

DSP LAB 1

Aim: To Simulate the Generation of Continuous Time and Discrete Time Signals.

Software: MATLAB

Group Number 1:

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Code:

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clc;
clear all;
x = [-40:.01:40];
no = input('Enter the wave you want\n1 : Sine Wave \n2 : Cos Wave\n3 : Unit Impulse Function\n4 : Unit Step Function\n5 : Ramp function\n6 : Exponential function\n');

switch no
    case 1
        z = input('Input the type of signal\n1 : Continuous\n2 : Discrete\n');
        amp = input('Enter the amplitude of the signal: ');
        fc = input('Enter the frequency of the signal: ');
        y = amp*sin(2*pi*x*1/fc);
        subplot(2,1,1);
        if z ==1
            plot(x,y);grid on;
            xlabel('Time t');
            ylabel('x(t)');
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        grid on;
        title('Continuous Sine Signal');
elseif z ==2
    stem(x,y);grid on;
    xlabel('Time n');
    ylabel('x[n]');
    grid on;
    title('Discrete Sine Signal');
else
    display("Wrong input for type of signal");
end

case 2
    z = input('Input the type of signal\n1 : Continuous
\n2 : Discrete\n');
    amp = input("Enter the amplitude of the signal: ");
    fc = input("Enter the frequency of the signal: ");
    y = amp*cos(2*pi*x*1/fc);
    if z ==1
        plot(x,y);grid on;
        xlabel('Time t');
        ylabel('x(t)');
        grid on;
        title('Continuous Cos Signal');
    elseif z ==2
        stem(x,y);grid on;
        xlabel('Time n');
        ylabel('x[n]');
        grid on;
        title('Discrete Cos Signal');
    else
        display("Wrong input for type of signal");
    end

case 3

    N=15;
    x=-N:1:N;
    y=[zeros(1,N),ones(1,1),zeros(1,N)];
    z = input('Input the type of signal\n1 : Continuous
\n2 : Discrete\n');
    if z ==1
        plot(x,y);grid on;
        xlabel('Time t');
        ylabel('x(t)');
        grid on;
        title('Continuous Unit Impulse Signal ');
    elseif z ==2
        stem(x,y);grid on ;
        xlabel('Time n');
        ylabel('x[n]');

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        grid on;
        title('Discrete Unit Impulse Signal');
    else
        display("Wrong input for type of signal");
    end
case 4
    N=20;
    x=0:1:N-1;
    y=ones(1,N);
    z = input('Input the type of signal\n1 : Continuous
\n2 : Discrete\n');
    if z ==1
        plot(x,y); grid on;
        plot(x,y);grid on;
        xlabel('Time t');
        ylabel('x(t)');
        grid on;
        title('Continuous Unit Impulse Signal');
    elseif z ==2
        stem(x,y);grid on;
        xlabel('Time n');
        ylabel('x[n]');
        grid on;
        title('Discrete Unit Impulse Signal');
    else
        display("Wrong input for type of signal");
    end

case 5
    N=20;
    x=-N:1:N-1;
    amp = input("Enter the amplitude of the signal: ");
    y=amp*x.*[x>=0];
    z = input('Input the type of signal\n1 : Continuous
\n2 : Discrete\n');
    if z ==1
        plot(x,y); grid on;
        plot(x,y);grid on;
        xlabel('Time t');
        ylabel('x(t)');
        grid on;
        title('Continuous Unit Ramp Signal');
    elseif z ==2
        stem(x,y);grid on;
        xlabel('Time n');
        ylabel('x[n]');
        grid on;
        title('Discrete Unit Ramp Signal');
    else
        display("Wrong input for type of signal");
    end

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        end
    case 6
        N=10;
        x=0:0.5:N;
        amp = input("Enter the amplitude of the signal: ");
        y=exp(amp*x);
        z = input('Input the type of signal\n1 : Continuous
\n2 : Discrete\n');
        if z ==1
            plot(x,y); grid on;
            plot(x,y); grid on;
            plot(x,y);grid on;
            xlabel('Time t');
            ylabel('x(t)');
            grid on;
            title('Continuous Exponential Signal');
        elseif z ==2
            stem(x,y);grid on;
            xlabel('Time n');
            ylabel('x[n]');
            grid on;
            title('Discrete Exponential Signal');
        else
            display("Wrong input for type of signal");
        end

    otherwise
        disp('Wrong input');
end

%%
clc;
clear all;
t = -5:0.01:5;
t1 = -5:0.1:5;

Graph1_continuous = unit_step(t)+unit_step(t-1)-unit_step(t-
2)-unit_step(t-3);
Graph1_discrete = unit_step(t1)+unit_step(t1-1)-unit_step(t1-
2)-unit_step(t1-3);

z = input('Input the type of signal\n1 : Continuous \n2 :
Discrete\n');
if z==1
    plot(t, Graph1_continuous)
    xlabel('Time t');
    ylabel('x(t)');
    grid on;
    title('Continuous Time Customized Signal 1');
else if z ==2
    stem(t1, Graph1_discrete)

```

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        xlabel('Time n');
        ylabel('x[n]');
        grid on;
        title('Discrete Time Customized Signal 1');
    end
end

%%
clc;
clear all;
t = -5:0.01:5;
t1 = -5:0.1:5;

Graph2_continuous = -unit_step(t+3) +
2*unit_step(t+2)+ramp(t+1)-...
    2*ramp(t)+ramp(t-1)-2*unit_step(t-2)+unit_step(t-3);
Graph2_discrete = -unit_step(t1+3) +
2*unit_step(t1+2)+ramp(t1+1)-...
    2*ramp(t1)+ramp(t1-1)-2*unit_step(t1-2)+unit_step(t1-3);
z = input('Input the type of signal\n1 : Continuous \n2 :
Discrete\n');
if z==1
    plot(t, Graph2_continuous)
    xlabel('Time t');
    ylabel('x(t)');
    grid on;
    title('Continuous Time Customized Signal 2');
    ylim([-3,3])
else if z ==2
    stem(t1, Graph2_discrete)
    xlabel('Time n');
    ylabel('x[n]');
    grid on;
    title('Discrete Time Customized Signal 2');
    ylim([-3,3])
end
end

