Republic of Iraq

Ministry of Higher Education

and Scientific Research

Al-Mustaqbal University College

Computer Engineering Techniques Department

(عملي)

Subject: Digital Signal Processing

Third stage

By

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Name of Experiment: Generation of Elementary Discrete Time Signals **(Part 2)**

Aim: develop some elementary discrete time (DT) signals.

Theory:-

A discrete-time signal is an indexed sequence of real or complex numbers. Thus, a discrete-time signal is a function of an integer-valued variable n, that is denoted by x[n]. Although the independent variable n need not necessarily represent "time" (n may, for example, correspond to a spatial coordinate or distance), x[n] is generally referred to as a function of time. Therefore, a real-valued signal x[n] will be represented as shown in Figure below.

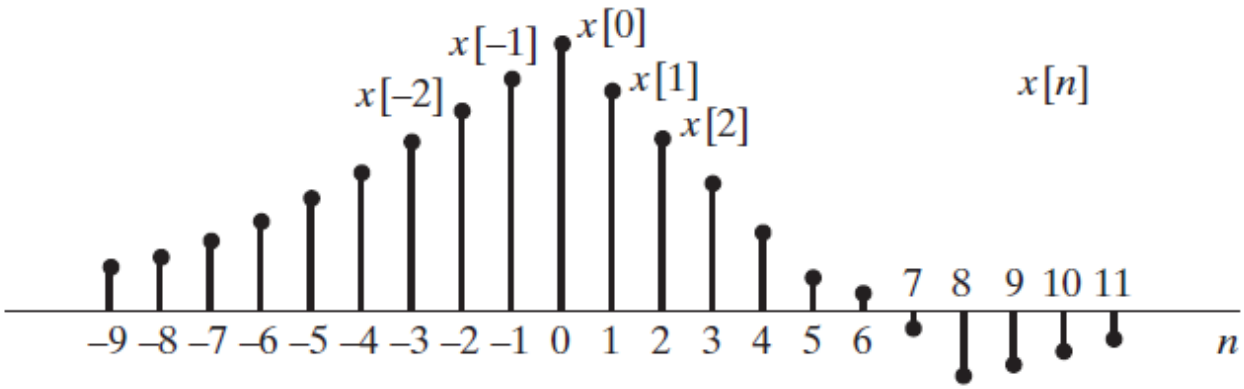


Fig . Graphical representation of a discrete-time signal.

The elements of the sequence are called ***samples***. The index n associated with each sample is an integer. If appropriate, the range of n will be specified.

Procedure:

a- Unit Impulse DT signal

```
clc;
clear all;
close all;
N = input('Enter the Number of Samples: ');
n = -N:1:N;
x = [zeros(1,N) 1 zeros(1,N)];
subplot (2,1,1);
stem (n,x,'r');
xlabel ('Time');
ylabel ('Amplitude');
title ('Impulse Response');
grid on;
```

b- Unit Step DT signal

```
clc;
clear all;
close all;
N = input(' Enter the Number of Samples : ');
n = -N:1:N;
x = [zeros(1,N) 1 ones(1,N)];
subplot (2,1,1);
stem (n,x,'r');
xlabel ('Time');
ylabel ('Amplitude');
title ('Unit Step Response');
grid on;
```

c- Unit Ramp DT signal

```
clc;
clear all;
close all;
N = input('Enter Number of Samples : ');
a = input('Enter Amplitude : ');
n = 0:1:N;
x = a*n;
subplot (2,1,1);
stem (n,x,'r');
xlabel ('Time');
ylabel ('Amplitude');
title ('Unit Ramp Response');
grid on;
```

