EXPERIMENT

1 Simulation of Signals

AIM

To generate the following discrete time signals(sequences) in MATLAB.

(a) Unit Impulse sequence

(b) Unit Step sequence

(c) Unit Ramp sequence

(d) Sinusoidal sequence

(e) Exponential sequence

THEORY

Unit Impulse Sequence(Unit sample sequence), $\delta[n]$:
The unit impulse sequence is a sequence of discrete samples having unit magnitude at origin and zero magnitude at all other sample instants.
It is defined as

$$\delta[n] = \begin{cases} 0, & \text{if } n \neq 0 \\ 1, & \text{if } n = 0 \end{cases}$$

It is the discrete time counterpart of the Dirac-Delta function $\delta(t)$.
Note: the value of $\delta[n]$ at $n = 0$ is defined unlike the c.t. delta function $\delta(t)$

Unit Step Sequence, $u[n]$:

It is defined as,

$$u[n] = \begin{cases} 1, & \text{if } n \geq 0 \\ 0, & \text{if } n < 0 \end{cases}$$

Note: the value of $u[n]$ at $n = 0$ is defined unlike the c.t. step function $u(t)$

Unit Ramp Sequence, $r[n]$:

It is defined as,

$$r[n] = nu[n] = \begin{cases} n, & \text{if } n \geq 0 \\ 0, & \text{if } n < 0 \end{cases}$$

Sinusoidal Sequence:

It has the general form,

$$x[n] = Acos(\omega_0 n + \phi)$$

Exponential Sequence:

It has the general form,

$$x[n] = A\alpha^n$$

ALGORITHM

Step1: Start

Step 2: Define the discrete range of time axis values

Step 3: Generate the required sequences using their standard definitions for the above range

