

Lab 11

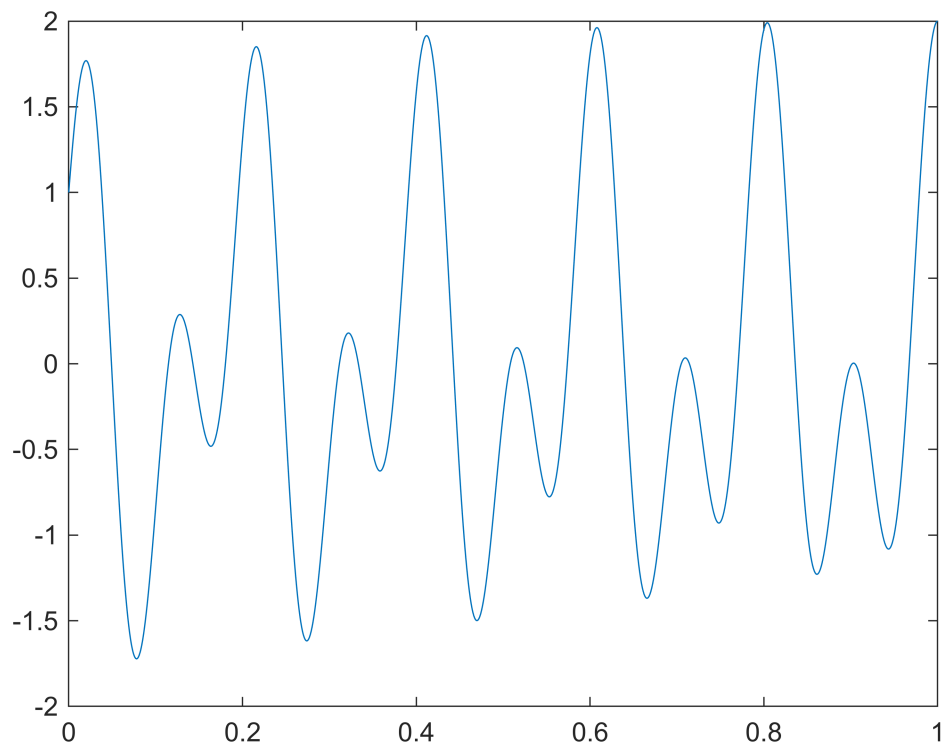
Name: Purval Madhukar Bhude

Roll No. S20230010193

Section 4

Question 1

```
t=0:0.001:1;  
xt=sin(20.5*pi*t)+cos(10*pi*t);  
figure;  
plot(t, xt);
```



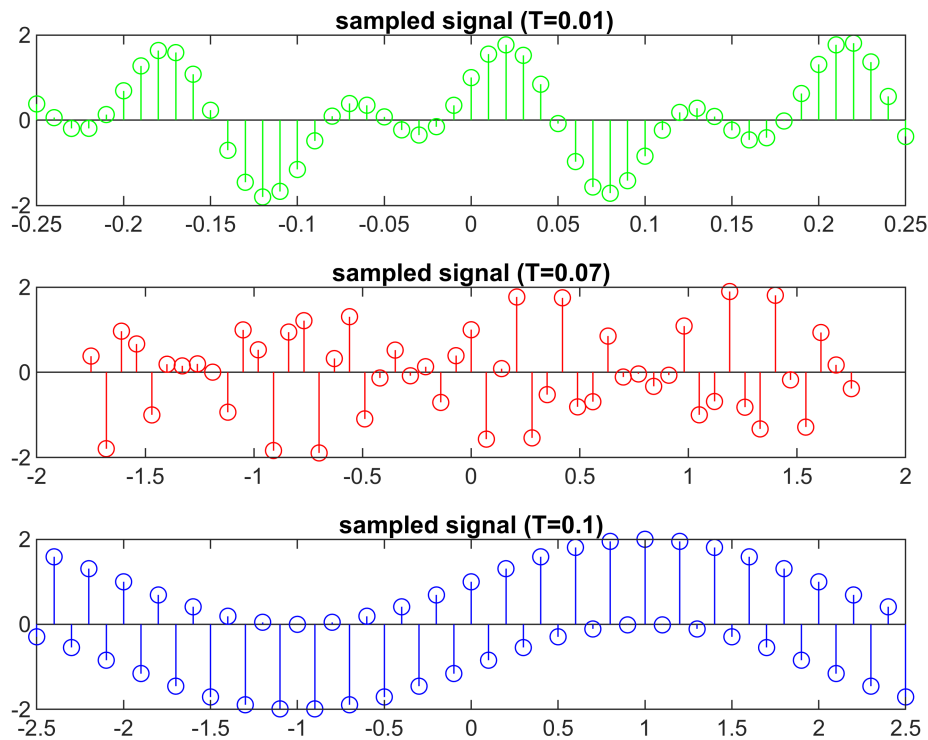
```
T1=0.01;  
T2=0.07;  
T3=0.1;  
n=-25:1:25;  
xnt1=sin(20.5*pi*n*T1)+cos(10*pi*n*T1);  
xnt2=sin(20.5*pi*n*T2)+cos(10*pi*n*T2);  
xnt3=sin(20.5*pi*n*T3)+cos(10*pi*n*T3);  
  
subplot(3,1,1);  
stem(n*T1,xnt1,'g');  
title(" sampled signal (T=0.01)");
```

```

subplot(3,1,2);
stem(n*T2,xnt2,'r');
title("sampled signal (T=0.07)");

subplot(3,1,3);
stem(n*T3,xnt3,'b');
title("sampled signal (T=0.1)");

