EE320 ASSIGNMENT - 3

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PROBLEM STATEMENT

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Wed 13/11/2019 11:45
eee17b; ece17b; DEEPIKA GUPTA; SANDEEP KUMAR PANDEY

Hello All,
There is a change in assignment only for those who are having their name written
in the paper. This is a relatively simple exercise and can be submitted after the exam (but before the grade submission date).
Please report your results to Deepika and Sandeep directly.

Exercise:

Design a causal low pass filter with symmetric coefficients.
Number of coefficients are odd in number.
Assume that the desired filter is
D is exp (-jw(N-1)/2) in the passband and zero in the stopband.

passband frequency = 0.3 pi
stopband frequency = 0.4 pi
maximum ripple allowed in passband and stopband is fixed at 0.05.

Try to design a filter (by varying N) with the
1) Eigen filter approach
2) Equiripple filter

Which filter achieves the target better?
You can use direct Matlab command.

Regards
HAnumant

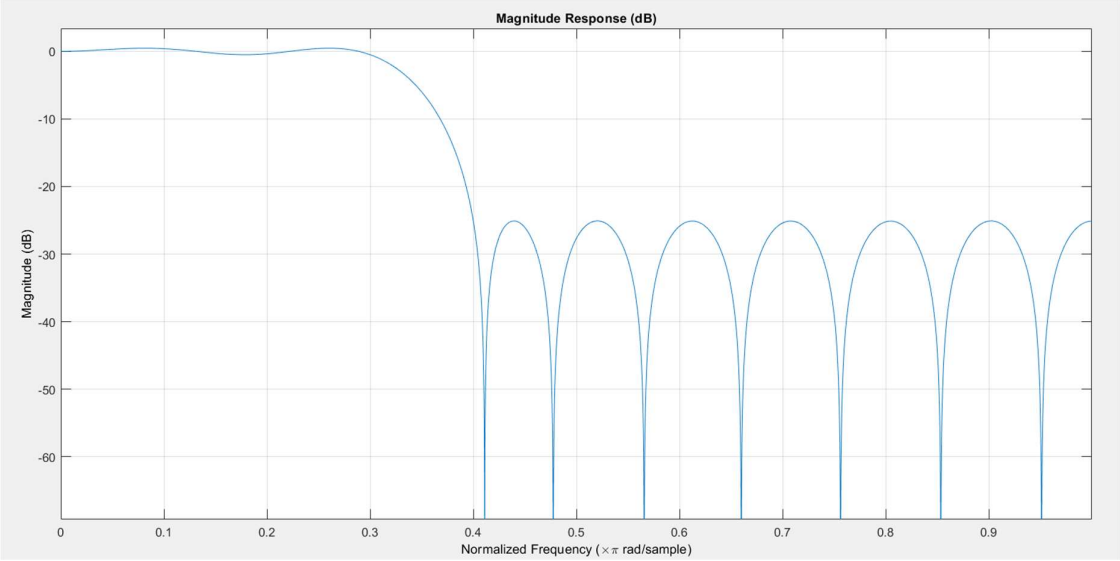
EQUIRIPPPLE FILTER

CODE :

```
function Hd = Eigen1
%EIGEN1 Returns a discrete-time filter object.

% MATLAB Code
% Generated by MATLAB(R) 9.7 and Signal Processing Toolbox
8.3.
% Generated on: 28-Nov-2019 13:44:13

% FIR least-squares Low pass filter designed using the FIRLS
function.

% All frequency values are normalized to 1.

N     = 90;  % Order
Fpass = 0.3;  % Passband Frequency
Fstop = 0.4;  % Stopband Frequency
Wpass = 1;    % Passband Weight
Wstop = 1;    % Stopband Weight

% Calculate the coefficients using the FIRLS function.
b  = firls(N, [0 Fpass Fstop 1], [1 1 0 0], [Wpass Wstop]);

Hd = dfilt.dffir(b);

fvtool(Hd);

%Done by SRI HARSHA VADATHYA(170108037) - EE320 Assignment
% [EOF]
```

