**DTSP**

**FIR FILTER DESIGNING USING RECTANGULAR WINDOW TECHNIQUE**

AIM: To design FIR digital filter using the rectangular window.

SOFTWARE USED: MATLAB Version 8.6 (R2015b)

PROGRAM:

%To design FIR digital filter using the rectangular window.

clc;

clear all;

close all;

rp=input('enter the passband ripple');

rs=input('enter the stopband ripple');

fp=input('enter the passband frequency');

fs=input('enter the stopband frequency');

f=input('enter the sampling frequency');

wp=2\*fp/f;

ws=2\*fs/f;

num= -20\*log10(sqrt(rp\*rs))-13; %numerator for finding the order of the filter

dem=14.6\*(fs-fp)/f; % denominator for finding the order of the filters.

n=ceil(num/dem); % to round off the order to the nearest integer value.

n1=n+1;

if(rem(n,2)~=0) % to check whether the order is even or not.

n1=n;

n=n-1;

end

y=rectwin(n1);

%LOW-PASS FILTER

b=fir1(n,wp,y); %to design low pass filter

[h,o]=freqz(b,1,256);

m=20\*log(abs(h)); % to obtain gain in dB

subplot(2,2,1);

plot(o/pi,m);

ylabel('Gain in dB');

xlabel(' (a) Normalised Frequency');

title('Low pass Filter');

%HIGH-PASS FILTER

b=fir1(n,wp,'high',y); %to design high pass filter

[h,o]=freqz(b,1,256);

m=20\*log10(abs(h));

subplot(2,2,2);

plot(o/pi,m);

ylabel('Gain in dB');

xlabel(' (b) Normalised frequency');

title('High pass Filter');

%BAND PASS FILTER

wn=[wp ws]; % to set the passband of a filter

b=fir1(n,wn,y);

[h,o]=freqz(b,1,256);

m=20\*log10(abs(h));

subplot(2,2,3);

plot(o/pi,m);

ylabel('Gain in dB');

xlabel(' (c) Normalised Frequency');

title('Band pass Filter');

%BAND STOP FILTER

b=fir1(n,wn,'stop',y); % to design the bandstop filter.

[h,o]=freqz(b,1,256);

m=20\*log10(abs(h));

subplot(2,2,4);

plot(o/pi,m);

ylabel('Gain in dB');

xlabel(' (d) Normalised frequency');

title('Band stop Filter');

gtext('name’);

OUTPUT:

