PROJECT1

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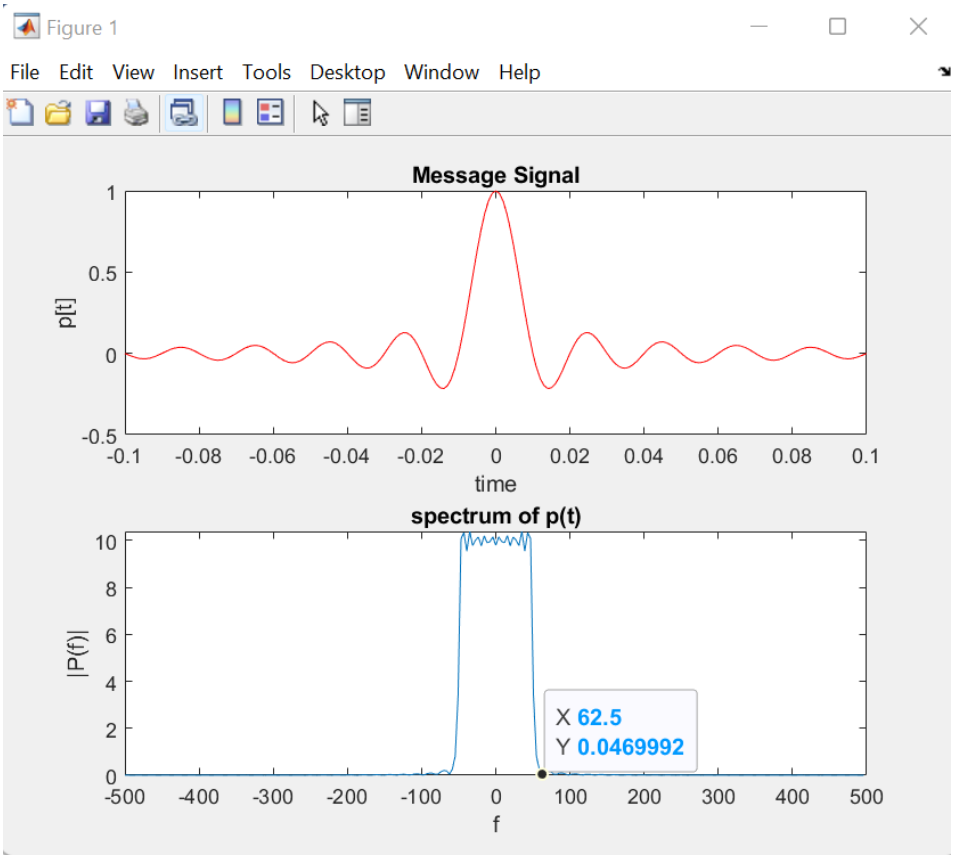
Pulse p(t) corresponding to the raised cosine spectrum