```



```

sinc = @(x) sin(pi*x)./(pi*x);

Fs = 100;

t_ini = -1:1/Fs:1;

xr1 = zeros(size(t_ini));
xr2 = zeros(size(t_ini));
xr3 = zeros(size(t_ini));

for i = 1:length(n)
    xr1 = xr1 + xnt1(i) * sinc((t_ini - n(i)*T1)/T1);% scaled by the sampling time
    xr2 = xr2 + xnt2(i) * sinc((t_ini - n(i)*T2)/T2);
    xr3 = xr3 + xnt3(i) * sinc((t_ini - n(i)*T3)/T3);
end

figure;

```

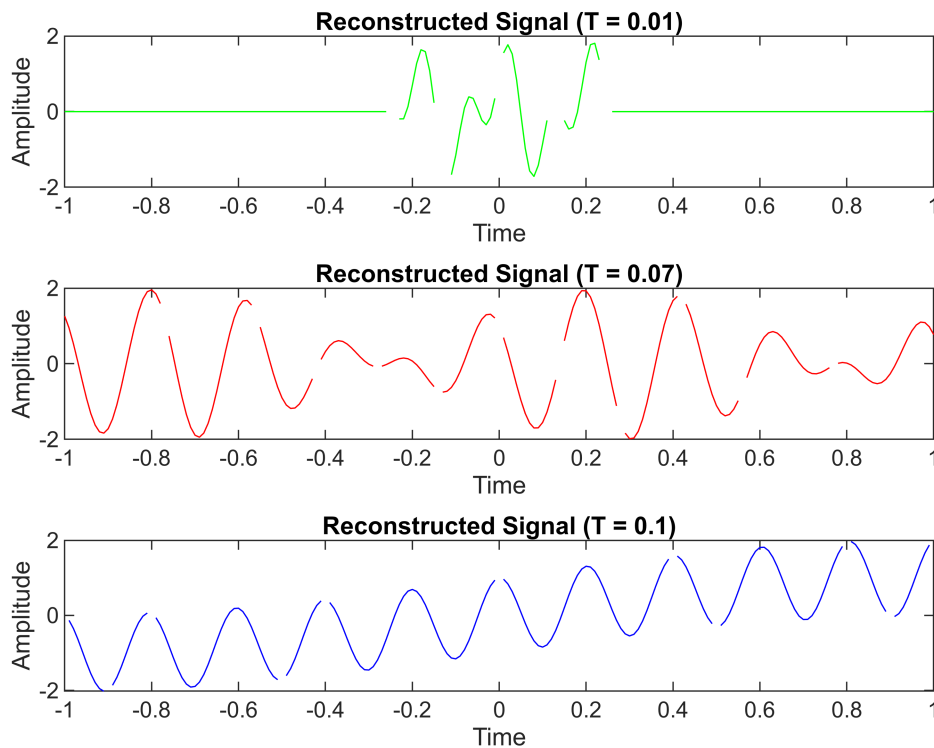
```

subplot(3,1,1);
plot(t_ini, xr1, 'g');
title("Reconstructed Signal (T = 0.01)");
xlabel("Time");
ylabel("Amplitude");

subplot(3,1,2);
plot(t_ini, xr2, 'r');
title("Reconstructed Signal (T = 0.07)");
xlabel("Time");
ylabel("Amplitude");

subplot(3,1,3);
plot(t_ini, xr3, 'b');
title("Reconstructed Signal (T = 0.1)");
xlabel("Time");
ylabel("Amplitude");

