DSAA COMPUTER ASSIGNMENT-2

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PROBLEM 1:-

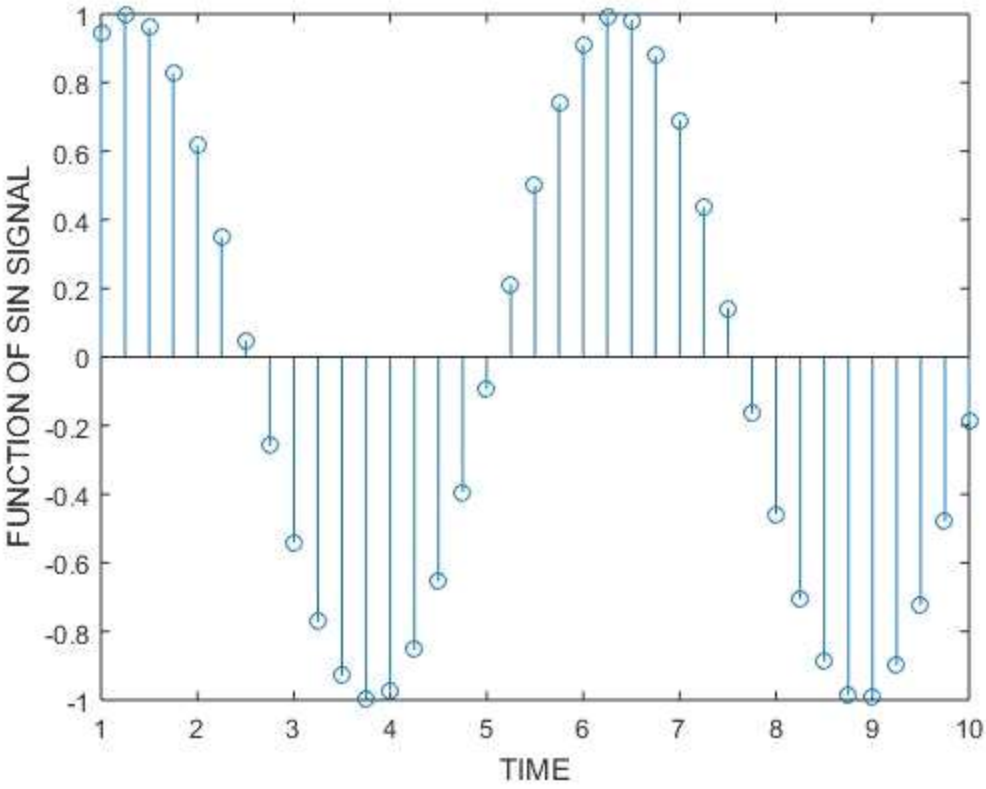
1) *Choose a discrete signal x[n] and write a matlab script for generating the quantized signal given by:*

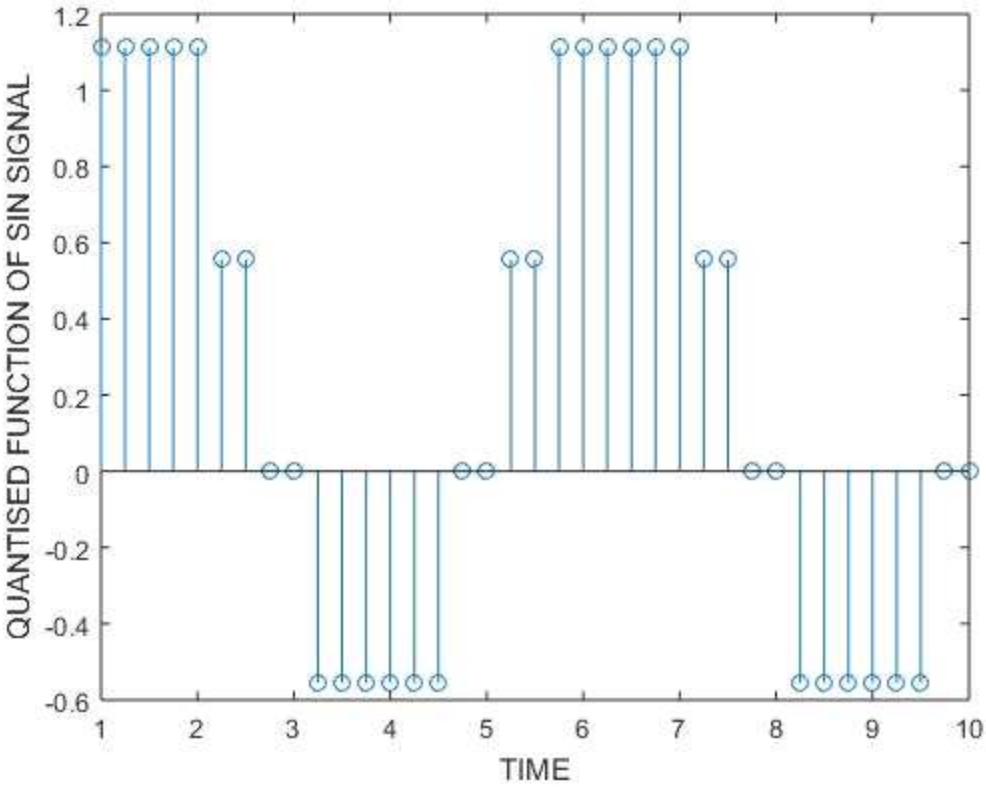
Xq[n]=delta(roundoff(Xq[n]/delta))