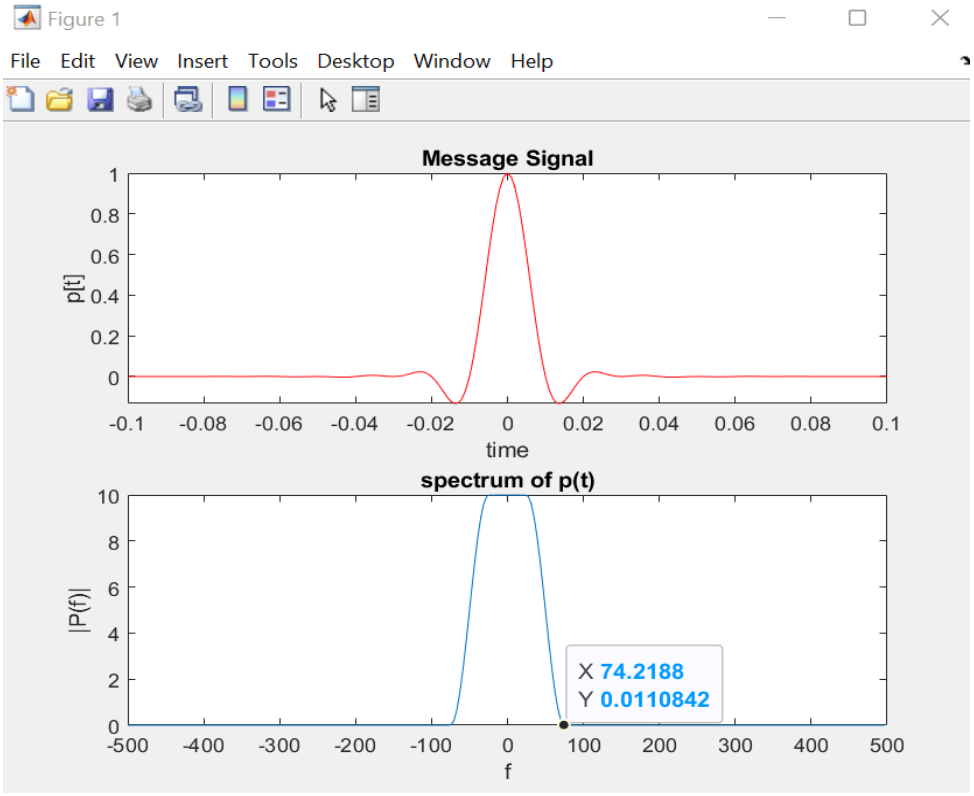
$$p(t) = \begin{cases} \frac{\text{sinc}(R_b t)\cos(\pi\alpha R_b t)}{1-4\alpha^2 {R_b}^2 t^2} & -T_{max} \le t \le T_{max} \\ 0 & \text{elsewhere} \end{cases}$$