```



```

error1 = xt - interp1(t_ini, xr1, t, 'linear', 'extrap');
error2 = xt - interp1(t_ini, xr2, t, 'linear', 'extrap');
error3 = xt - interp1(t_ini, xr3, t, 'linear', 'extrap');

figure;
subplot(3,1,1);
plot(t, error1, 'g');
title("Reconstruction Error (T = 0.01)");
xlabel("Time");

```

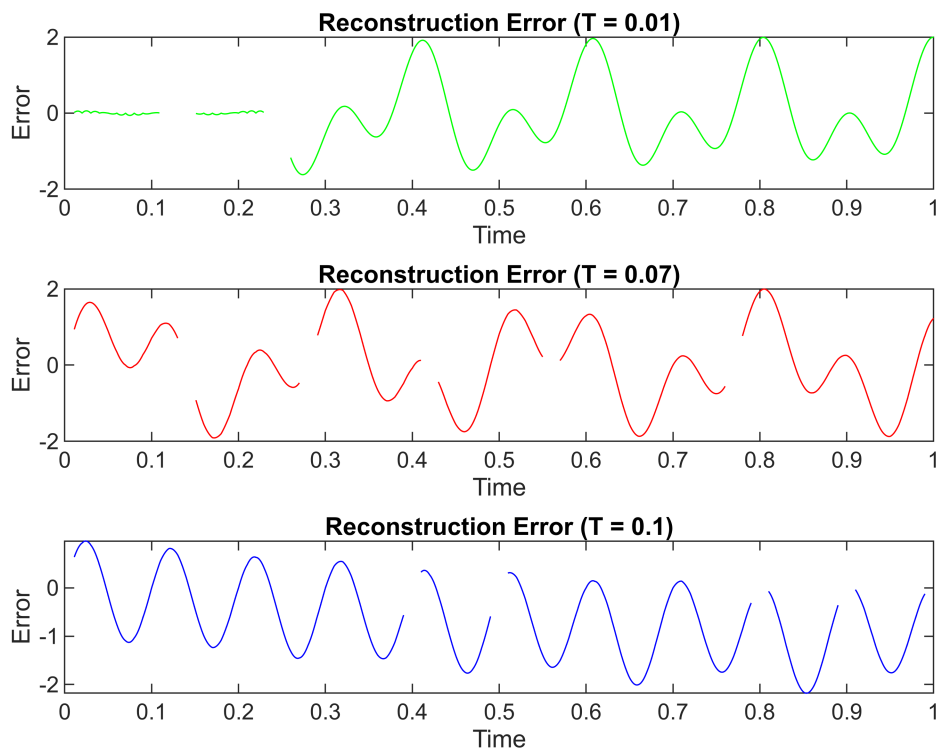
```

ylabel("Error");

subplot(3,1,2);
plot(t, error2, 'r');
title("Reconstruction Error (T = 0.07)");
xlabel("Time");
ylabel("Error");

subplot(3,1,3);
plot(t, error3, 'b');
title("Reconstruction Error (T = 0.1)");
xlabel("Time");
ylabel("Error");

```

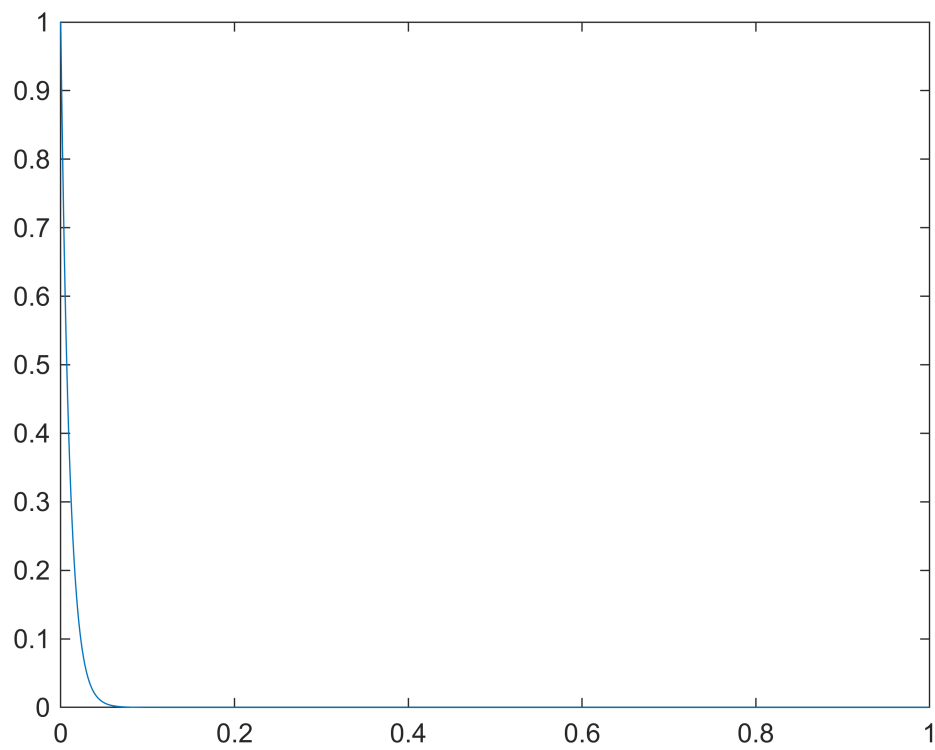


Question 2

```

t=0:0.001:1;
xt=exp(-100*abs(t));
figure;
plot(t, xt);

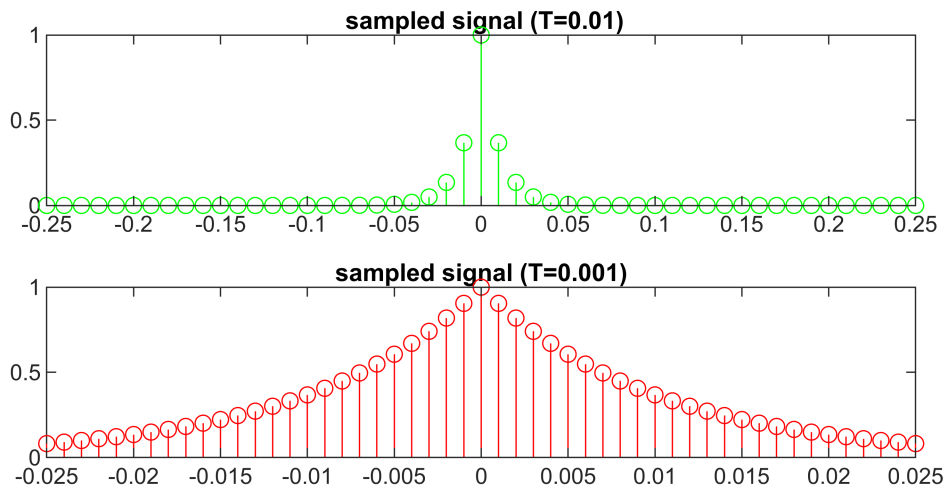
```



```
T1=0.01;
T2=0.001;
n=-25:1:25;
xnt1 = exp(-100*abs(n*T1));
xnt2 = exp(-100*abs(n*T2));

subplot(3,1,1);
stem(n*T1,xnt1,'g');
title(" sampled signal (T=0.01)");

subplot(3,1,2);
stem(n*T2,xnt2,'r');
title("sampled signal (T=0.001)");
```



```

sinc = @(x) sin(pi*x)./(pi*x);

Fs = 1000;

t_ini = -1:1/Fs:1;

xr1 = zeros(size(t_ini));
xr2 = zeros(size(t_ini));

for i = 1:length(n)
    xr1 = xr1 + xnt1(i) * sinc((t_ini - n(i)*T1)/T1); % scaled by the sampling time
period T1
    xr2 = xr2 + xnt2(i) * sinc((t_ini - n(i)*T2)/T2);
end

figure;

subplot(2,1,1);
plot(t_ini, xr1, 'g');
title("Reconstructed Signal (T = 0.01)");
xlabel("Time");
ylabel("Amplitude");

subplot(2,1,2);
plot(t_ini, xr2, 'r');
title("Reconstructed Signal (T = 0.001)");

```

```
xlabel("Time");  
ylabel("Amplitude");
```