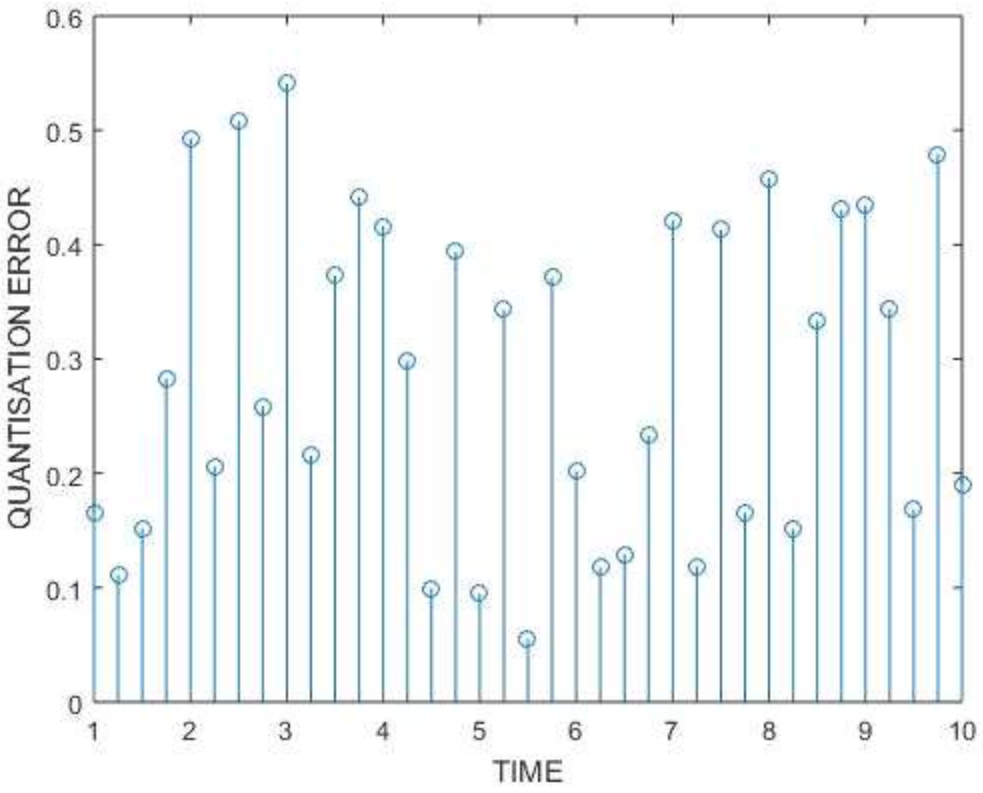
MATLAB CODE:-

```
%%COMP ASSIGN-2
%%ANIRUDH KANNAN V P
%%201601004
%%UG2 CSE

clc
clear all
close all


%DECLARING VALUE OF PI
pi1=3.14159;

%DECLARING TIME VECTOR
timevec=1:0.25:10;

%DECLARING A FREQUENCY
freq=130;

%DECLARING A SAMPLING FREQUENCY
samplingfreq=660;
```

```
%FUNCTION
func=sin(2*pi1*freq/samplingfreq*timevec);

%DELTA
del=0.5555;

% FIGURE 1
figure(1);
stem(timevec,func);
xlabel('TIME');
ylabel('FUNCTION OF SIN SIGNAL');

%DEFINING QUANTISED
quantised=del*ceil(func/del);

% FIGURE 2
figure(2);
stem(timevec,quantised);
xlabel('TIME');
ylabel('QUANTISED FUNCTION OF SIN SIGNAL');

% FIGURE 3
figure(3);
quanterror=quantised-func;
stem(timevec,quanterror);
xlabel('TIME');
ylabel('QUANTISATION ERROR');
```


FUNCTION OF SIN SIGNAL
TIME
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
1
2
3
4
5
6
7
8
9
10


QUANTISED FUNCTION OF SIN SIGNAL
TIME
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1
2
3
4
5
6
7
8
9
10



DISCUSSION:-

According to sampling theorem the sampling frequency should be greater than twice the maximum frequency and the signal should be band limited. Here all values are declared as follows:

```
%DECLARING TIME VECTOR
timevec=1:0.25:10;

%DECLARING A FREQUENCY
freq=130;

%DECLARING A SAMPLING FREQUENCY
samplingfreq=660;

%FUNCTION
func=sin(2*pi1*freq/samplingfreq*timevec);
```

```
%DELTA
del=0.5555;
```

Then the sin function is plotted as in figure 1.

```
%DEFINING QUANTISED
quantised=del*ceil(func/del);
```

Then the quantisation function is shown as above:-

and then the quantisation is plotted.Here the ceil function is used for quantisation.

Then the quantisation error is plotted error is caculated as `quanterror=quantised-originalfunc;` and then quantisation error is plotted.