1. Alpha=0 , Tmax=10Tb



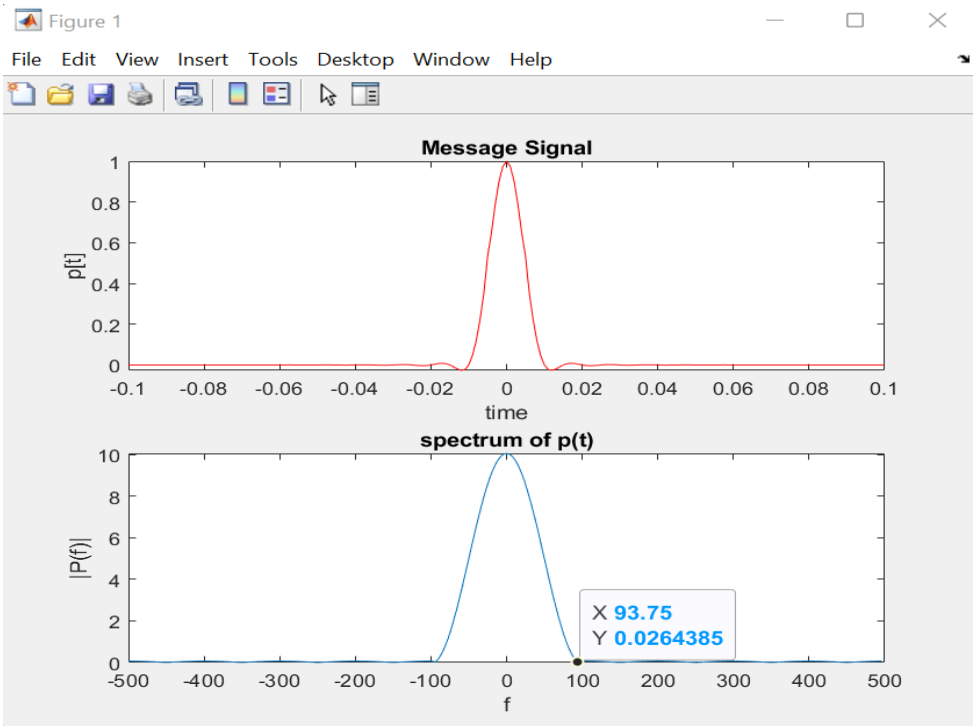
Bandwidth: 62.5 Hz

2. Alpha=0.5 , Tmax=10Tb



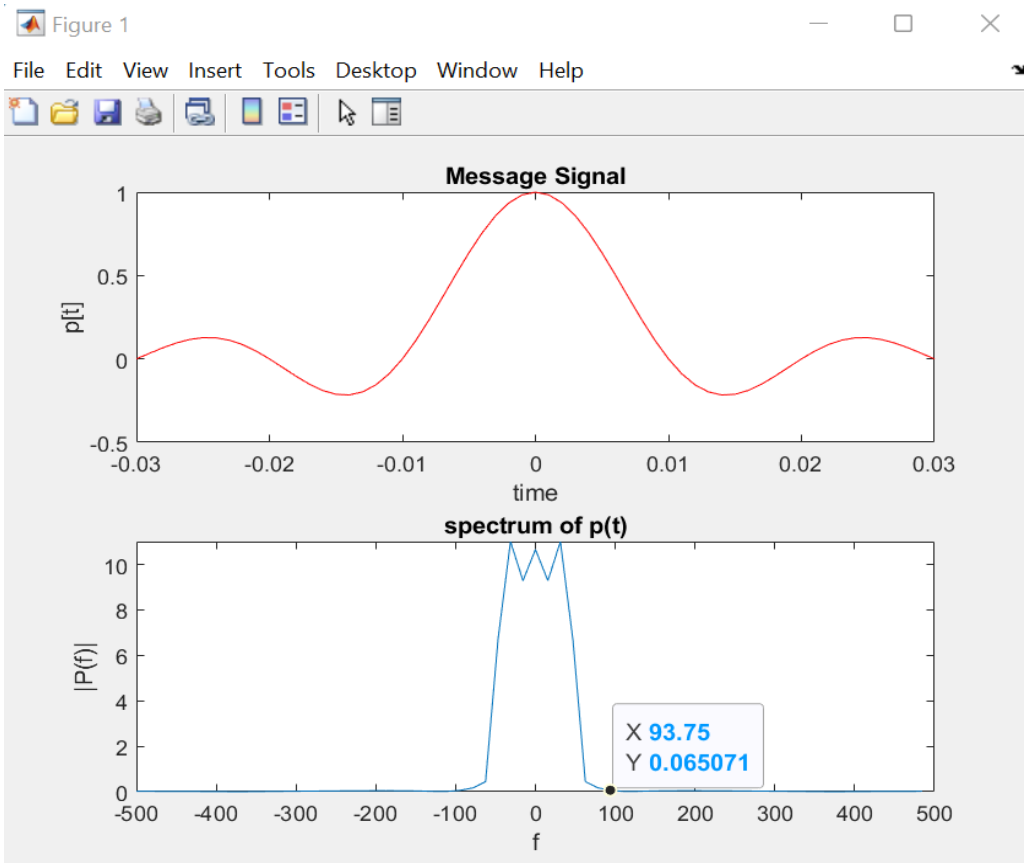
Bandwidth=74.21Hz

3. Alpha=1 , Tmax=10Tb



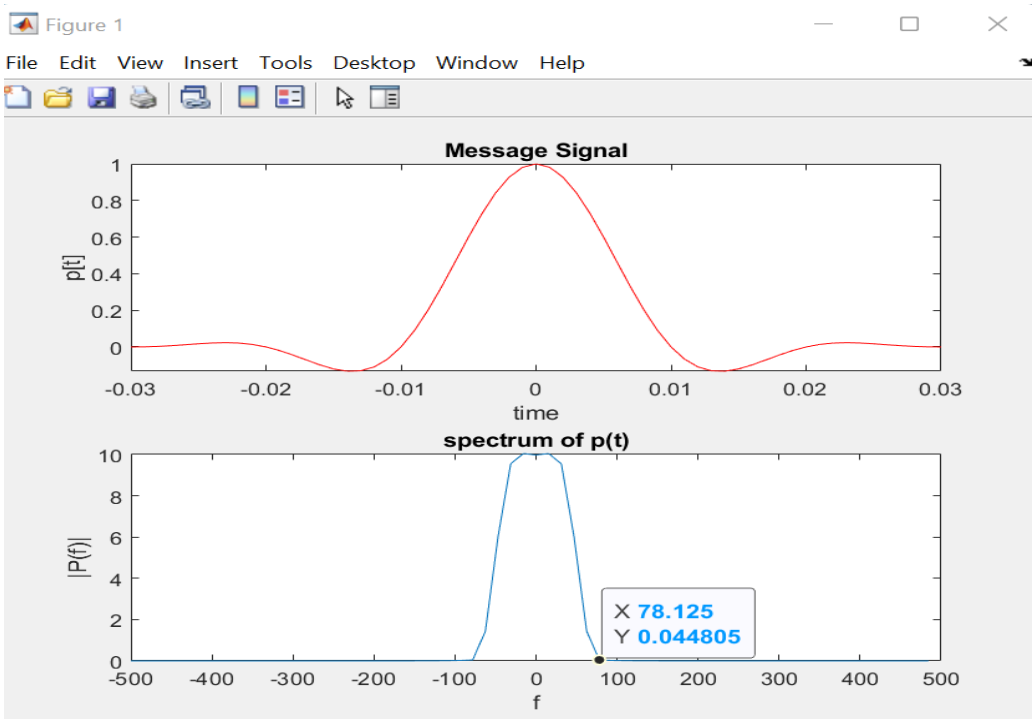
