EXP 9 ***FIR FILTERS***

21/8/14

AIM:

To design for the given specifications in Matlab.

PROGRAM:

*FIR LOW PASS FILTER*

clc;

clear all;

close all;

fprintf('\nFIR LOW PASS FILTER\n');

N=input('ENTER THE ORDER ');

Wc=input('ENTER THE CUT-OFF FREQUENCY ');

m=(N-1)/2;

h=zeros(1,N);

hd=zeros(1,N);

blackwin=zeros(1,N);

for n=0:N-1

hd(n+1)=sin(pi/2\*(n-m))/(pi\*(n-m));

blackwin(n+1)=0.42-0.5\*cos((2\*pi\*(n))/(N-1))+0.08\*cos((4\*pi\*(n))/(N-1));

if n==m

hd(n+1)=Wc/pi;

end

h(n+1)=hd(n+1)\*blackwin(n+1);

end

fprintf('\nTHE FILTER COEFFICIENTS ARE');

disp(h);

[FRF,WF]=freqz(h,1);

figure

set(gca, 'FontSize', 16)

plot(WF/pi,((abs(FRF))));

title('FREQUENCY RESPONSE');

xlabel('NORMALISED FREQUENCY');

ylabel('MAGNITUDE');

figure

set(gca, 'FontSize', 16)

plot(WF/pi,angle(FRF));

xlabel('NORMALISED FREQUENCY');

ylabel('PHASE');

OUTPUT:

FIR LOW PASS FILTER

ENTER THE ORDER 11

ENTER THE CUT-OFF FREQUENCY pi/2

THE FILTER COEFFICIENTS ARE

-0.0000 -0.0000 -0.0213 0.0000 0.2703 0.5000 0.2703 0.0000 -0.0213 -0.0000 -0.0000





*FIR HIGH PASS FILTER*

clc;

clear all;

close all;

fprintf('\nFIR HIGH PASS FILTER\n');

N=input('ENTER THE ORDER ');

Wc=input('ENTER THE CUT-OFF FREQUENCY ');

m=(N-1)/2;

h=zeros(1,N);

hd=zeros(1,N);

whm=zeros(1,N);

for n=0:N-1

hd(n+1)=(sin((n-m)\*pi)-sin((n-m)\*Wc))./((n-m)\*pi);

whm(n+1)=0.54-.46\*cos(2\*pi\*(n)./(N-1));

if n==m

hd(n+1)=(pi-Wc)/pi;

end

h(n+1)=hd(n+1)\*whm(n+1);

end

fprintf('\nTHE FILTER COEFFICIENTS ARE');

disp(h);

[FRF,WF]=freqz(h,1);

subplot(2,1,1);

plot(WF/pi,(abs(FRF)));

title('FREQUENCY RESPONSE');

xlabel('NORMALISED FREQUENCY');

ylabel('MAGNITUDE');

subplot(2,1,2);

plot(WF/pi,angle(FRF));

xlabel('NORMALISED FREQUENCY');

ylabel('PHASE');

OUTPUT:

FIR HIGH PASS FILTER

ENTER THE ORDER 11

ENTER THE CUT-OFF FREQUENCY pi/4

THE FILTER COEFFICIENTS ARE

0.0036 -0.0000 -0.0298 -0.1086 -0.2053 0.7500 -0.2053 -0.1086 -0.0298 -0.0000 0.0036





*FIR BAND PASS FILTER*

clc;

clear all;

close all;

fprintf('\nFIR BAND PASS FILTER\n');

N=input('ENTER THE ORDER ');

WL=input('ENTER THE LOWER CUT-OFF FREQUENCY ');

WU=input('ENTER THE UPPER CUT-OFF FREQUENCY ');

m=(N-1)/2;

h=zeros(1,N);

hd=zeros(1,N);

for n=0:N-1

hd(n+1)=(sin((n-m)\*WU)-sin((n-m)\*WL))./((n-m)\*pi);

if n==m

hd(n+1)=(2\*WU-2\*WL)/(2\*pi);

end

h(n+1)=hd(n+1);

end

fprintf('\nTHE FILTER COEFFICIENTS ARE');

disp(h);

[FRF,WF]=freqz(h,1);

figure

set(gca, 'FontSize', 16)

plot(WF/pi,(abs(FRF)));

title('FREQUENCY RESPONSE');

xlabel('NORMALISED FREQUENCY');

ylabel('MAGNITUDE');

figure

set(gca, 'FontSize', 16)

plot(WF/pi,angle(FRF));

xlabel('NORMALISED FREQUENCY');

ylabel('PHASE');

OUTPUT:

FIR BAND PASS FILTER

ENTER THE ORDER 25

ENTER THE LOWER CUT-OFF FREQUENCY pi/3

ENTER THE UPPER CUT-OFF FREQUENCY 2\*pi/3

THE FILTER COEFFICIENTS ARE Columns 1 through 16

-0.0000 0.0000 0.0551 -0.0000 -0.0689 0.0000 -0.0000 0.0000 0.1378 -0.0000 -0.2757 0.0000 0.3333 0.0000 -0.2757 -0.0000

Columns 17 through 25

0.1378 0.0000 -0.0000 0.0000 -0.0689 -0.0000 0.0551 0.0000 -0.0000





*FIR BAND STOP FILTER*

clc;

clear all;

close all;

fprintf('\nFIR BAND STOP FILTER\n');

N=input('ENTER THE ORDER ');

WL=input('ENTER THE LOWER CUT-OFF FREQUENCY

');

WU=input('ENTER THE UPPER CUT-OFF FREQUENCY ');

m=(N-1)/2;

h=zeros(1,N);

hd=zeros(1,N);

Wt=zeros(1,N);

for n=0:N-1

hd(n+1)=(sin(pi\*(n-m))+sin((n-m)\*WL)-sin((n-m)\*WU))./((n-m)\*pi);

Wt(n+1)=1-((2\*abs(n-m))/(N-1));

if n==m

hd(n+1)=1+WL/pi-WU/pi;

end

h(n+1)=hd(n+1)\*Wt(n+1);

end

fprintf('\nTHE FILTER COEFFICIENTS ARE');

disp(h);

[FRF,WF]=freqz(h,1);

figure

set(gca, 'FontSize', 16)

plot(WF/pi,(abs(FRF)));

title('FREQUENCY RESPONSE');

xlabel('NORMALISED FREQUENCY');

ylabel('MAGNITUDE');

figure

set(gca, 'FontSize', 16)

plot(WF/pi,angle(FRF));

xlabel('NORMALISED FREQUENCY');

ylabel('PHASE');

*OUTPUT:*

*FIR BAND STOP FILTER*

*ENTER THE ORDER 11*

*ENTER THE LOWER CUT-OFF FREQUENCY pi/4*

*ENTER THE UPPER CUT-OFF FREQUENCY 3\*pi/4*

*THE FILTER COEFFICIENTS ARE 0 -0.0000 0.0000 0.1910 0 0.5000 0 0.1910 0.0000 -0.0000 0*

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RESULT:

Thus FIR filters have been designed for the given specifications in Matlab.