```

```

function out = unit_step(t)
x1 = 1;
x0 = 0;
out = x1.*(t>=0) + x0.*(t<0);
end

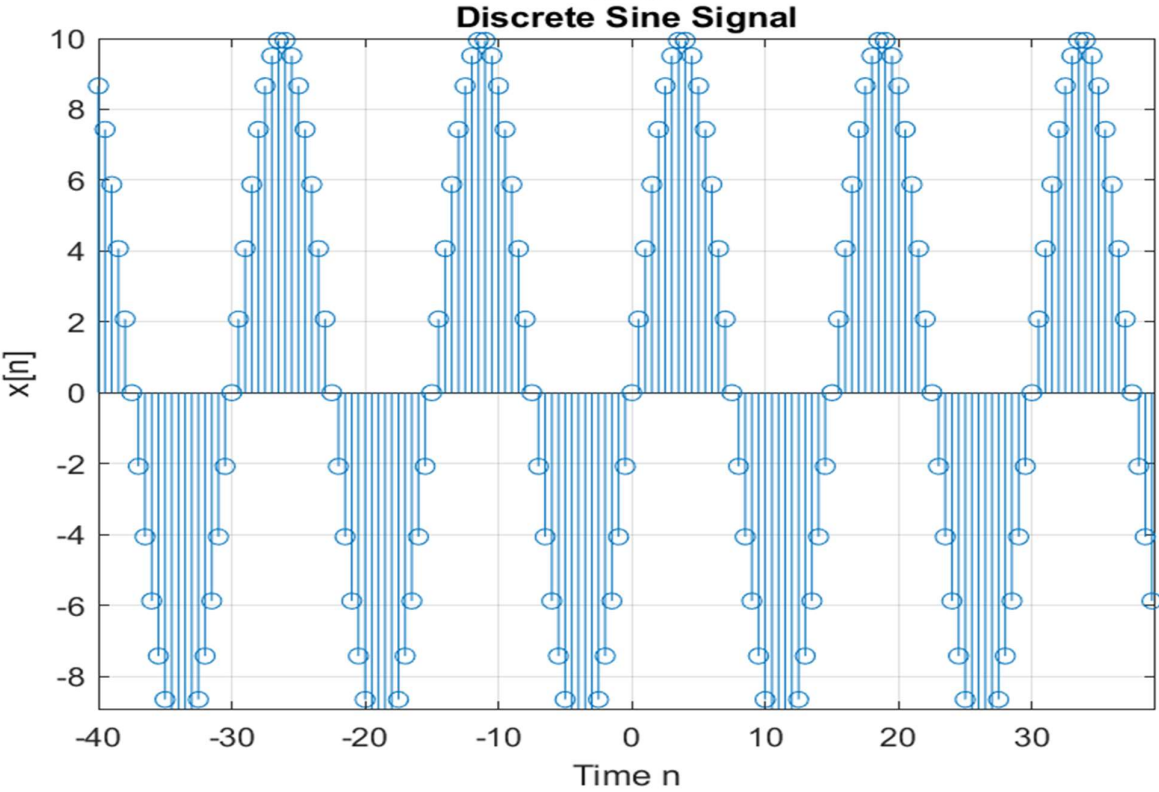
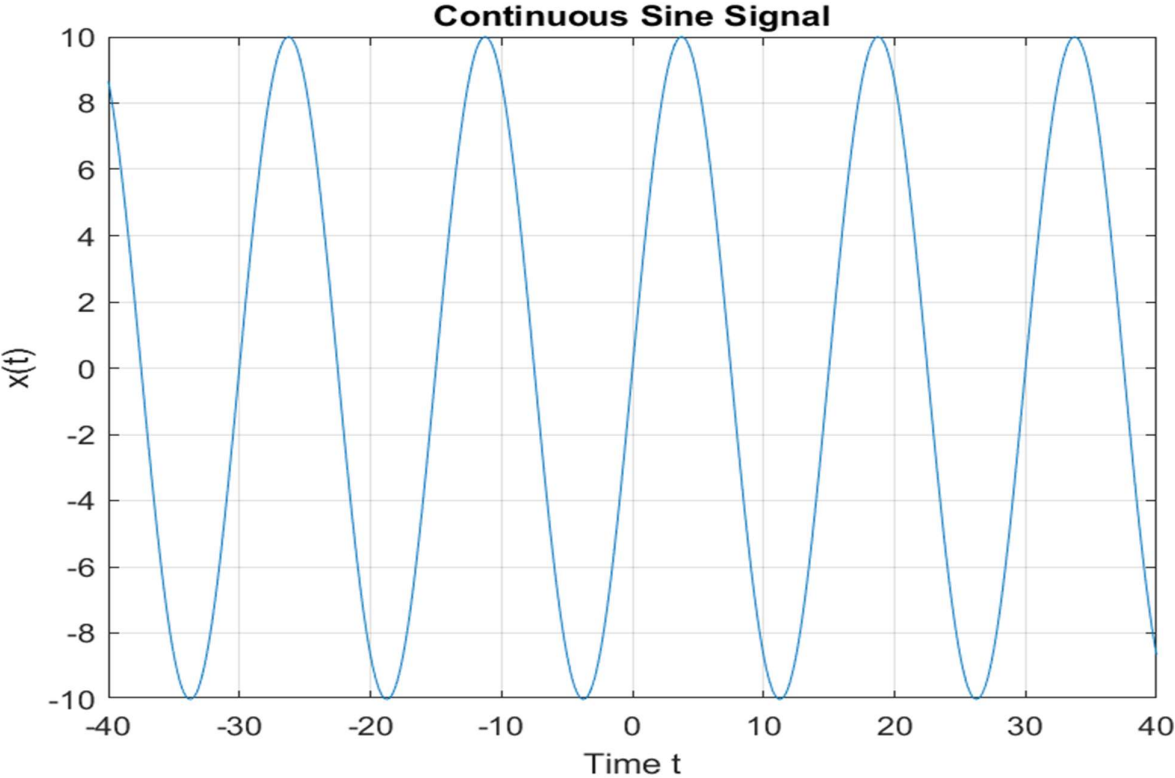