SIGNAL TRANSFORMATION

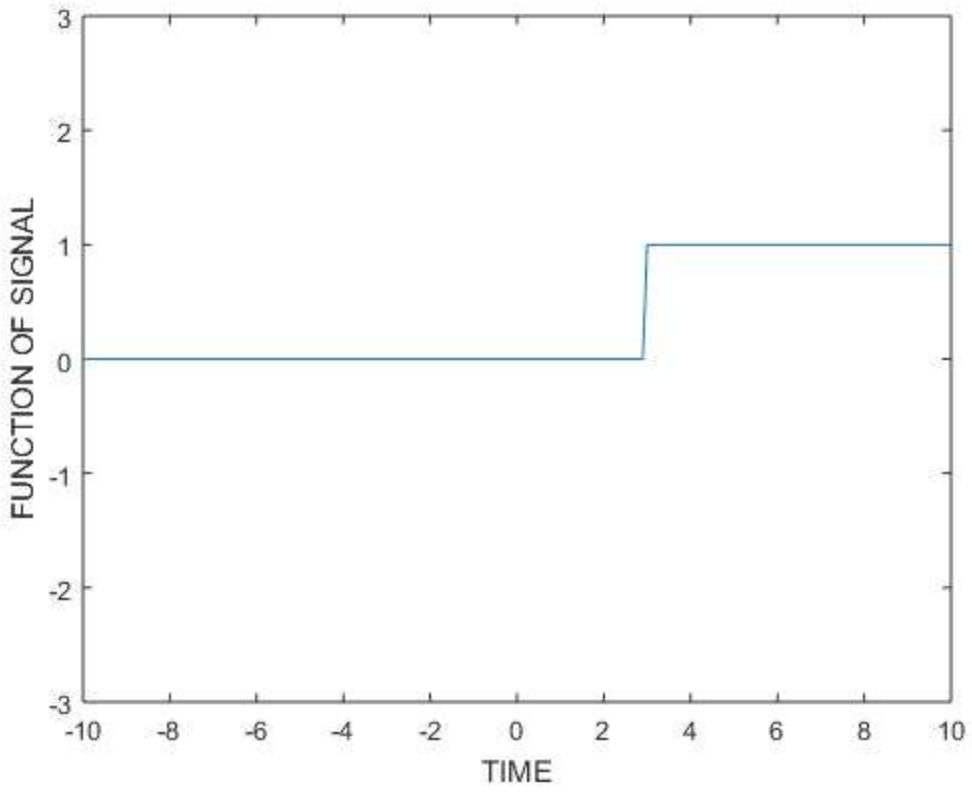
PROBLEM 2:-

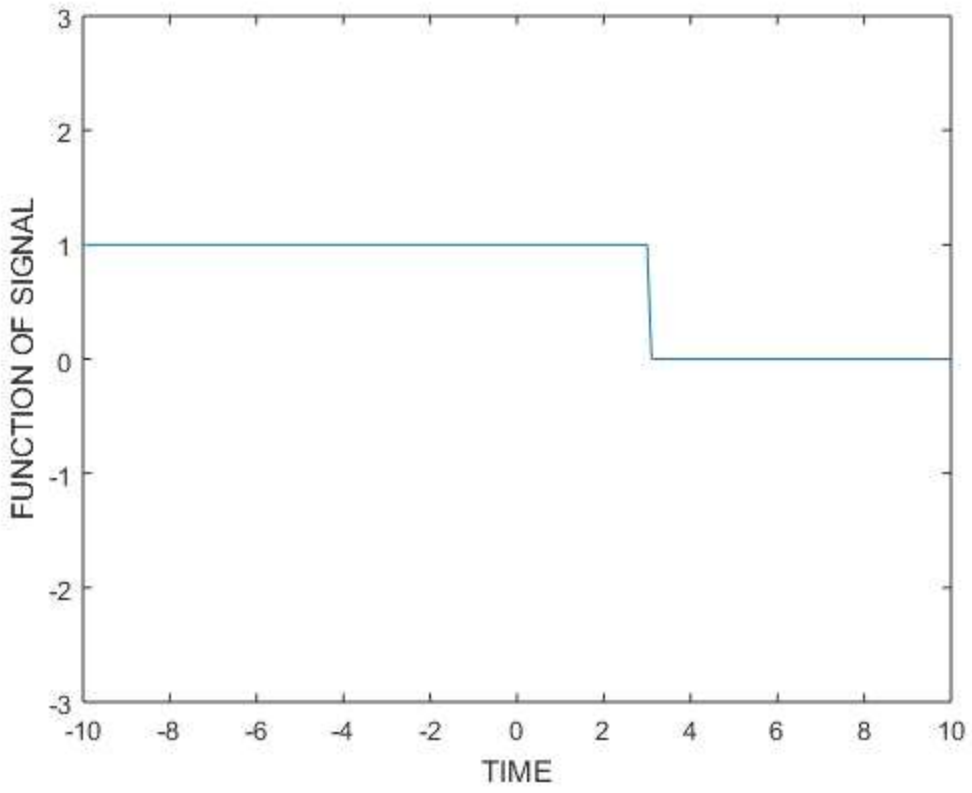
SECTION 1:-

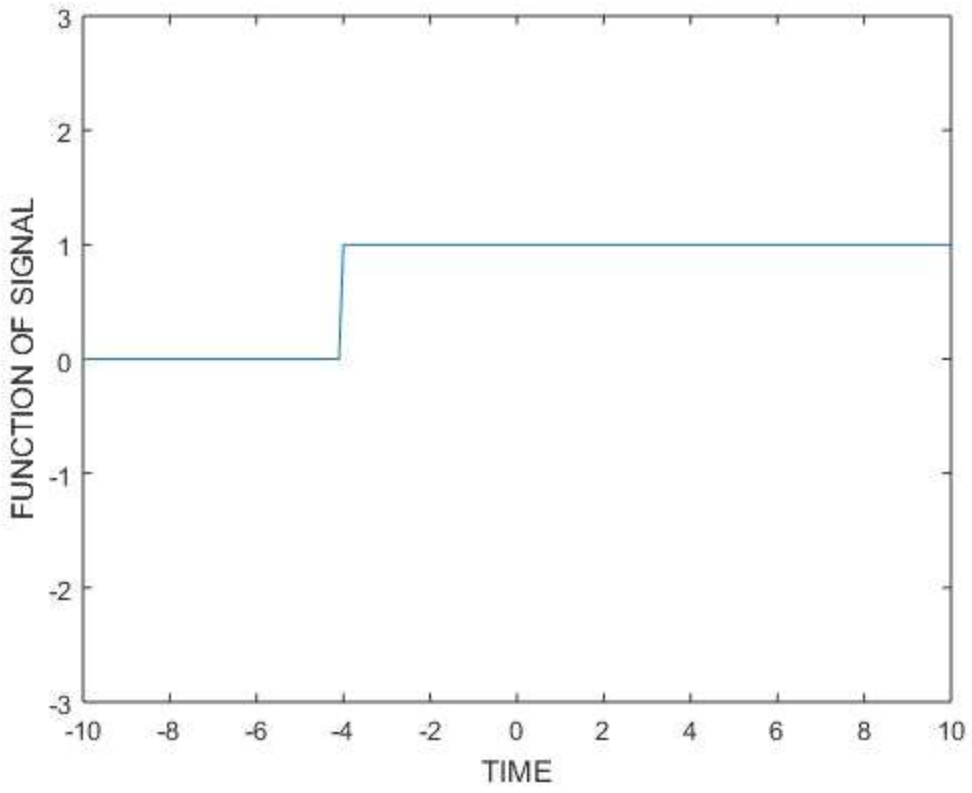
u(t)-Unit Step Signal
u(t-3)
u(3-t)
u(t+4)

MATLAB CODE:-

```
%%COMP ASSIGN-2
%%ANIRUDH KANNAN V P
%%201601004
%%UG2 CSE

clc
clear all
close all

%FIGURE 1
figure(1);
timevec= -10:0.1:10;
length1 = length(timevec);
xvector=zeros(1,length1);
xvector((timevec-3)>=0)=1;
plot(timevec,xvector);
ylim([-3,3]);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');

%FIGURE 2
figure(2);
timevec= -10:0.1:10;
length1 = length(timevec);
xvector=zeros(1,length1);
xvector((3-timevec)>=0)=1;
plot(timevec,xvector);
ylim([-3,3]);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');

%FIGURE 3
figure(3);
timevec= -10:0.1:10;
length1 = length(timevec);
xvector=zeros(1,length1);
xvector((timevec+4)>=0)=1;
plot(timevec,xvector);
ylim([-3,3]);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');
```


