nyq

```
f=2;
T=1/f;
t=0:0.001:f*T;
y=sin(2*pi*f*t);
subplot(3,1,1);
plot(t,y);
xlabel('Time t');
ylabel('Amplitude');
title('Input Signal with f=2Hz');
Fs=2;
Ts=1/Fs;
t1=0:Ts:f*T;
y1=sin(2*pi*f*n);
subplot(3,1,2);
stem(n,y1,'fill');
xlabel('Time Index n');
ylabel('Amplitude');
title('Sampled Signal with f=2Hz');
t2=linspace(0,f*T,1001);
y2=interp1(n,y1,t2,'spline');
subplot(3,1,3);
plot(n,y1,'o', t2,y2,'-');
xlabel('Time Index n');
ylabel('Amplitude');
title('Reconstructed Signal with f=2Hz');
```

Sampling

```
clc; clear; close all;
fsignal = 10;
t = 0:0.001:0.2;
x = cos(2*pi*fsignal*t);
fs1 = 5;
fs2 = 20;
fs3 = 10;
t1 = 0:1/fs1:0.2;
t2 = 0:1/fs2:0.2;
t3 = 0:1/fs3:0.2;
x1 = cos(2*pi*fsignal*t1);
x2 = cos(2*pi*fsignal*t2);
x3 = cos(2*pi*fsignal*t3);
% Plot Results
subplot(3,1,1);
plot(t, x, 'b'); hold on;
stem(t1, x1, 'r');
```

```
title('Aliasing Effect: fs < 2*fsignal (Under Sampling)');
xlabel('Time (s)'); ylabel('Amplitude');
%legend('Original Signal', 'Sampled Signal');
subplot(3,1,2);
plot(t, x, 'b'); hold on;
stem(t3, x3, 'g');
title('Nyquist Rate: fs = 2*fsignal (Critical Sampling)');
xlabel('Time (s)'); ylabel('Amplitude');
%legend('Original Signal', 'Sampled Signal');
subplot(3,1,3);
plot(t, x, 'b'); hold on;
stem(t2, x2, 'k');
title('No Aliasing: fs > 2*fsignal (Over Sampling)');
xlabel('Time (s)'); ylabel('Amplitude');
%legend('Original Signal', 'Sampled Signal');
```

Z trans

```
clc;
clear;
syms n z
x = (0.5)^n;
X_z = ztrans(x, n, z);
disp('Z-Transform of x[n] = (0.5)^n is:');
pretty(X_z)
X_z_inverse = iztrans(X_z, z, n);
disp('Inverse Z-Transform of the obtained function:');
pretty(X_z_inverse)
u = heaviside(n);
U_z = ztrans(u, n, z);
disp('Z-Transform of unit step function u[n]:');
pretty(U_z)
x2 = n;
X2_z = ztrans(x2, n, z);
disp('Z-Transform of x[n] = n is:');
pretty(X2_z)
x3 = sin(n);
X3_z = ztrans(x3, n, z);
disp('Z-Transform of x[n] = sin(n) is:');
pretty(X3_z)
```

M avg

```
clc;
n=0:100;
s1=cos(2*pi*0.05*n); % A low frequency sinusoid
s2=cos(2*pi*0.47*n); % A high frequency sinusoid
x=s1+s2;
%Implementation of M_Point Moving Average Filter
```

```
M=input('Desired Length of The Filter = ');
num=ones(1,M);
z=filter(num,1,x);
y=filter(num,1,x)/M;
%Display the Input & Output Signals
clf;
subplot(2,2,1);
plot(n,s1);
axis([0,100 -2,2]);
xlabel('Time Index');
ylabel('Amplitude');
title('Pure Signal');
subplot(2,2,2);
plot(n,s2);
axis([0,100 -2,2]);
xlabel('Time Index');
ylabel('Amplitude');
title('Noise Signal');
subplot(2,2,3);
plot(n,x);
%axis([0,100 -2,2]);
xlabel('Time Index');
ylabel('Amplitude');
title('Input Noisy Signal');
subplot(2,2,4);
plot(n,y);
axis([0,100 -2,2]);
xlabel('Time Index');
ylabel('Amplitude');
title('Output Signal');
```

Convolution fir

```
%Convolution of FIR System
clf;
h=[3 2 1 -2 1 0 -4 0 3]; % Impulse Response
x=[1 -2 3 -4 3 2 1]; % Input Sequence
y=conv(h,x);
n=0:14;
subplot(2,1,1);
stem(n,y);
xlabel('Time Index n');
ylabel('Ampitude');
title('Output Obtained by Convolution');
x1=[x ones(1,8)]
y1=filter(h,1,x1)
```

```
subplot(2,1,2);
stem(n,y1);
xlabel('Time Index n');
ylabel('Ampitude');
title('Output Obtained by Filter');

Fft
Fs=1000;
Ts=1/Fs;
dt=0:Ts:2-Ts;
f1=10;
f2=30;
f3=70;
y1=10*sin(2*pi*f1*dt);
y2=10*sin(2*pi*f2*dt);
y3=10*sin(2*pi*f3*dt);
subplot(4,1,1);
plot(dt,y1,'r');
xlabel('Time Index');
ylabel('Amplitude');
title('Signal For 10Hz');
subplot(4,1,2);
plot(dt,y2,'r');
xlabel('Time Index');
ylabel('Amplitude');
title('Signal For 30Hz');
subplot(4,1,3);
plot(dt,y3,'r');
xlabel('Time Index');
ylabel('Amplitude');
title('Signal For 70Hz');
y4=y1+y2+y3;
subplot(4,1,4);
plot(dt,y4,'r');
xlabel('Time Index');
ylabel('Amplitude');
title('Signal For 10Hz,30Hz & 70Hz');
nfft=length(y4);
ff=fft(y4,nfft2);
plot(abs(ff));
fff=ff(1:nfft2/2);
plot(abs(fff))
xfft1=Fs*(0:nfft2/2)/nfft2;
xfft=Fs*(0:nfft2/2-1)/nfft2;
plot(xfft,abs(fff));
fff=10*(fff/max(fff));
plot(xfft,abs(fff));
```