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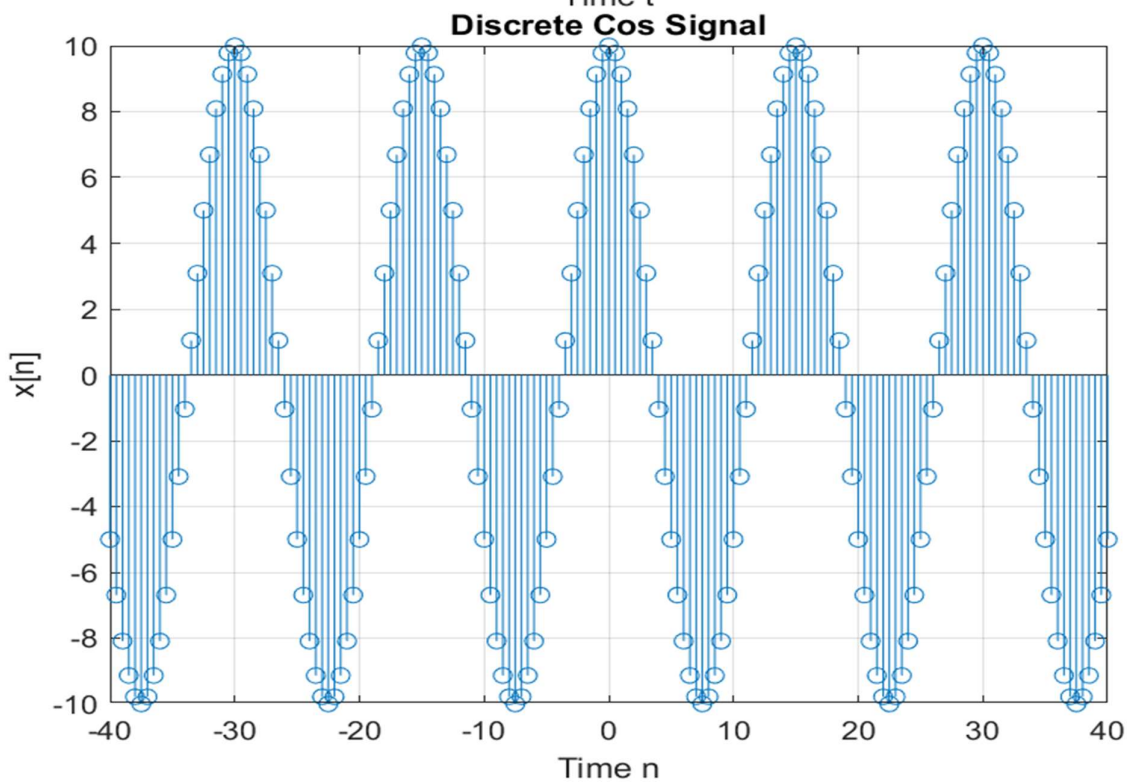
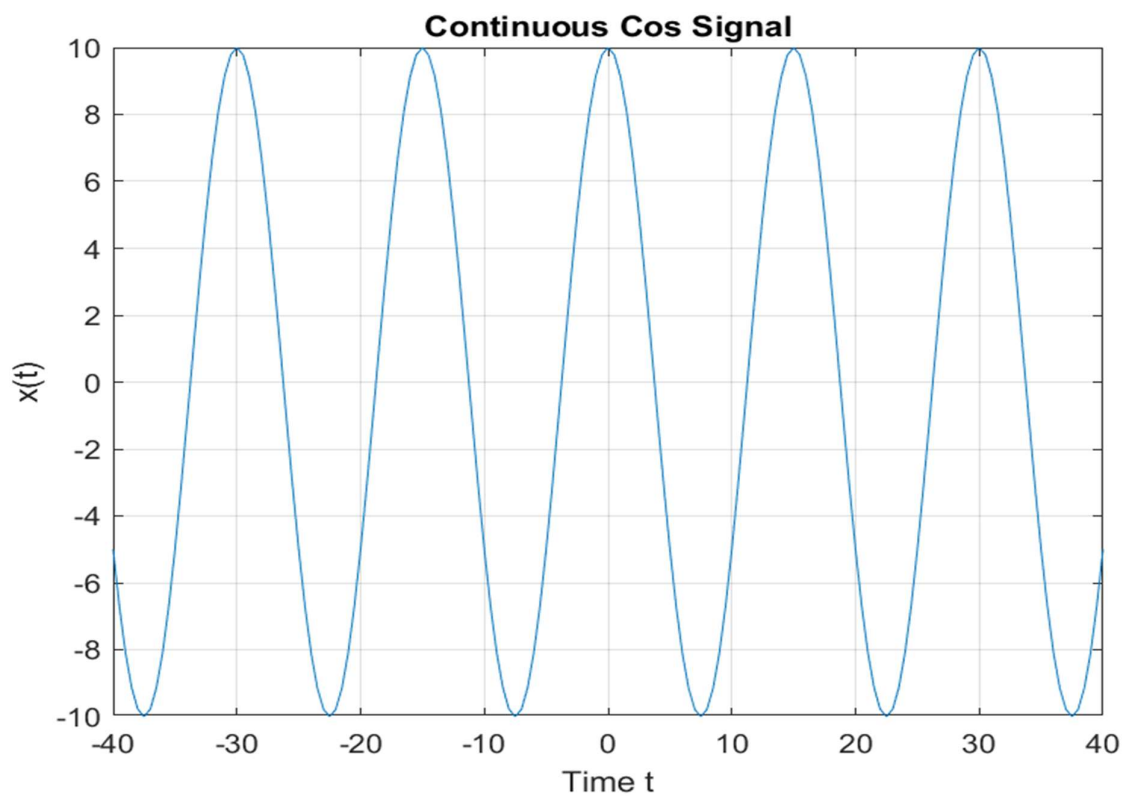
```