FUNCTION OF SIGNAL
TIME
3
2
1
0
-1
-2
-3
-10
-8
-6
-4
-2
0
2
4
6
8
10


FUNCTION OF SIGNAL
TIME
3
2
1
0
-1
-2
-3
-10
-8
-6
-4
-2
0
2
4
6
8
10



DISCUSSION:-

The various transformations of the unit step signal is plotted here.u(t-3) right shift toward 3,u(3-t) reverse and right shift toward 3,u(t+4) left shift toward 4.Here a vector is used to declare all values to the right as '1', and then the signal is transformed.

SECTION 2:-
r(t)-RAMP SIGNAL

r(t-1)
r(4-t)
r(t-2*t)

```
%%COMP ASSIGN-2
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%%201601004
%%UG2 CSE

clc
clear all
close all

%TIME
t=(0:0.02:10);

% FIGURE 1
figure(1);
ya=max(0,t-4);
plot(t,ya);
ylim([-3,3]);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');


% FIGURE 2
figure(2);
ya=max(0,4-t);
plot(t,ya);
ylim([-3,3]);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');

% FIGURE 3
figure(3);
ya=max(0,1-2.*t);
plot(t,ya);
ylim([-3,3]);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');
```
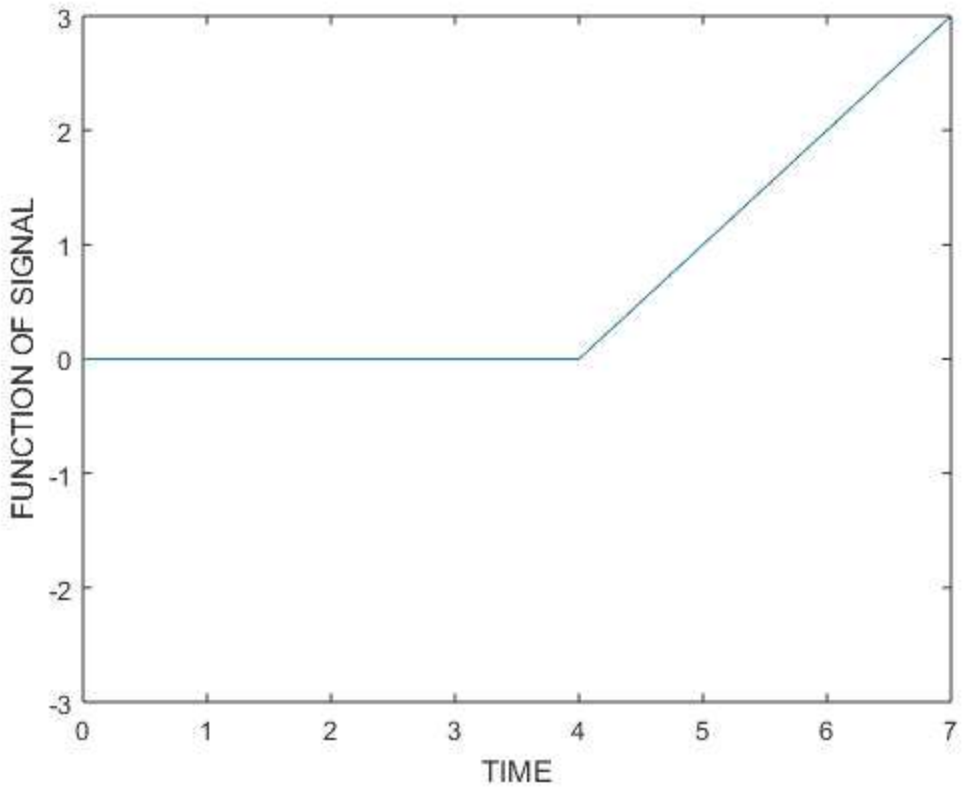
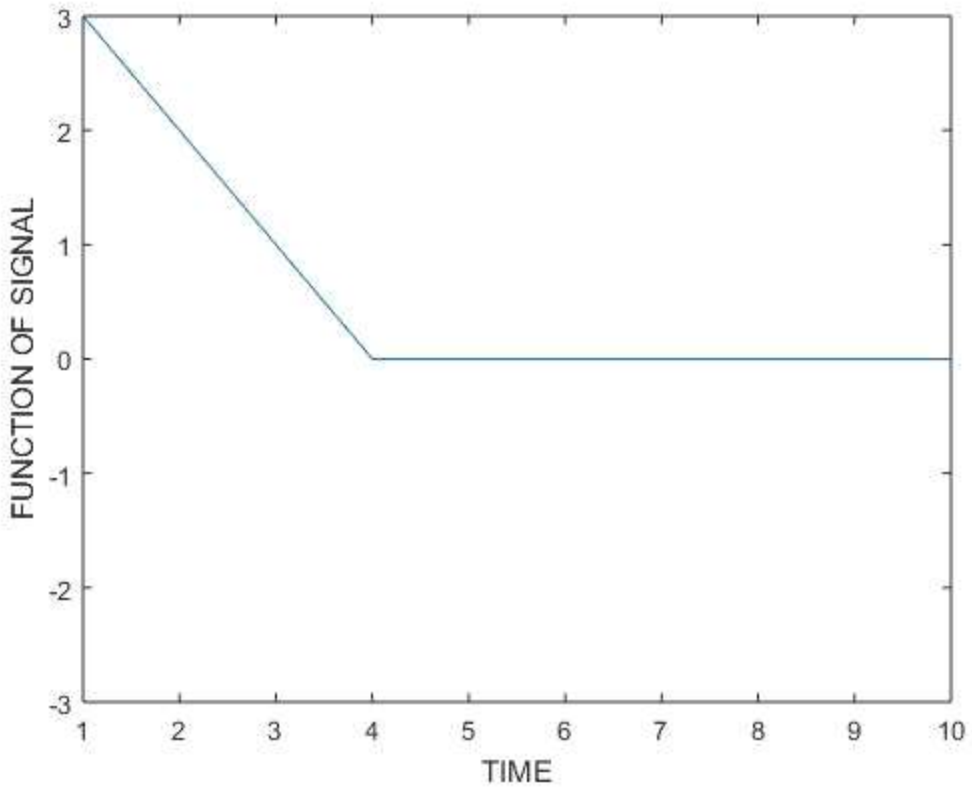
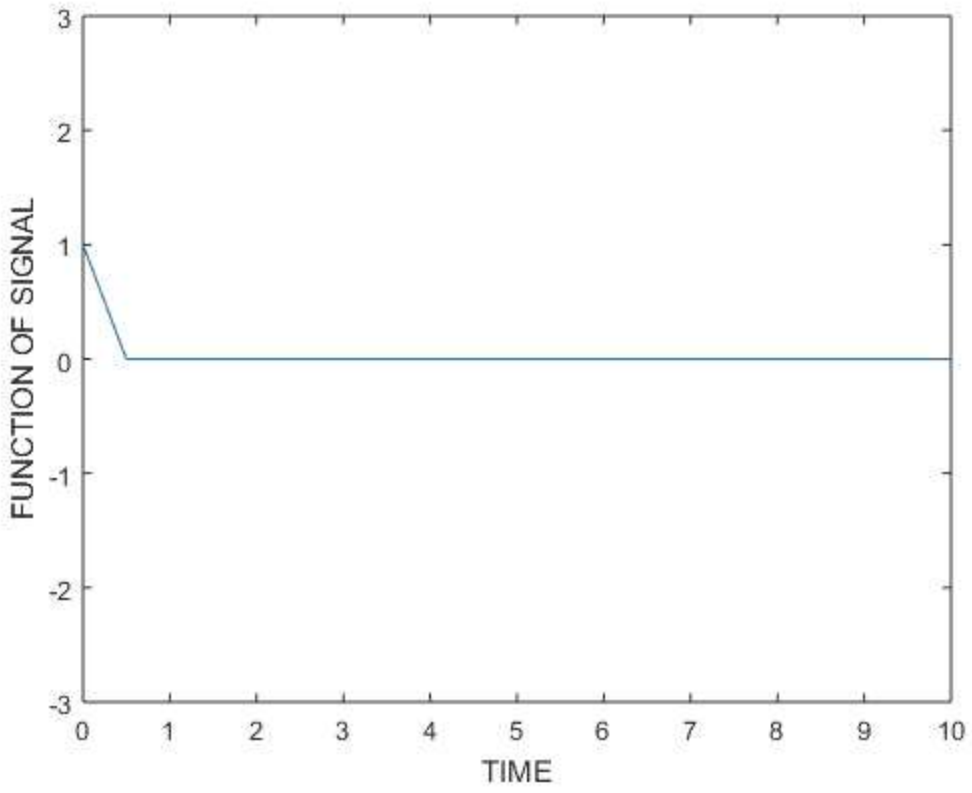