Bandwidth=93.75 Hz

4 . Alpha =0 ,Tmax=3Tb



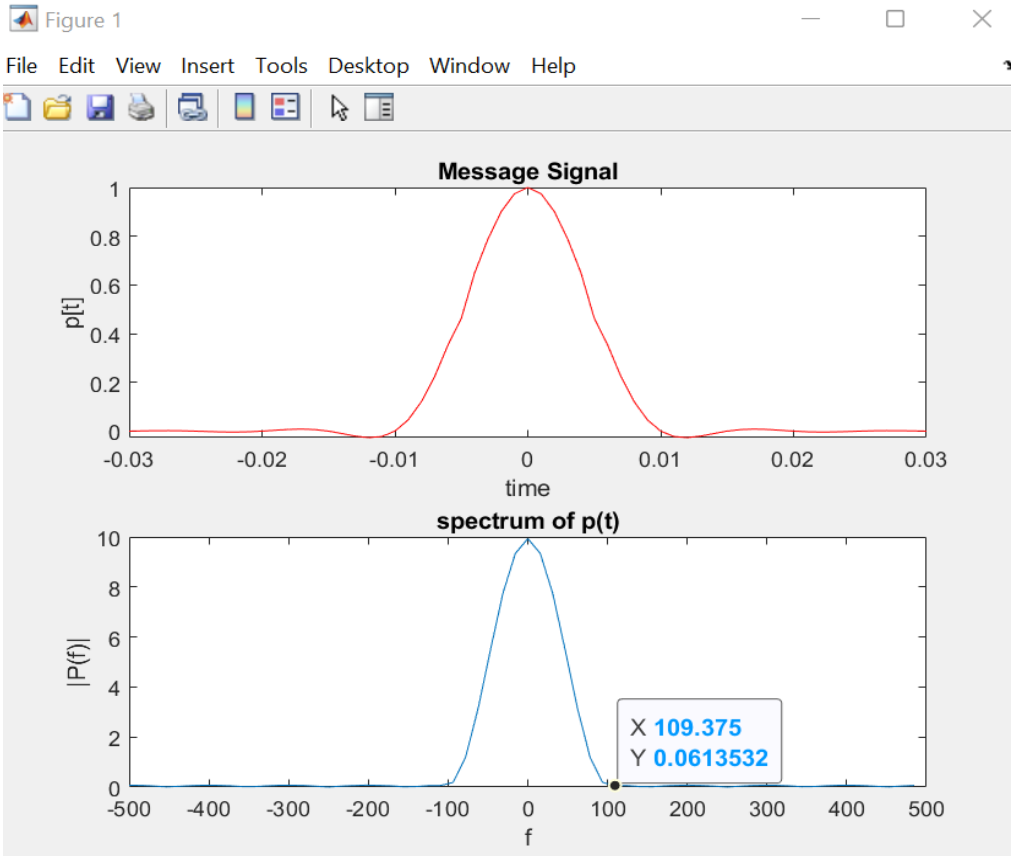
Bandwidth = 93.75 Hz

5.Alpha =0.5 , Tmax=3Tb



Bandwidth=78.12 Hz

6.Alpha =1, Tmax=3Tb



Bandwidth=109.37 Hz

Theoretical Calculations Bandwidth:

BW=(Rb/2)*(1 + Alpha)

1. Alpha = 0 :
   Bw=50 Hz
2. Alpha = 0.5:
   Bw= 75 Hz
3. Alpha = 1:
   Bw=100Hz

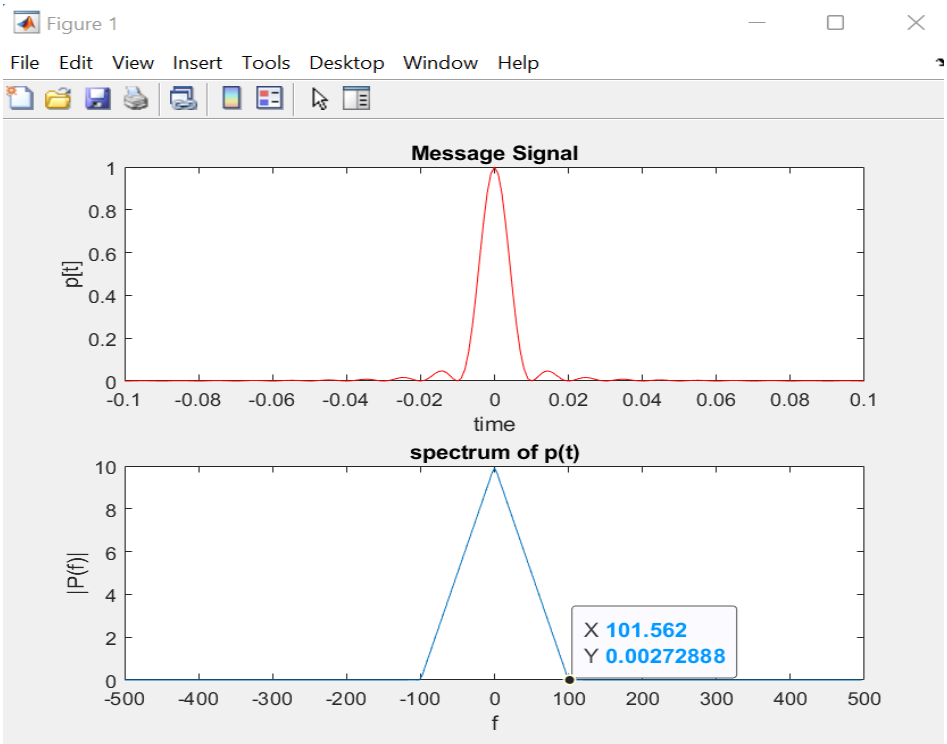
Code:

```
Rb=100;
Tb=1/Rb;
Tmax=3*Tb; %Tmax = 10*Tb / 3*Tb
alpha=0; %alpha =0.5 / 0 / 1
tr=0.001;
t=(-Tmax:tr:Tmax);
```

```
%p[t] signal
p=zeros(1,length(t));
num=sinc(Rb*t).*cos(pi*alpha*Rb*t);
den=1-(4*(alpha^2)*(Rb^2)*(t.^2));
p=num./den;

%plotting
subplot(2,1,1);
plot(t,p,'r');
title('Message Signal');
xlabel('time');
ylabel('p[t]');

% To get Spectrum
Nfft=length(t);
Nfft=2^(ceil(log2(Nfft)));
f=((-Nfft/2):(Nfft/2)-1)/(Nfft*tr);

%plot spectrum of m(t)
P=fft(p,Nfft); %computes DFt
P=fftshift(P); %to show values symmetric about zero
subplot(2,1,2);
plot(f,abs(P));
title("spectrum of p(t)")
xlabel('f');
ylabel('|P(f)|');
```