function out = ramp(t)
x1=t;
x0=0;
out = x1.*(t>=0) + x0.*(t<0);
end

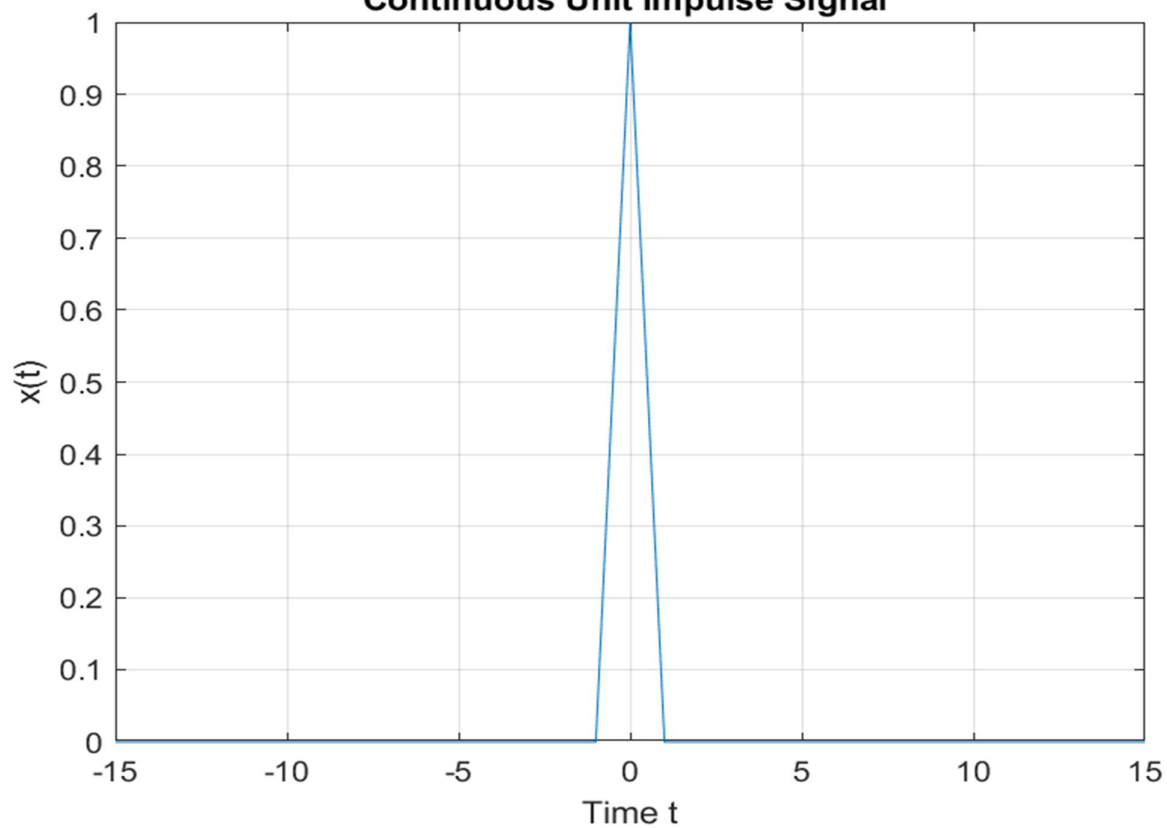
```

Outputs:

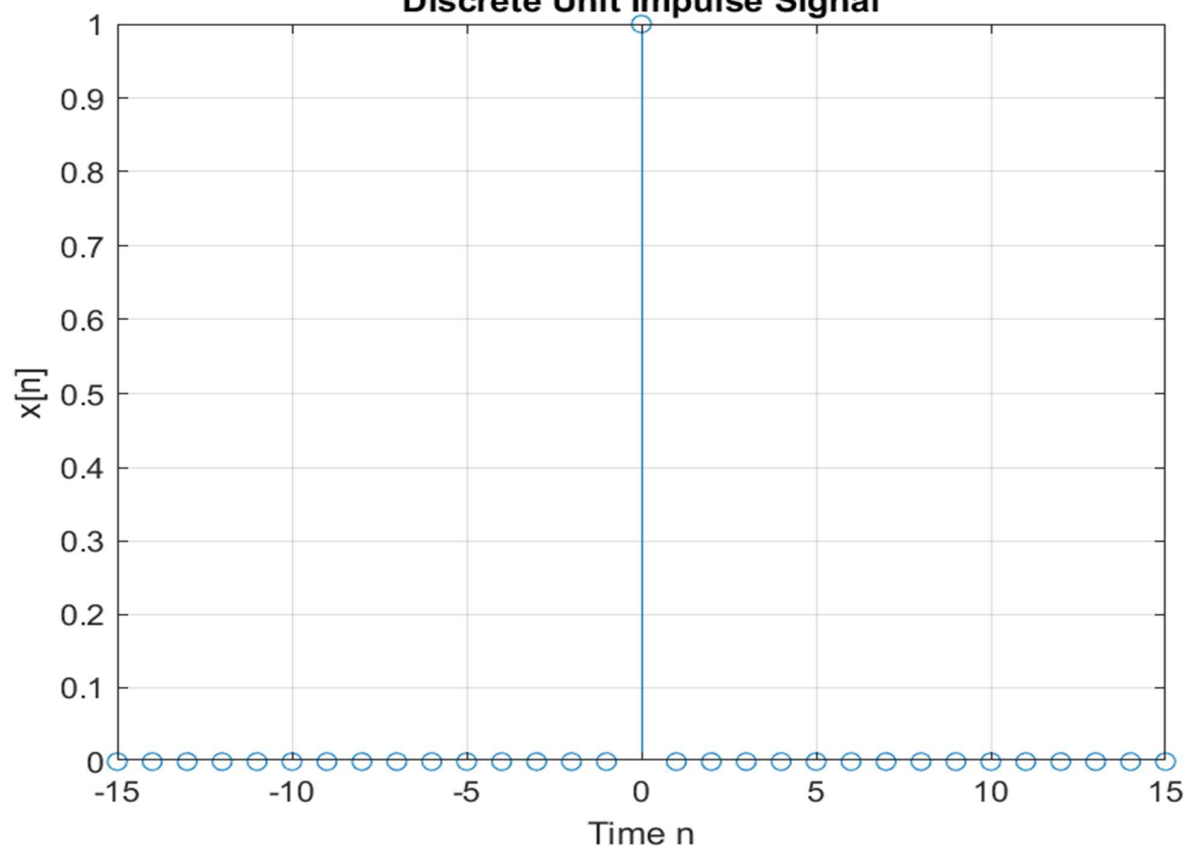