FUNCTION OF SIGNAL
TIME
3
2
1
0
-1
-2
-3
0
1
2
3
4
5
6
7


FUNCTION OF SIGNAL
TIME
3
2
1
0
-1
-2
-3
1
2
3
4
5
6
7
8
9
10



DISCUSSION:-

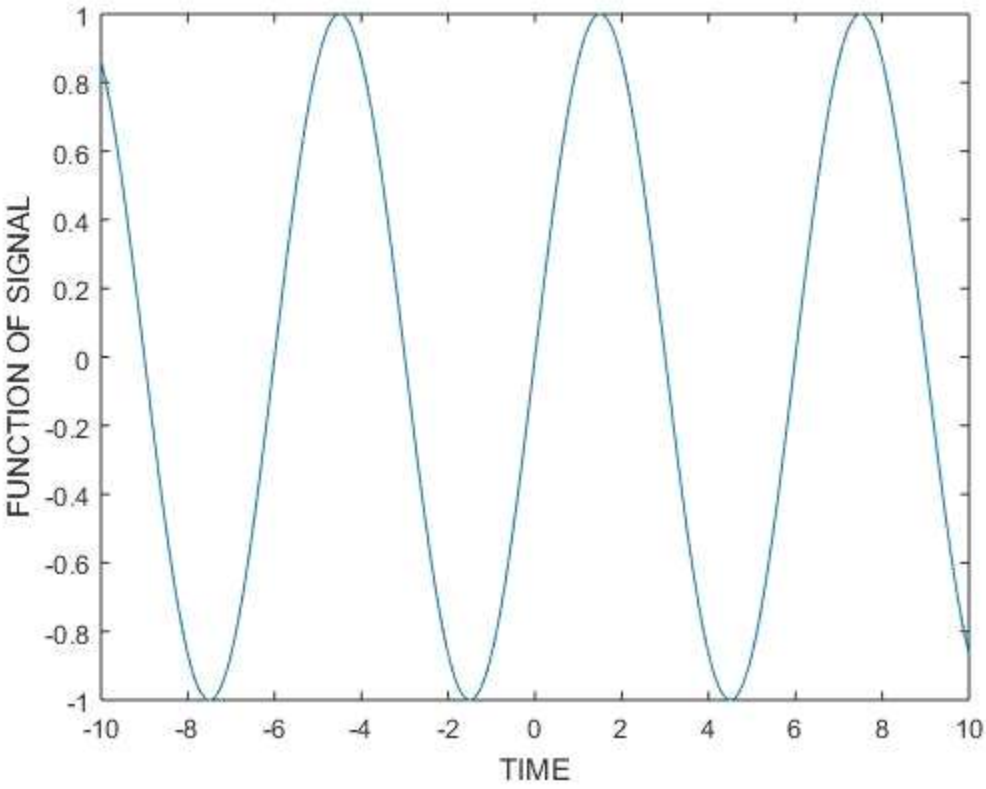
The ramp signal is plotted here. x(t)=t for t>=0
Therefore ramp signal is 0 below 0,so used max(0,f(t)) for plotting ramp function,using t vector, max,ylim and plot function according to various cases.