Basic

```
n1=10:-1:0;
n=0:10;
x=1:11;
y=x.*n;
y1=2^2;
y2=x.^n;
y3=ones(1,5);
y4=ones(2,5);
y5=zeros(2,5);
y6=size(n);
y7=length(n);
y8=x.^2-10.*x+15;
subplot(2,2,1);
plot(x,y8);
subplot(2,2,2);
plot(x,y8,'or','LineWidth',3.0,'MarkerSize',6,'MarkerEdgeColor','r','MarkerFaceColor'
,'g');
y9=linspace(0,10,50);
```

fir filter

```
clc;
clear;
close all;
Fs = 1000; % 1000 Hz
Fc = 100;
N = 50;
b = fir1(N, Fc/(Fs/2), 'low', hamming(N+1));
fvtool(b,1);
t = 0:1/Fs:1;
x = sin(2*pi*50*t) + sin(2*pi*200*t);
y = filter(b,1,x);
% Plot results
subplot(2,1,1);
plot(t, x);
title('Original Signal (50 Hz + 200 Hz)');
xlabel('Time (s)');
ylabel('Amplitude');
grid on;
subplot(2,1,2);
plot(t, y);
title('Filtered Signal (50 Hz preserved, 200 Hz removed)');
xlabel('Time (s)');
ylabel('Amplitude');
```

```
grid on;

Real img
c=-(1/2)+(pi/6)*i;
c1=0+(pi/6)*i;
c2=(1/2)+(pi/6)*i;
k=2;
n=0:40;
x=k*exp(c*n);
x1=k*exp(c1*n);
x2=k*exp(c2*n);
subplot(3,2,1);
stem(n,real(x));
xlabel('Time Index n');
ylabel('Amplitude');
title('Real part with SIGMA<0');
subplot(3,2,2);
stem(n,imag(x));
xlabel('Time Index n');
ylabel('Amplitude');
title('Imaginary part with SIGMA<0');
subplot(3,2,3);
stem(n,real(x1));
xlabel('Time Index n');
ylabel('Amplitude');
title('Real part with SIGMA=0');
subplot(3,2,4);
stem(n,imag(x1));
xlabel('Time Index n');
ylabel('Amplitude');
title('Imaginary part with SIGMA=0');
subplot(3,2,5);
stem(n,real(x2));
xlabel('Time Index n');
```

Uds

```
%Run A Program to Generate the Delayed Unit Sample Sequence s(n) with a
%delay of 11 sample and display it.
%Generation of a Unit Sample Sequence
clf;
%Generate a vector from -10 t0 20
n=-10:20;
%Generation of a Unit Sample Sequence
s=[zeros(1,21) 1 zeros(1,9)];
%Plot The Unit Sample Sequence
stem(n,s,'r');
```

```
xlabel('Time Index n');
ylabel('Amplitude');
title('Unit Delayed Sample Sequence')
axis([-10 20 0 1.2]);
```

Udstep

```
%Run A Program to Gnerate the Delayed Unit Step Sequence s(n) with a
%delay of 11 sample and display it.
%Generation of a Unit Sample Sequence
clf;
%Generate a vector from -10 t0 20
n=-10:20;
%Generation of a Unit Sample Sequence
u=[zeros(1,21) ones(1,10)];
%Plot The Unit Sample Sequence
stem(n,u,'r');
xlabel('Time Index n');
ylabel('Amplitude');
title('Unit Delayed Sample Sequence')
axis([-10 20 0 1.2]);
```

Us

```
%Run A Program to Gnerate thr Unit Sample Sequence s(n) and display it.
%Generation of a Unit Sample Sequence
clf;
%Generate a vector from -10 t0 20
n=-10:20;
%Generation of a Unit Sample Sequence
s=[zeros(1,10) 1 zeros(1,20)];
%Plot The Unit Sample Sequence
stem(n,s,'r');
xlabel('Time Index n');
ylabel('Amplitude');
title('Unit Sample Sequence')
axis([-10 20 0 1.2]);
legend('S[n]');
```

Ustep

```
%Run A Program to Gnerate the Unit Step Sequence u(n) and display it.
%Generation of a Unit Sample Sequence
clf;
%Generate a vector from -10 to 20
n=-10:20;
%Generation of a Unit Sample Sequence
u=[zeros(1,10) ones(1,21)];
%Plot The Unit Sample Sequence
```

```
stem(n,u,'g');
xlabel('Time Index n');
ylabel('Amplitude');
title('Unit Sample Sequence')
axis([-10 20 0 1.2]);
legend('U[n]');
```