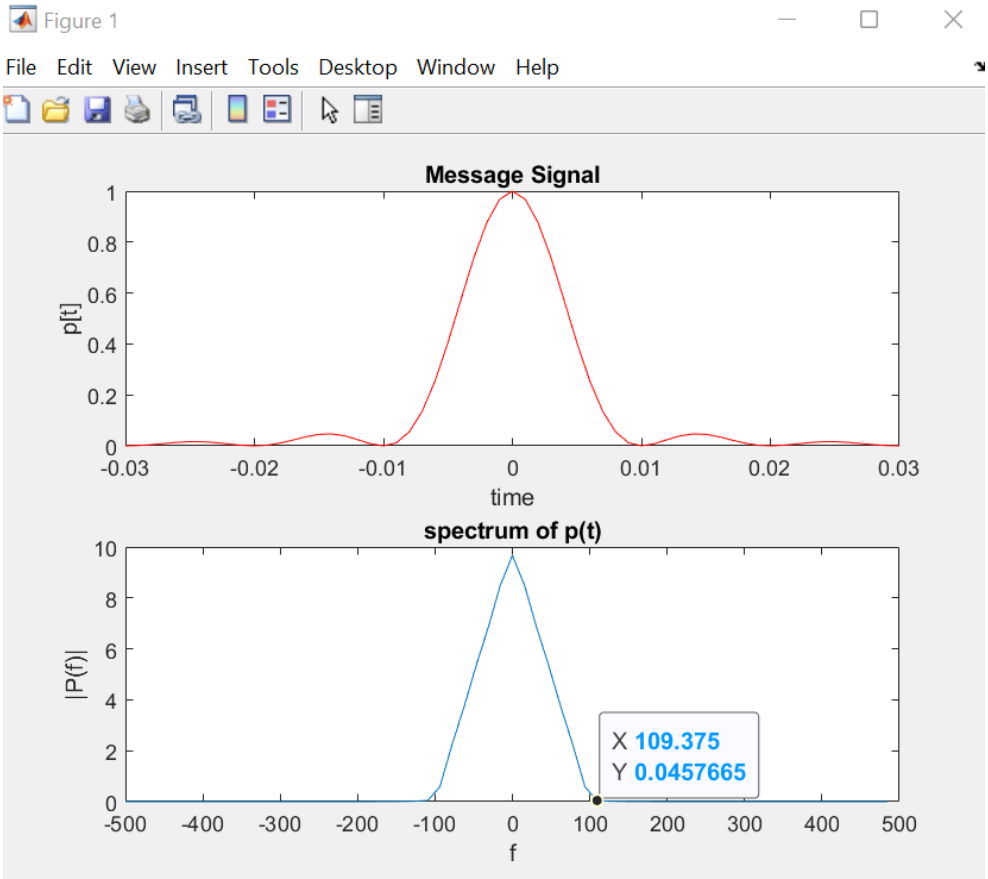
$sinc^2$ pulse shaping

1. Tmax=10Tb



Bandwidth: 101.562 Hz

2. Tmax=3Tb



Bandwidth : 109.37HZ

Theoretical Calculations Bandwidth:

BW=Rb=100Hz

Code:

```
Rb=100;
Tb=1/Rb;
Tmax=3*Tb; %Tmax = 10*Tb / 3*Tb
tr=0.001;
t=(-Tmax:tr:Tmax);

%p[t] signal
p=zeros(1,length(t));
p=sinc(Rb*t).*sinc(Rb*t);

%plotting
subplot(2,1,1);
plot(t,p,'r');
title('Message Signal');
xlabel('time');
```

```
ylabel('p[t]');

% To get Spectrum
Nfft=length(t);
Nfft=2^(ceil(log2(Nfft)));
f=((-Nfft/2):(Nfft/2)-1)/(Nfft*tr);

%plot spectrum of m(t)
P=fft(p,Nfft); %computes DFt
P=fftshift(P); %to show values symmetric about zero
subplot(2,1,2);
plot(f,abs(P));
title("spectrum of p(t)")
xlabel('f');
ylabel('|P(f)|');
```