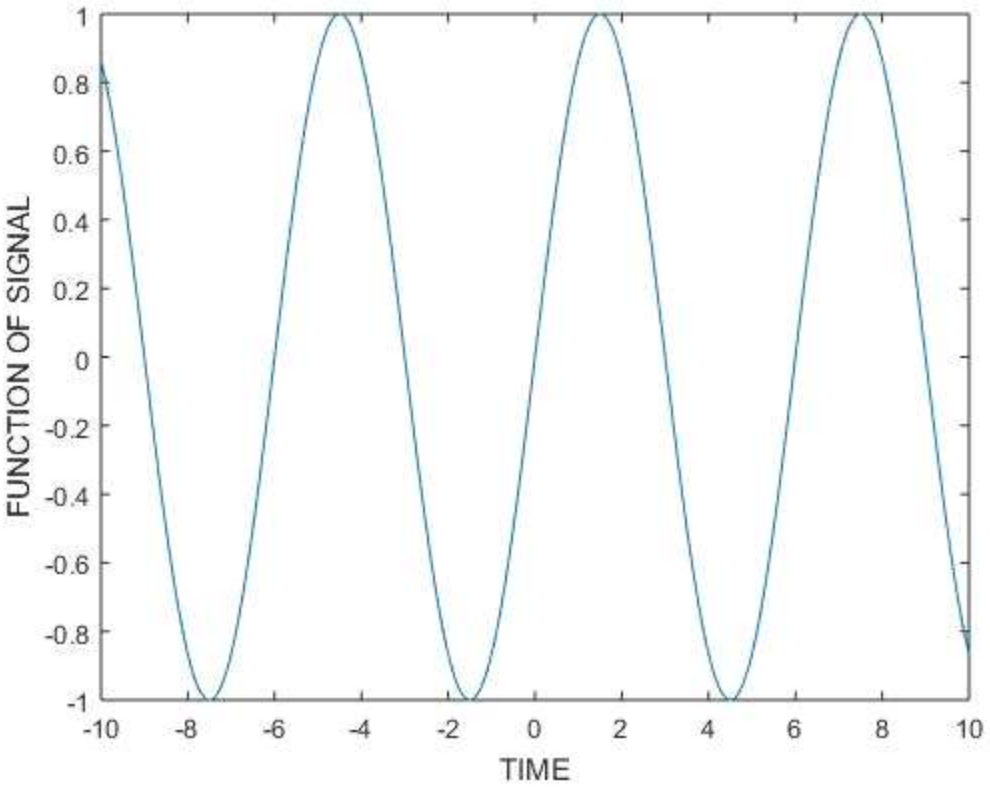
SECTION 3:-

sin(omega0(t-t0))
sin(omega0(t+t0))

MATLAB CODE:-

```
%%COMP ASSIGN-2
%%ANIRUDH KANNAN V P
%%201601004
%%UG2 CSE

clc
clear all
close all

%timevec
ti=(-10:0.02:10);

%putting t0 value
t0 = 6;

%angular freq
w = (2*pi)/t0;

figure(1);
y=sin(w.*(ti-t0));
plot(ti,y);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');



figure(2);
y=sin(w.*(ti+t0));
plot(ti,y);
xlabel('TIME');
ylabel('FUNCTION OF SIGNAL');
```


FUNCTION OF SIGNAL
TIME
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-10
-8
-6
-4
-2
0
2
4
6
8
10



DISCUSSION:-

The sinusoidal signal is plotted here.sin(omega0(t-t0)), sin(omega0(t+t0)) where omega0 is angular frequency.It is plotted using `y=sin(w.*(ti-t0));` `plot(ti,y);` and then xlabel and y label is used to write on axis.

SECTION 5:-

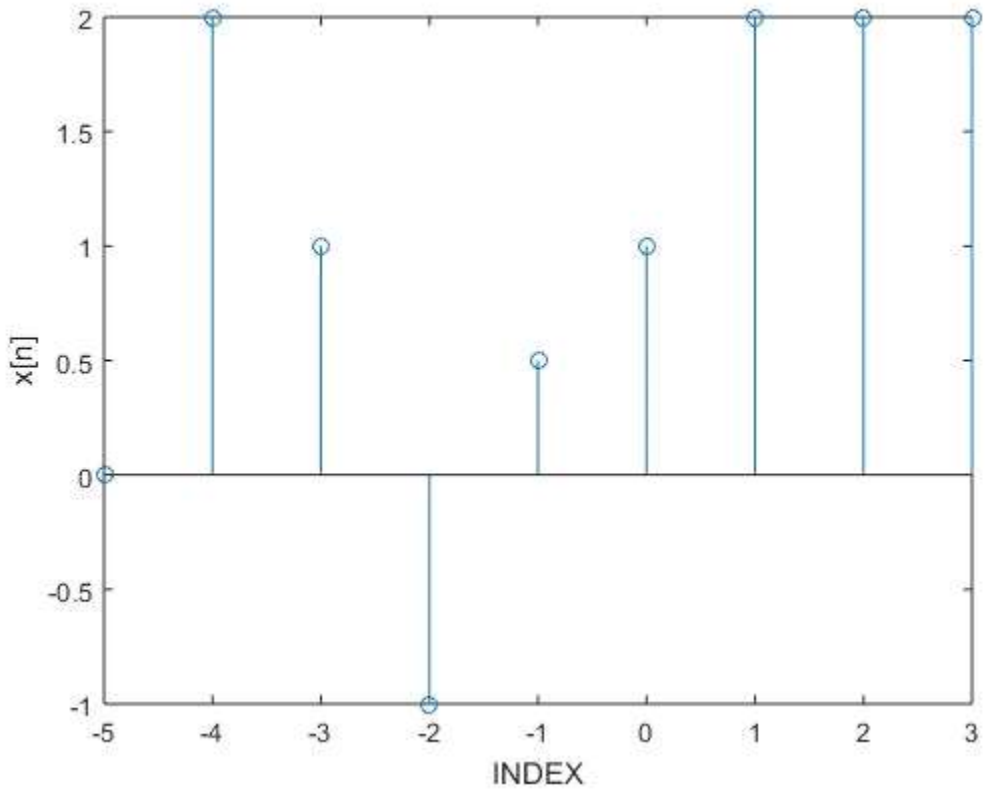
The discrete signal is shown in figure in question paper.