Step 4: Plot the waveforms using the stem command

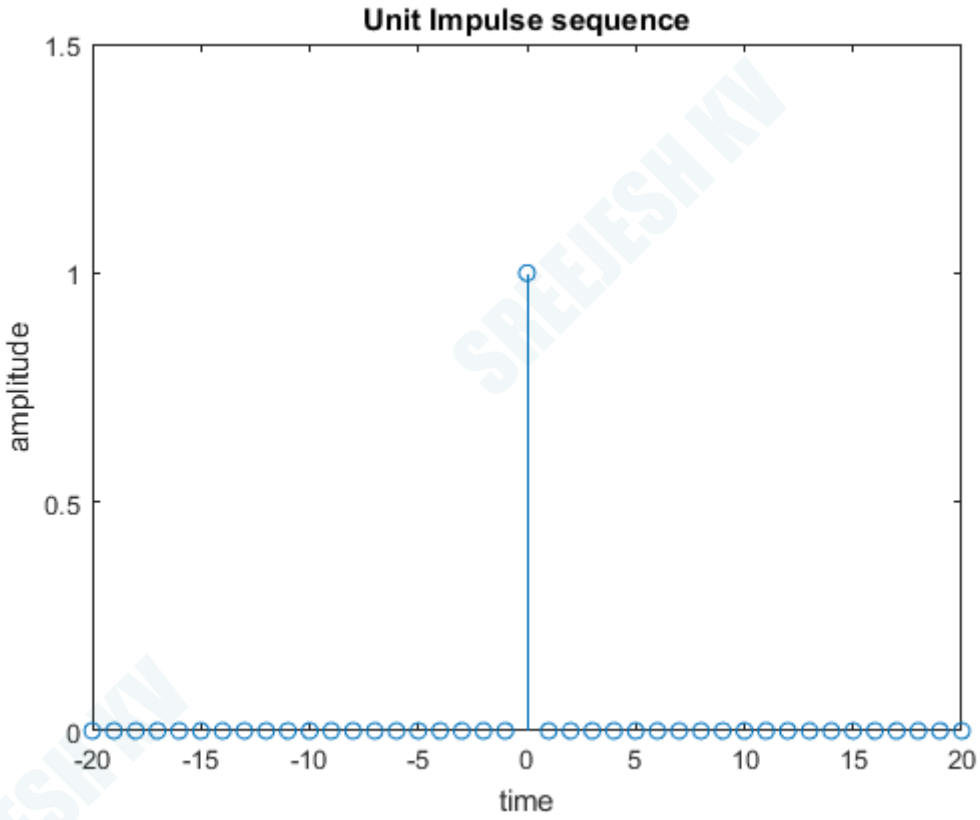
Step 5: Stop

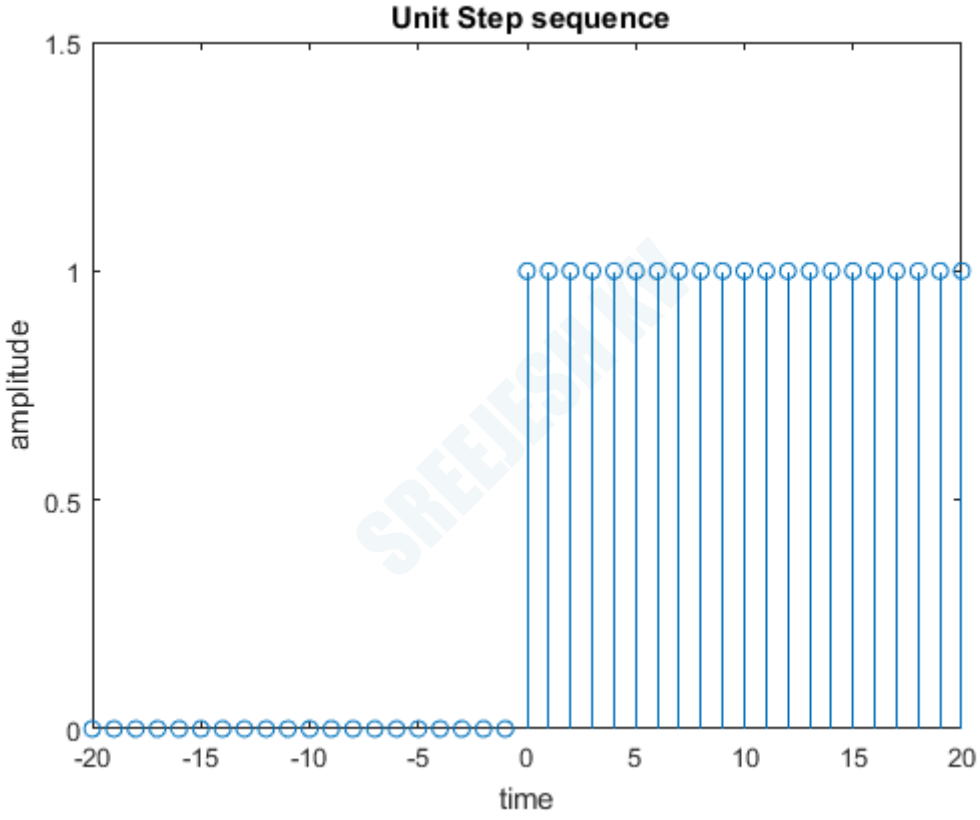
Program

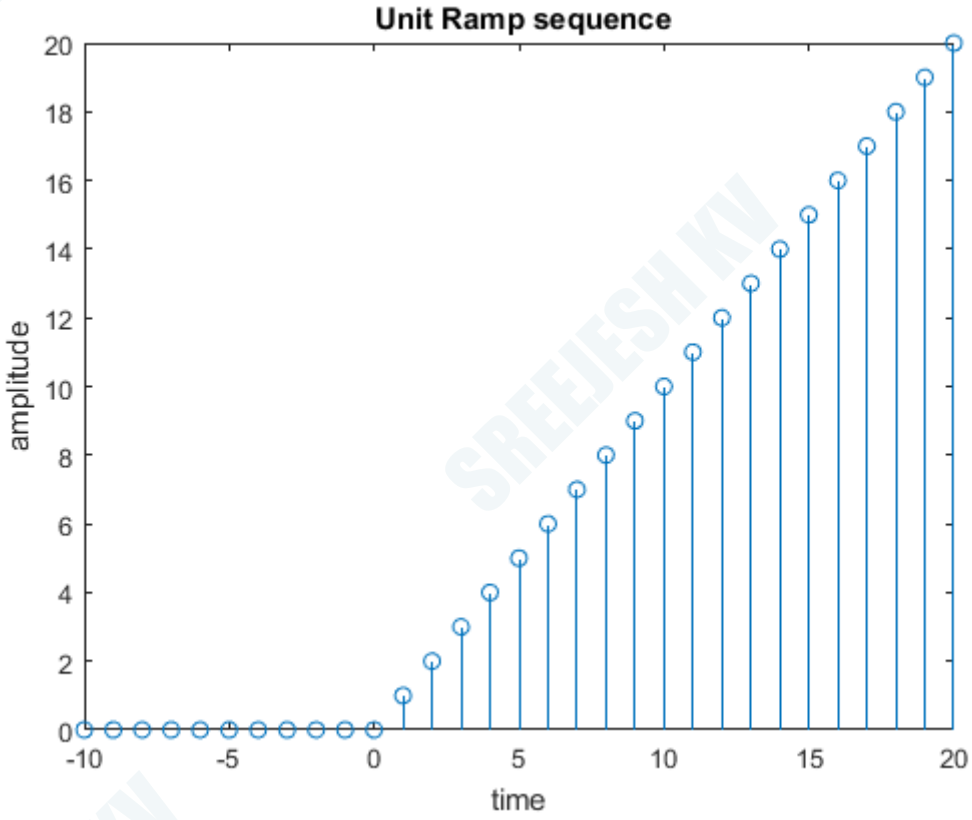
```
%Title: Generation of Discrete time sequences
%Author: Sreejesh K V, Dept. of ECE, GCEK
%Date: 17/09/2022

clc;
clear all;
close all;
n=-20:20;

%---Unit Impulse Sequence ---%
i=(n==0);
figure(1);
stem(n,i);
axis([-20 20 0 1.5]);
title('Unit Impulse sequence');
xlabel('time');
ylabel('amplitude');

```

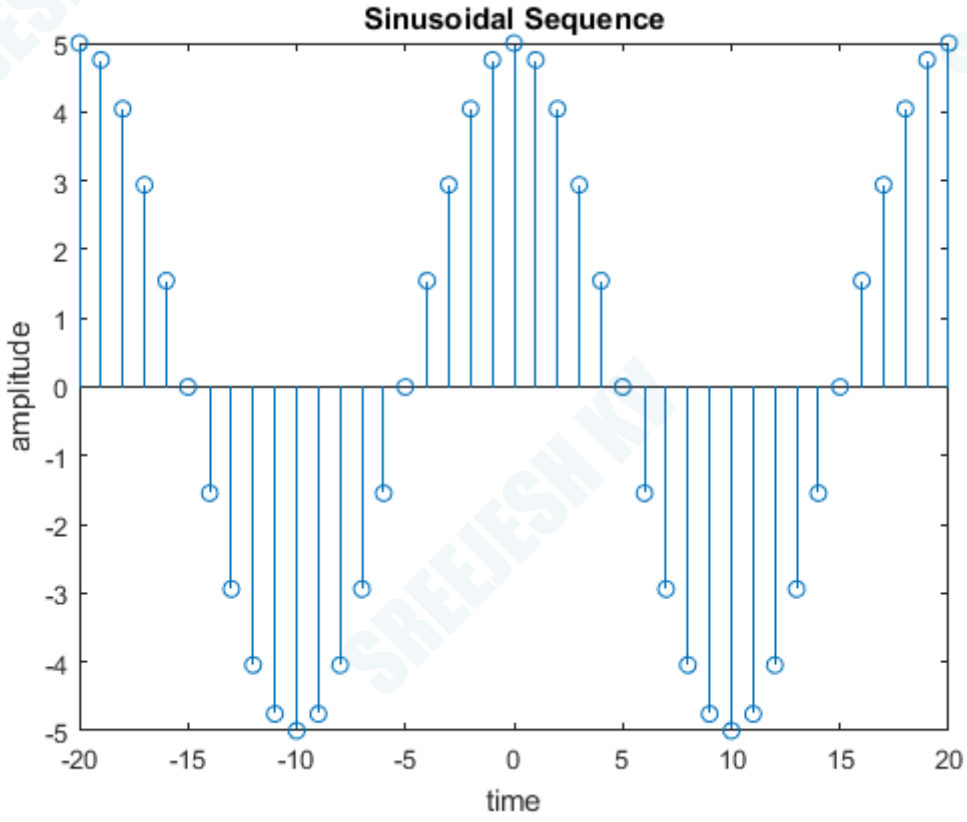
```
%---Unit Step Sequence ---%
s=n>=0;
figure(2);
stem(n,s);
axis([-20 20 0 1.5]);
title(' Unit Step sequence');
xlabel('time');
ylabel('amplitude');

%---Unit Ramp Sequence ---%
r=n.*(n>=0);
figure(3);
stem(n,r);
axis([-10 20 0 20]);
title(' Unit Ramp sequence');
xlabel('time');
ylabel('amplitude');

%---Sinusoidal Sequence ---%
N=20; % fundamental Period
A=5; % Amplitude
f=1/N;
y=A*cos(2*pi*f*n);
figure(4);
stem(n,y);
title(' SINUSOIDAL SIGNAL');
xlabel('time');
ylabel('amplitude');

%---Exponential Sequence ---%
A=5; % Amplitude
alpha=.9;
ye=A* (alpha.^n);
figure(5);
stem(n,ye);
title(' Exponential Sequence');
xlabel('time');
ylabel('amplitude');
```