d- Exponential DT signal

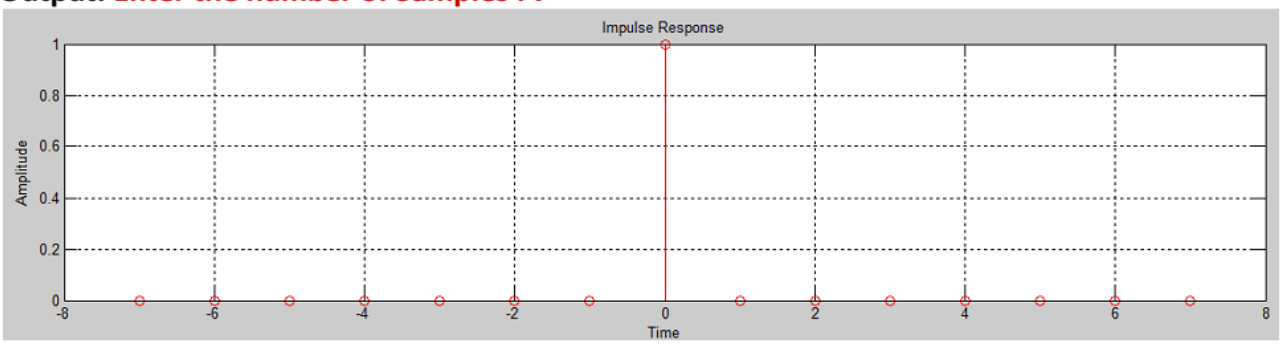
```
clc;
clear all;
close all;
N = input('Enter Number of Samples : ');
% EXPONENTIAL DECAYING SIGNAL
a = 0.5;
n = 0:.1:N;
x = a.^n;
subplot (2,1,1);
stem (n,x,'r');
xlabel ('Time');
ylabel ('Amplitude');
title ('Exponential Decaying Signal Response');
grid on;
```

```
%EXPONENTIAL GROWING SIGNAL
subplot (2,1,2);
x = a.^-n;
stem (n,x,'r');
xlabel ('Time');
ylabel ('Amplitude');
title ('Exponential Growing Signal Response');
grid on;
```

Result

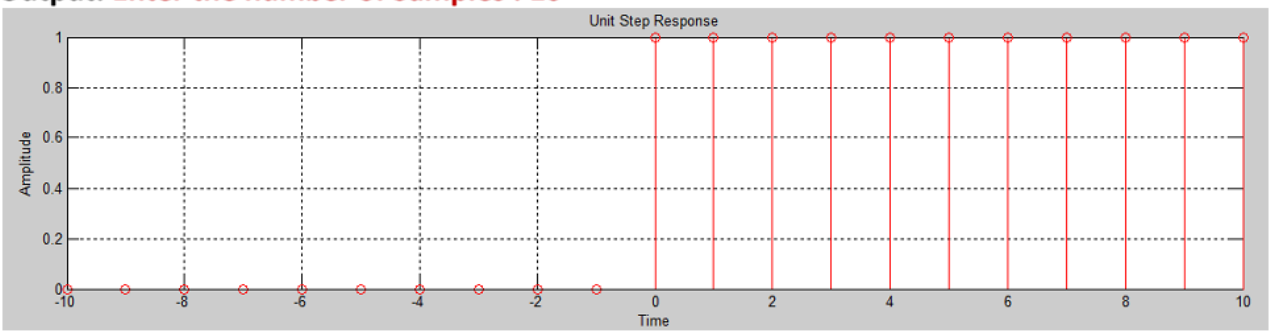
a- Unit impulse DT signal

Output: Enter the number of Samples : 7



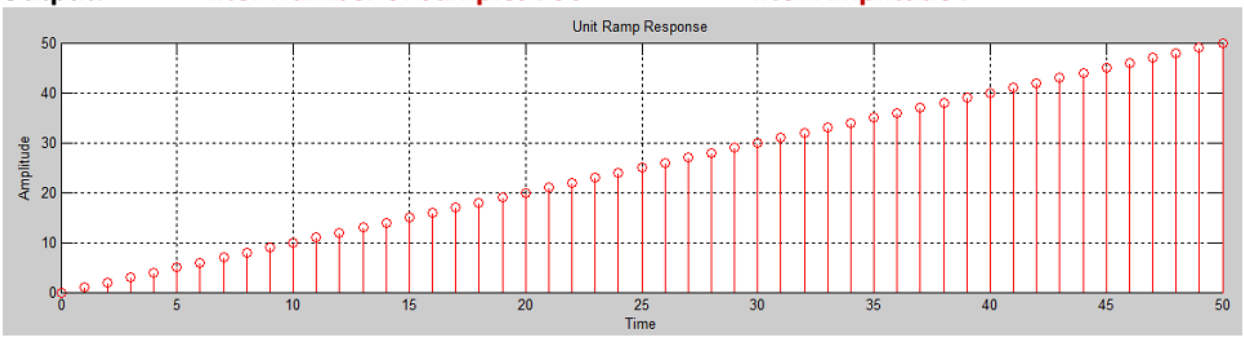
b- Unit Step DT signal

Output: Enter the number of Samples : 10



c- Unit Ramp DT signal

Output: **Enter Number of Samples : 50** **Enter Amplitude : 1**



d- Exponential DT signal

Output: **Enter Number of Samples : 5**