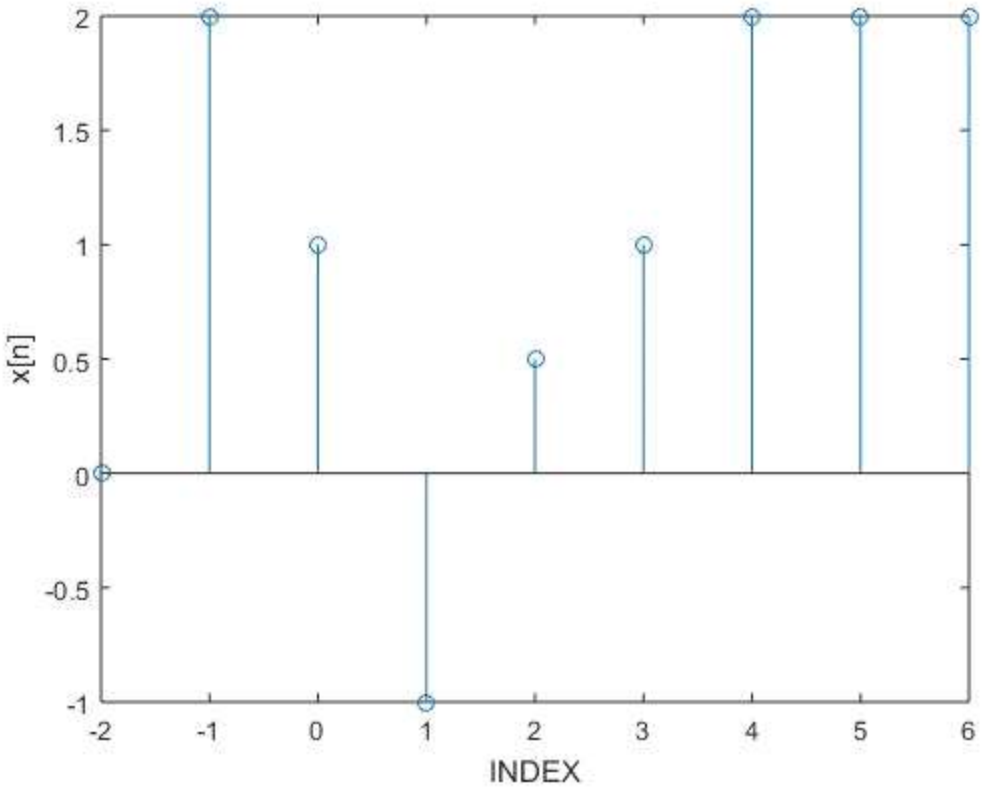
-x[n-1]
-x[n+2]
-x[2-n]
-x[1-2n]
-x[2n+3]

