.  clear all;
3.  close all;
4.
5.  t=0:1:7;
6.  u = [ones(1,1).*1 ones(1,2).*2 ones(1,1).*4 ones(1,1).*4 ones(1,2).*2
    ones(1,1)];
7.  subplot(2,1,1);
8.  plot(t,u);
9.  xlabel('Time');
10. ylabel('Amplitude');
11. title('Signal 1');
12. xlim=([0, 8]);
13. ylim([1, 5]);
14.
15. t=0:1:6;
16. u1 = [zeros(1,1) ones(1,5) zeros(1,1)];
17. subplot(2,1,2);
18. plot(t,u1);
19. xlabel('Time');
20. ylabel('Amplitude');
21. title('Signal 2');
22. xlim=([-0, 7]);
23. ylim([0, 1.1]);
```
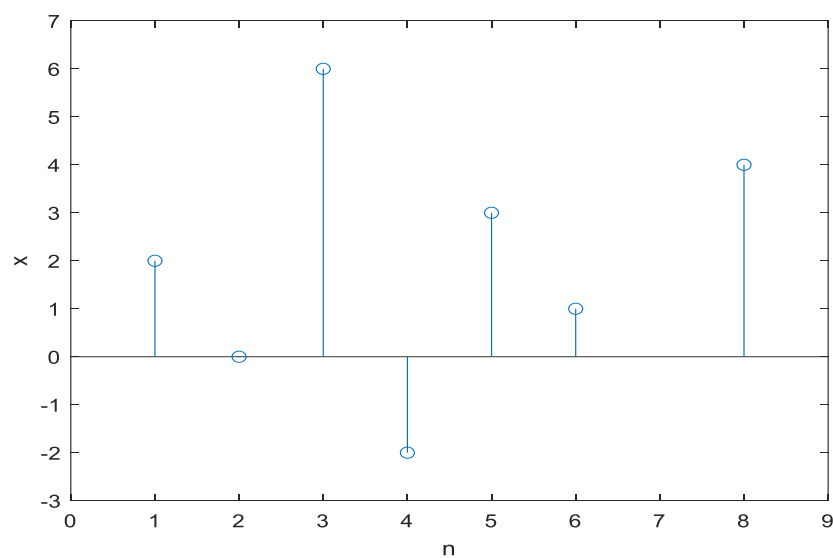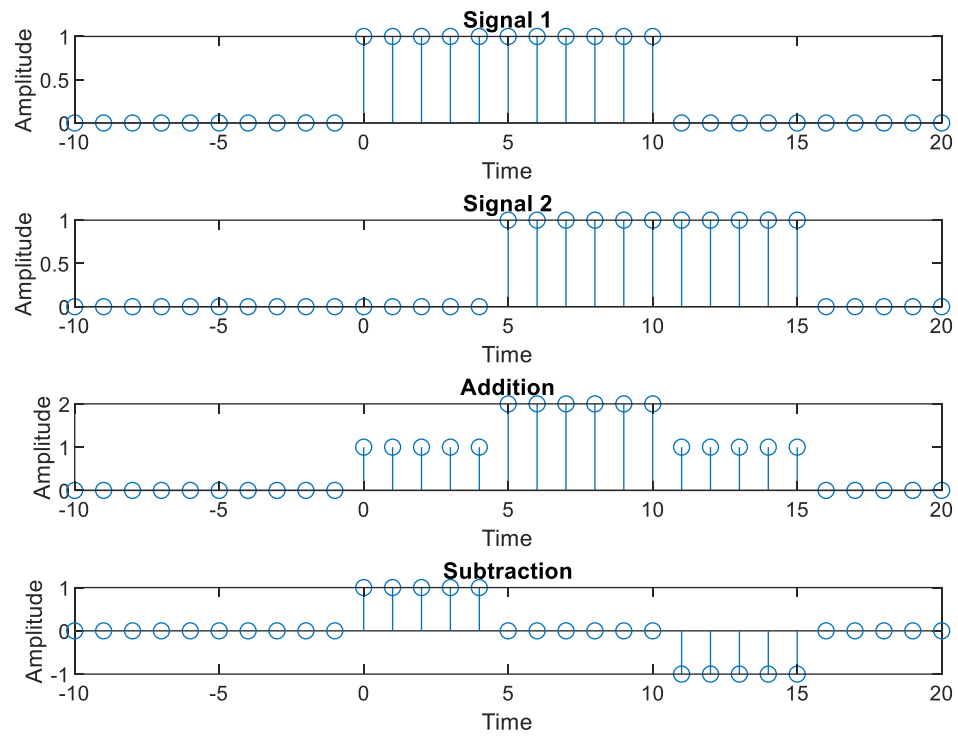
Output Graph:

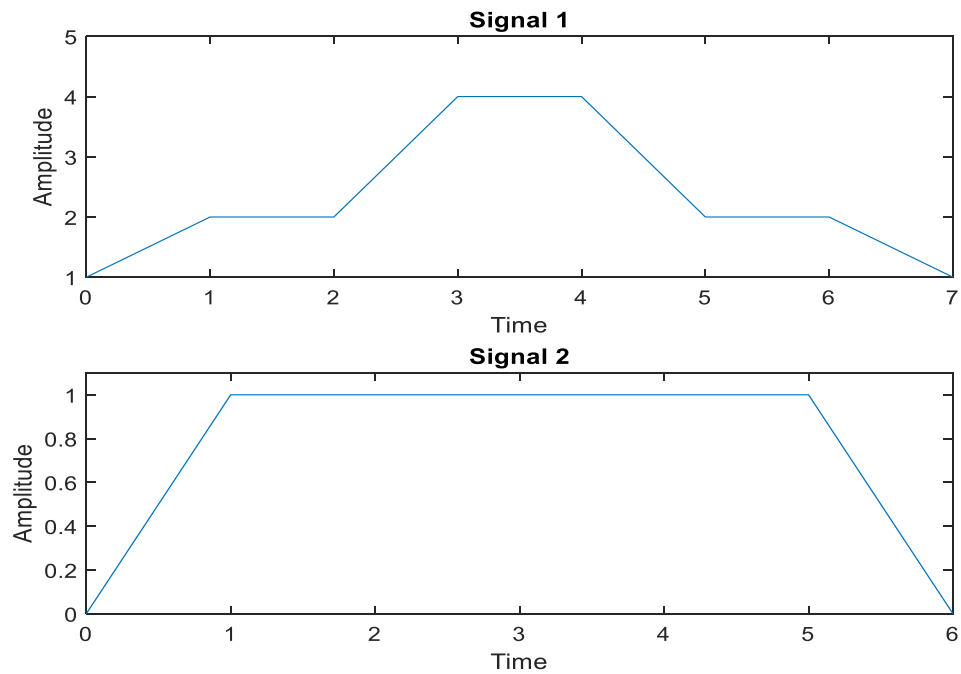**Output 1:** Unit step, unit impulse and unit ramp-

Output 2: Discrete signal –

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

Output 4: Presentation of two signals-

Discussion: Here in this experiment, firstly we worked with the unit step, unit impulse and unit ramp signals using conditions not the built in functions. For unit step before time zero all values are zero and after time zero all are one. For impulse only one value at zero, otherwise zero values. Discrete plot was done by using stem function.

We worked with two different signals, add then and subtract them using steps. For the last code to plot the two given signals we have used ones and zeros to create functions. In code 4, the first plot was not exact but close to the given one. The second one was similar to the given function.

Conclusion: In the experiment, we have plotted different continuous and discrete functions. The codes gave correct output graphs which were same as the theoretical explanation and given functions.