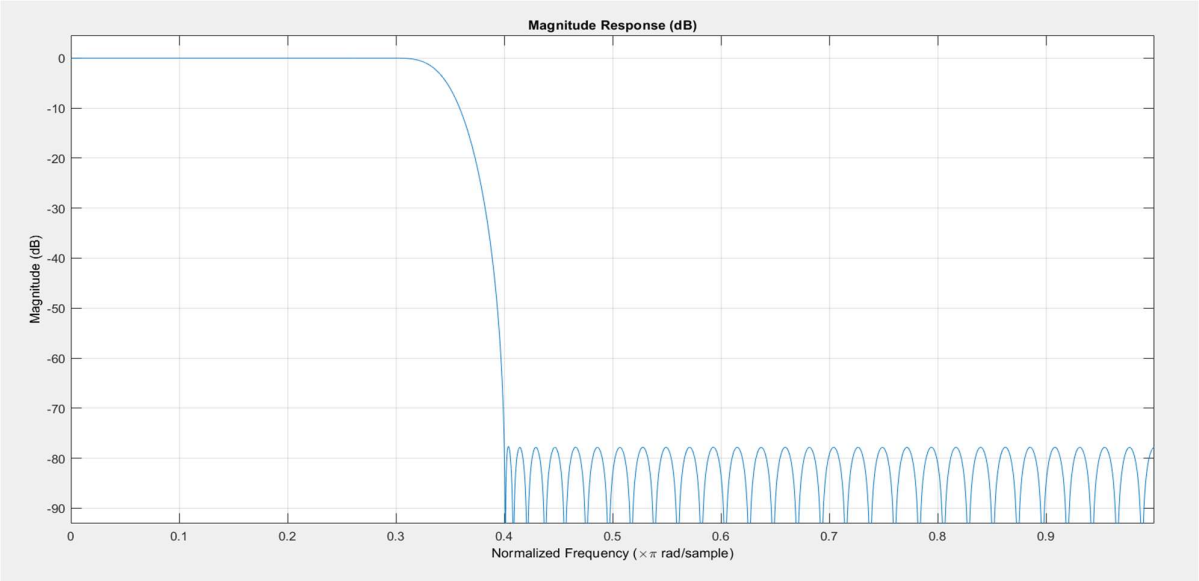
RESULTS:

1. **N = 20**



Magnitude Response does not look as desired.

2. **N = 90**



We get desired Magnitude Response approximately.