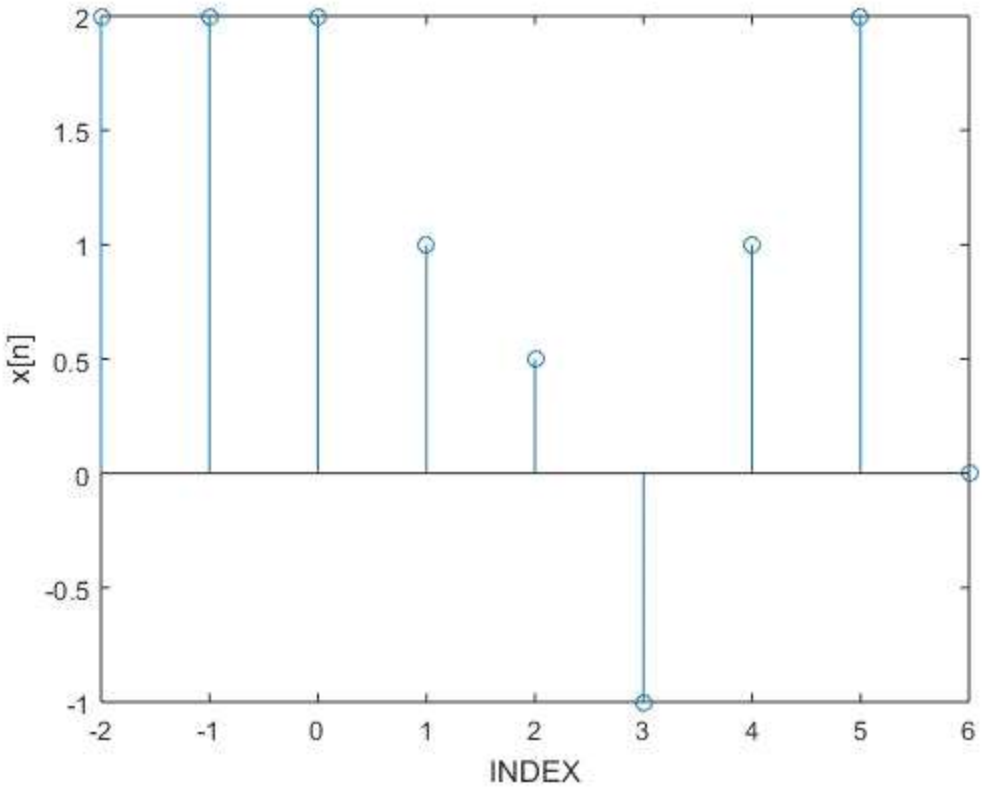
MATLAB CODE:-

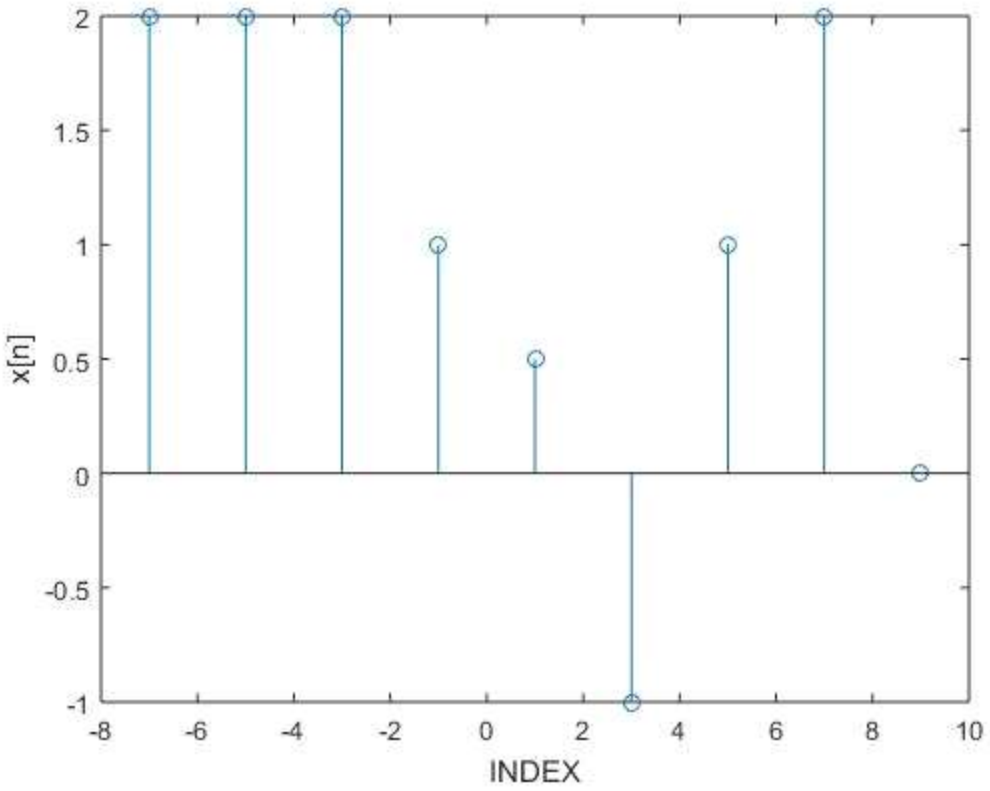
```
%%COMP ASSIGN-2
%%ANIRUDH KANNAN V P
%%201601004
%%UG2 CSE

clc
clear all
close all

%DECLARING TIME VECTOR AS IN QUE
tvec= -4:1:4;

discxt=zeros(1,length(tvec));

%THE GIVEN DISCRETE VALUES IN QUESTION
discxt=[0,2,1,-1,0.5,1,2,2,2];

%FIGURE 1
figure(1);
stem(tvec-1,discxt);
xlabel('INDEX');
ylabel('x[n]');



%FIGURE 2
figure(2);
stem(tvec+2,discxt);
xlabel('INDEX');
ylabel('x[n]');


%FIGURE 3
figure(3);
stem(2-tvec,discxt);
xlabel('INDEX');
ylabel('x[n]');



%FIGURE 4
```

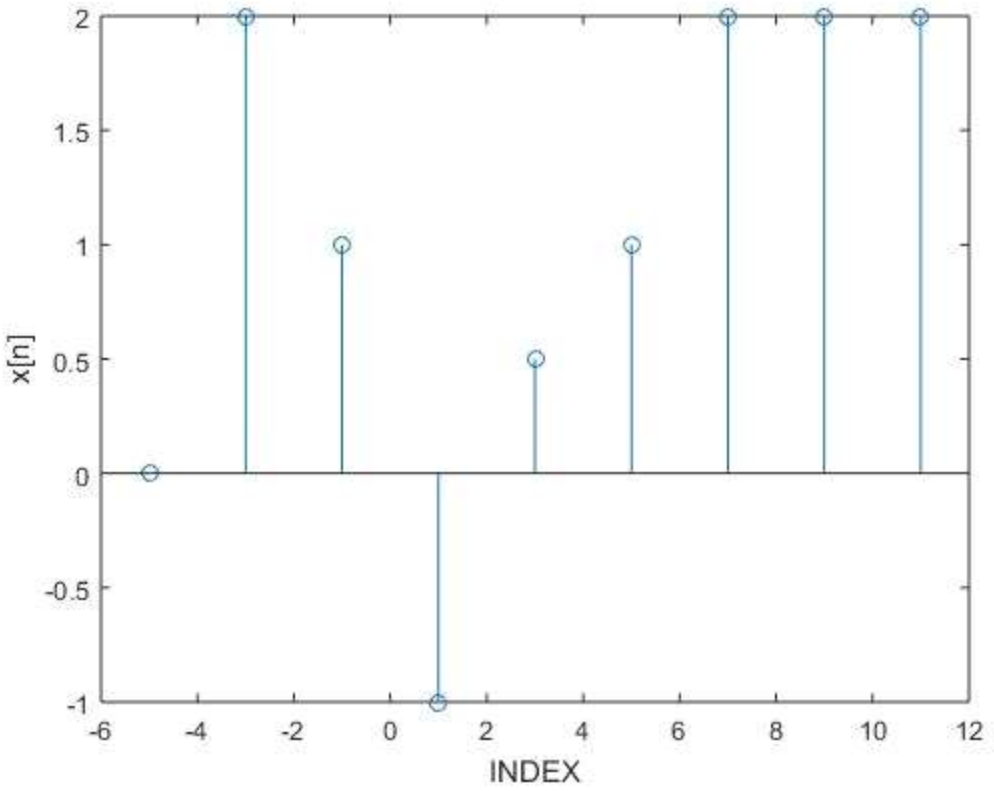
```
figure(4);
stem(1-(2*tvec),discxt);
xlabel('INDEX');
ylabel('x[n]');


%FIGURE 5
figure(5);
stem(3+(2*tvec),discxt);
xlabel('INDEX');
ylabel('x[n]');
```




2
1.5
1
0.5
0
-0.5
-1
x[n]
-2
-1
0
1
2
3
4
5
6
INDEX


2
1.5
1
0.5
0
-0.5
-1
x[n]
-2
-1
0
1
2
3
4
5
6
INDEX


2
1.5
1
0.5
0
-0.5
-1
x[n]
-8
-6
-4
-2
0
2
4
6
8
10
INDEX



DISCUSSION:-

The discrete signal values is given in the

```
%THE GIVEN DISCRETE VALUES IN QUESTION
discxt=[0,2,1,-1,0.5,1,2,2,2];
```

Then the given function is plotted according to the given transformations as given in question using figure and stem function and a time vector.

ASSIGNMENT END