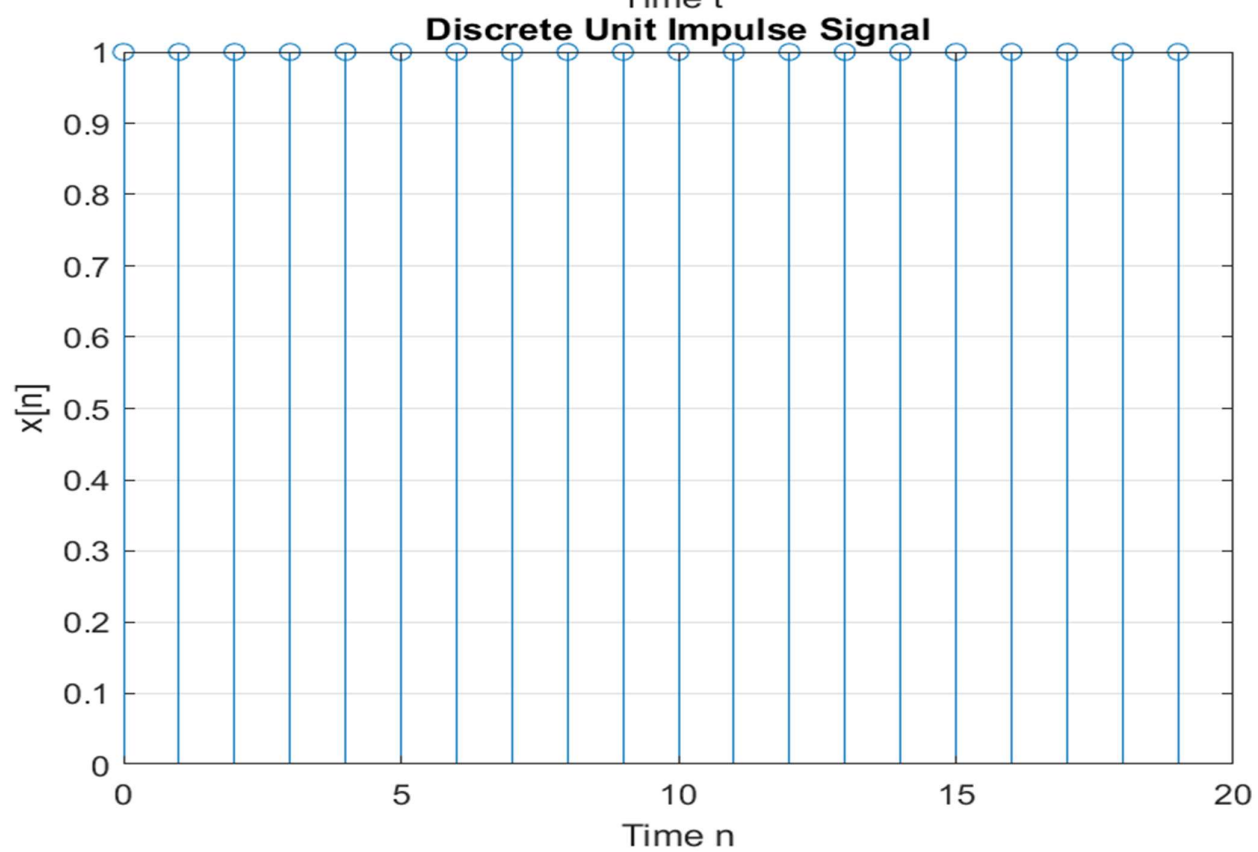
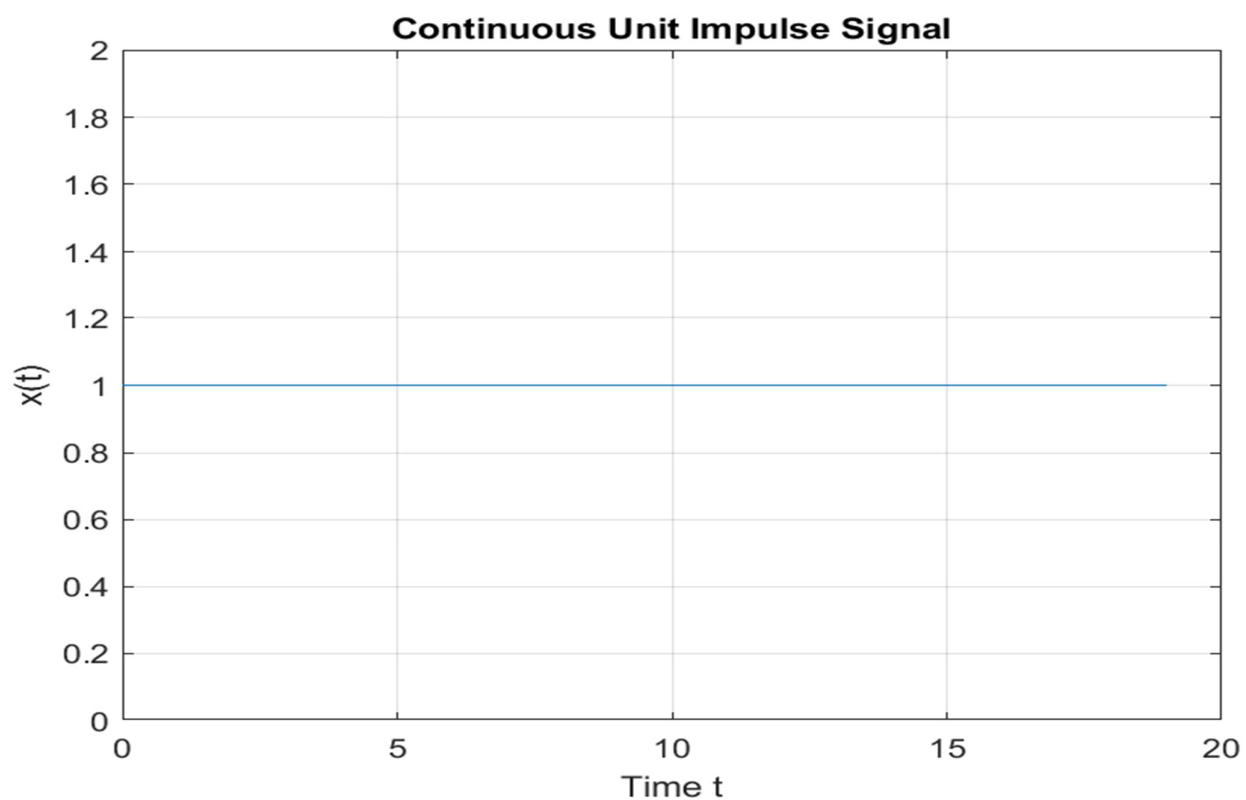


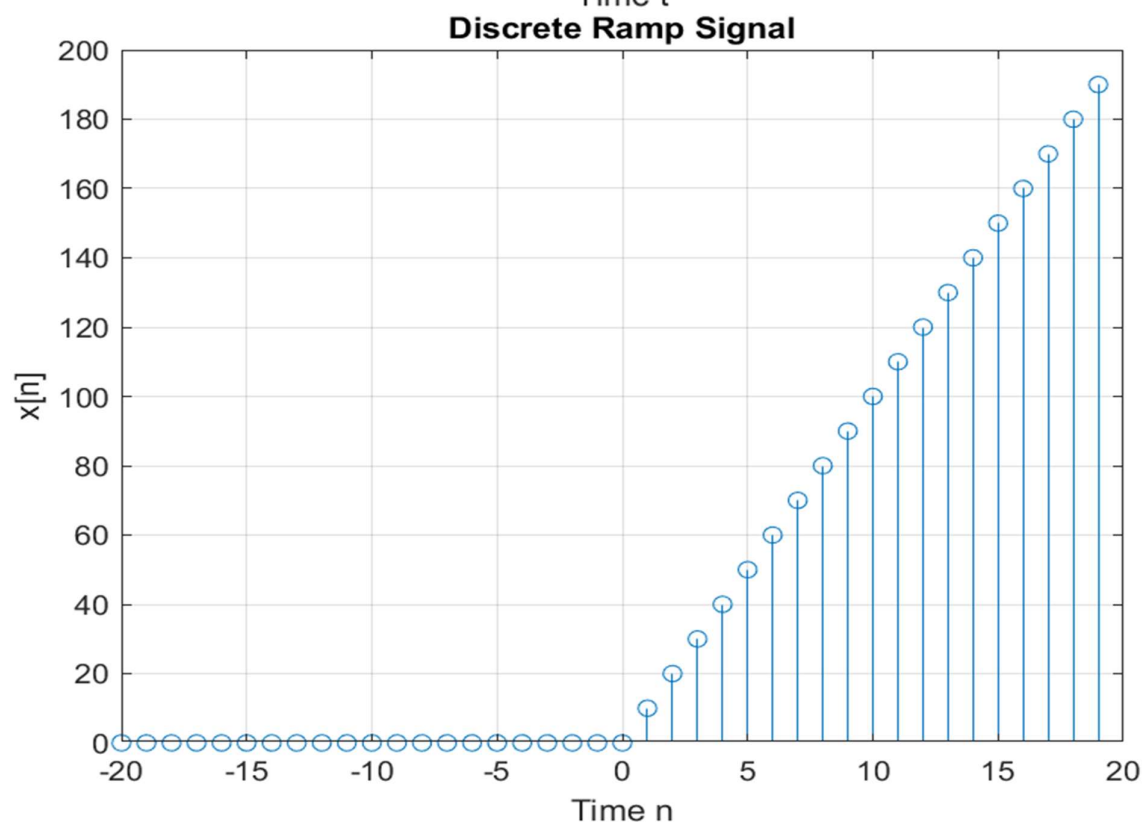
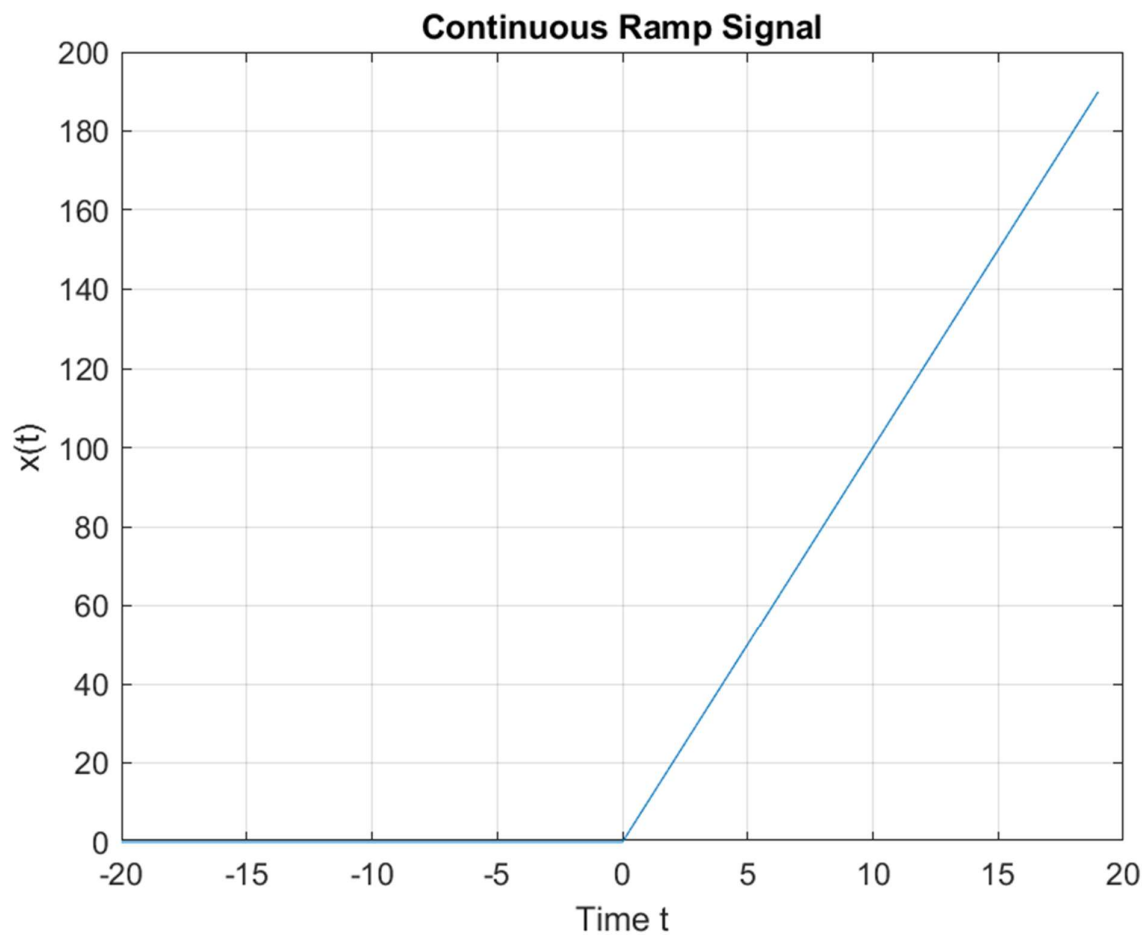
Continuous Unit Impulse Signal

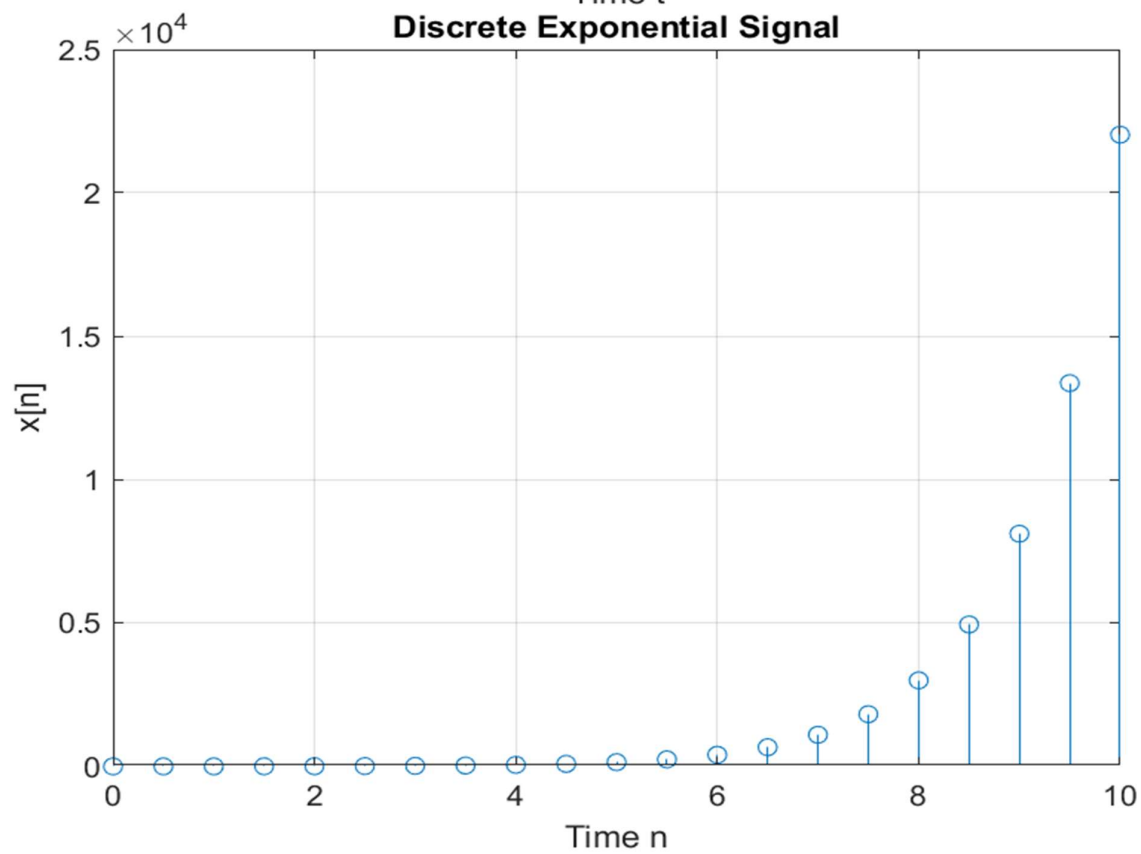
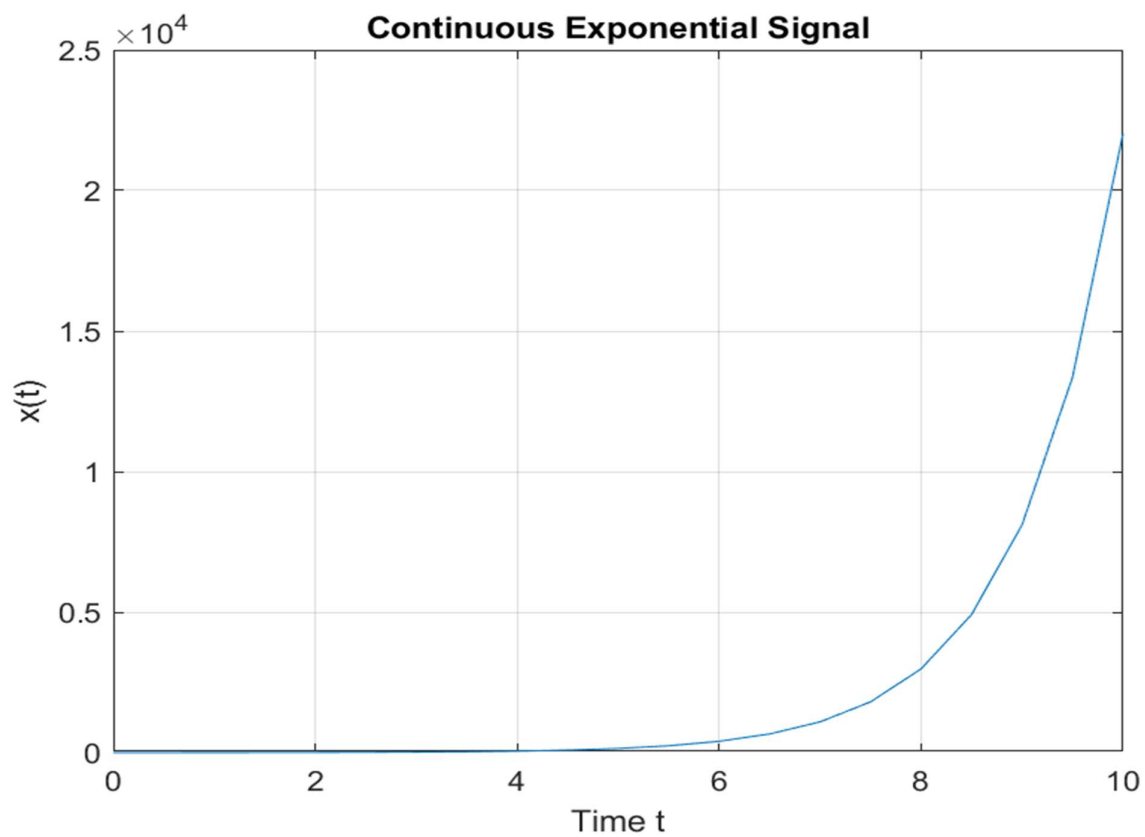


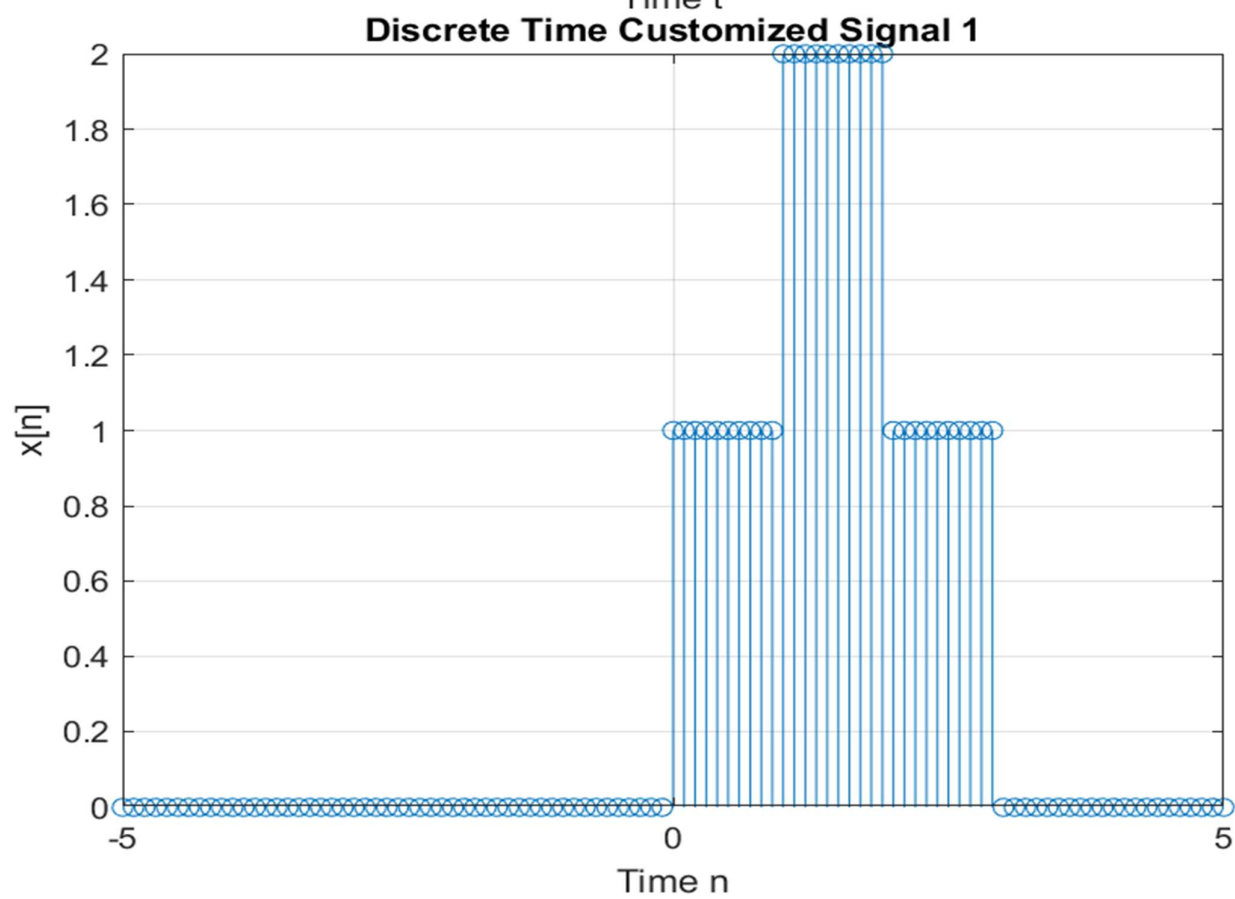
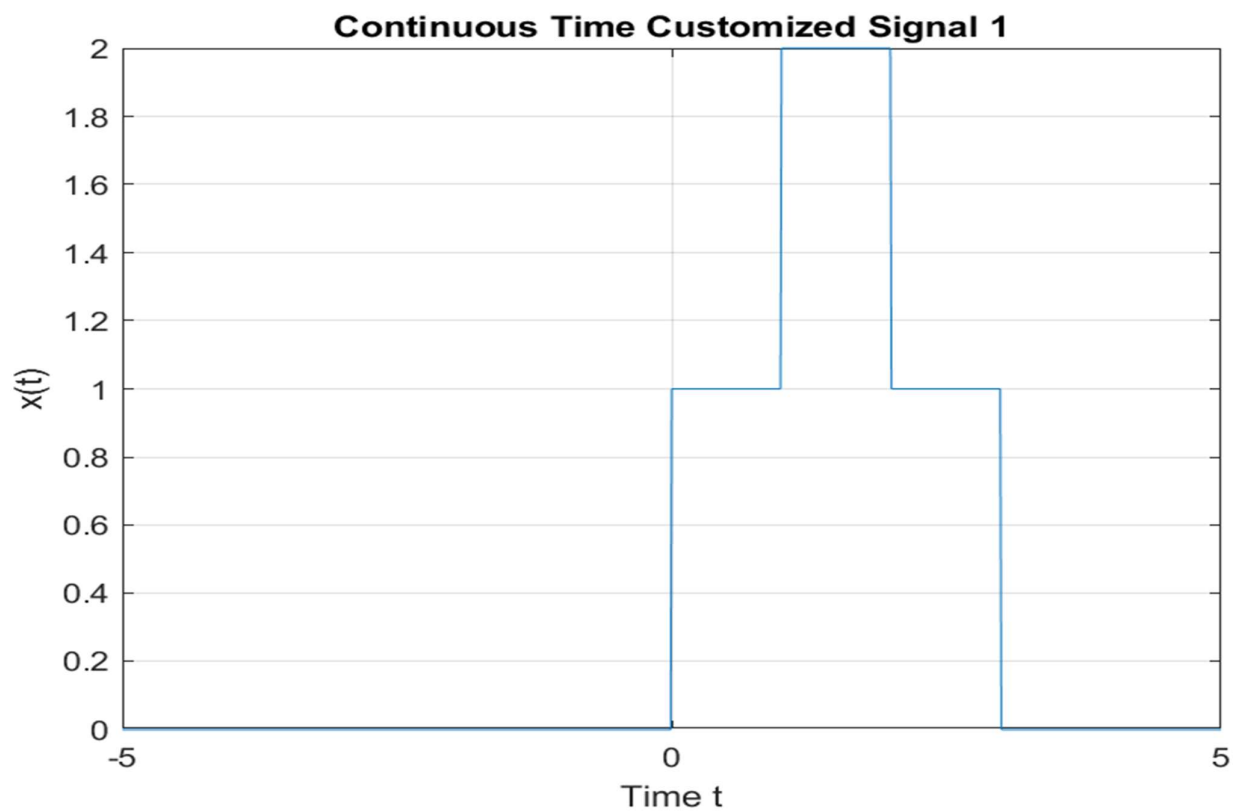
Discrete Unit Impulse Signal