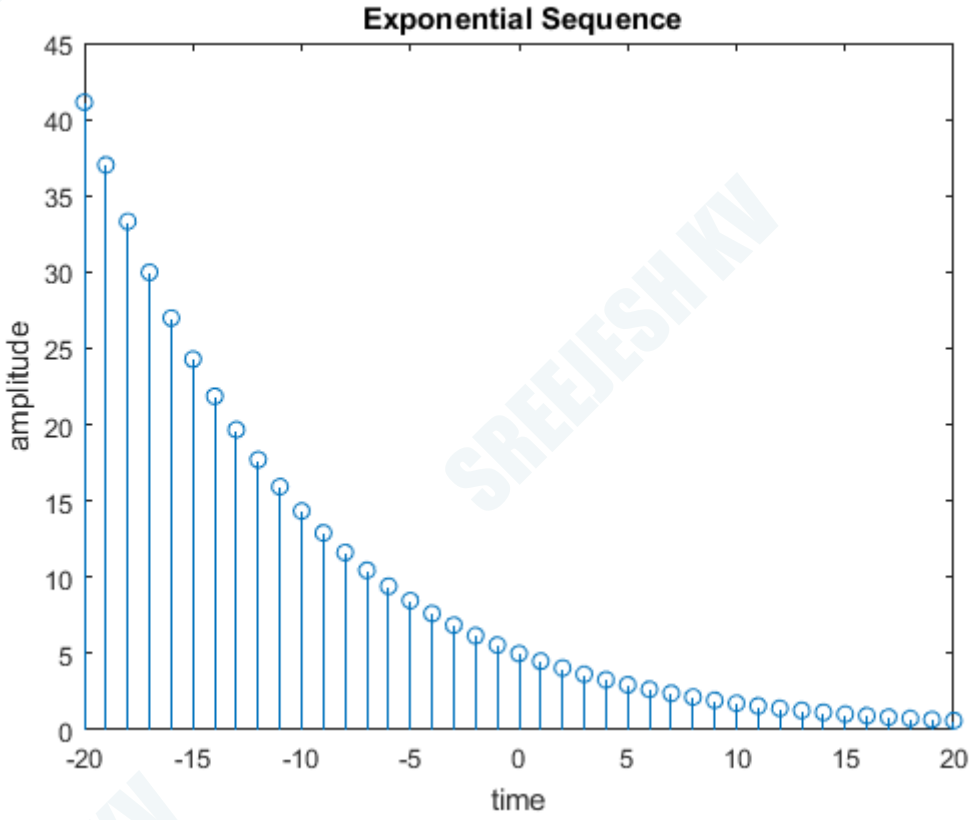
OUTPUT & OBSERVATIONS






Unit Ramp sequence
amplitude
time
20
18
16
14
12
10
8
6
4
2
0
-10
-5
0
5
10
15
20


Sinusoidal Sequence
amplitude
time
5
4
3
2
1
0
-1
-2
-3
-4
-5
-20
-15
-10
-5
0
5
10
15
20



RESULTS

The following discrete time sequences were generated using MATLAB.

(a) Unit Impulse sequence

(b) Unit Step sequence

(c) Unit Ramp sequence

(d) Sinusoidal sequence

(e) Exponential sequence