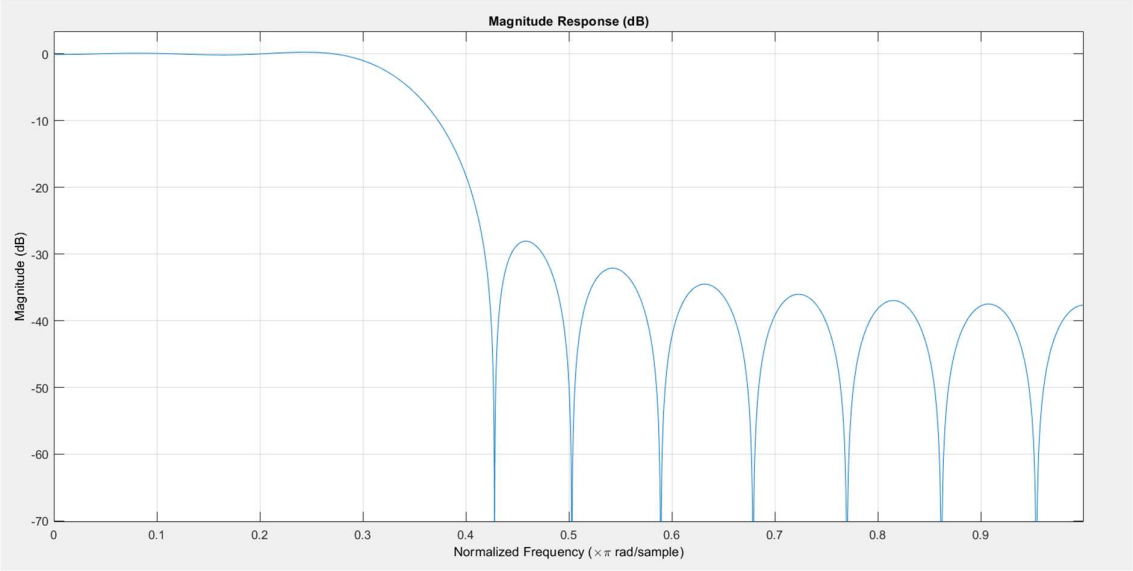
EIGEN FILTER

CODE:

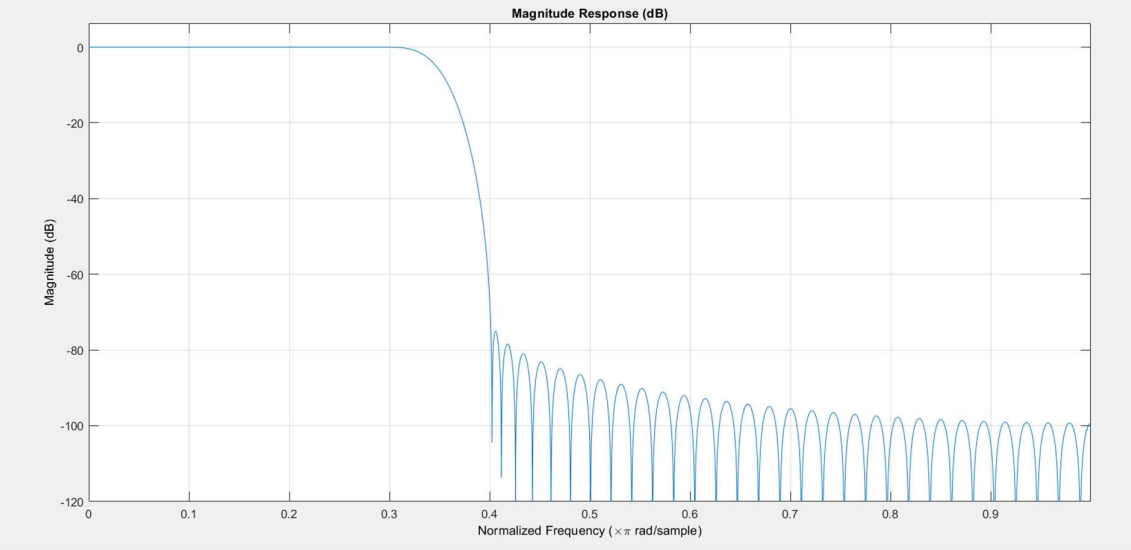
```
function Hd = Eigen1
%EIGEN1 Returns a discrete-time filter object.

% MATLAB Code
% Generated by MATLAB(R) 9.7 and Signal Processing
Toolbox 8.3.
% Generated on: 28-Nov-2019 13:44:13

% FIR least-squares Lowpass filter designed using the
FIRLS function.

% All frequency values are normalized to 1.

N     = 90;   % Order
Fpass = 0.3;  % Passband Frequency
Fstop = 0.4;  % Stopband Frequency
Wpass = 1;    % Passband Weight
Wstop = 1;    % Stopband Weight

% Calculate the coefficients using the FIRLS function.
b  = firls(N, [0 Fpass Fstop 1], [1 1 0 0], [Wpass
Wstop]);
Hd = dfilt.dffir(b);

fvtool(Hd);

%Done by SRI HARSHA VADATHYA(170108037) - EE320
Assignment
% [EOF]
```

RESULTS:

1. N= 20



2. N = 90



CONCLUSION

If we observe the Magnitude Response we can conclude that Equiripple Filter is better than Eigen Filter due to the starting Ripples in Stop Band.

THANK YOU