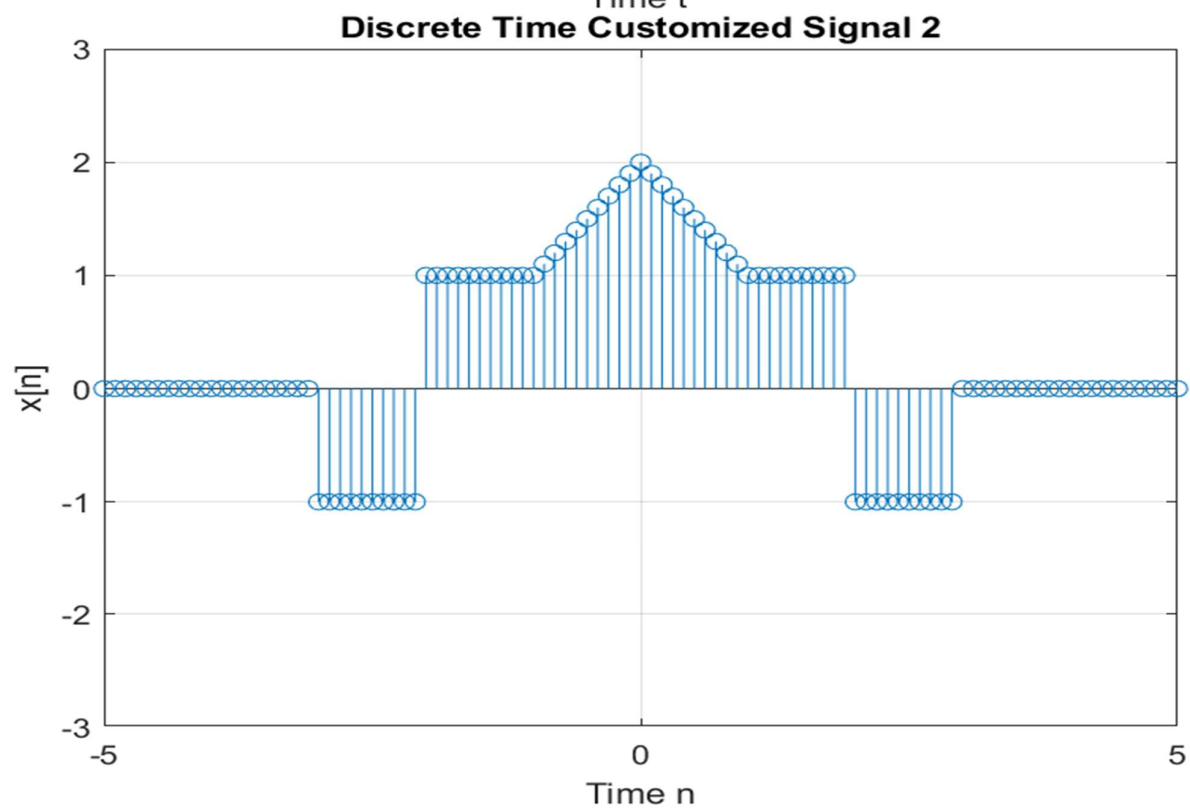
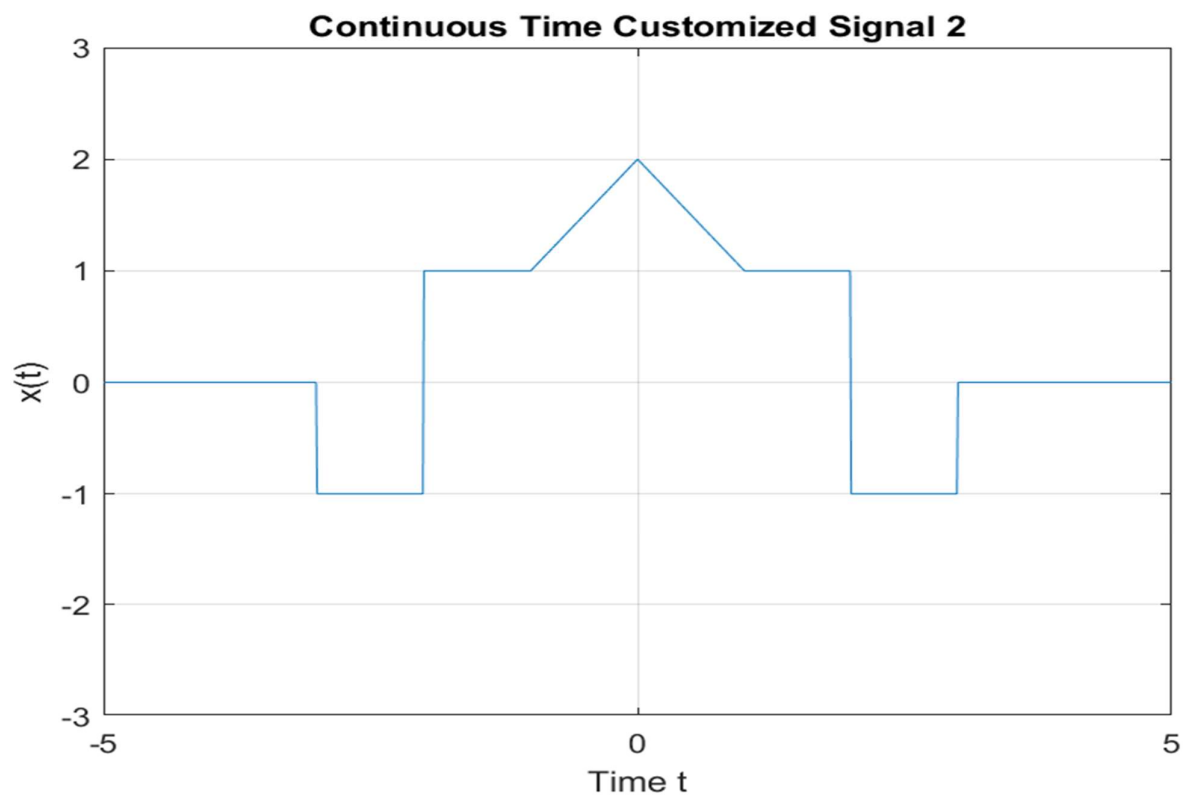












Conclusion: Continuous Time and Discrete Time Signals were simulated in MATLAB successfully. The code written is capable of simulating sine, cosine unit impulse, unit step, ramp and exponential signals both in continuous and discrete time. Also, custom signals can also be simulated.