EXPERIMENT NO.8

AIM: Design and implementation of FIR filter to meet given specifications.

APPARATUS: MATLAB software

THEORY:

finite impulse response (FIR) filter is a filter whose impulse response is of finite duration, because it settles to zero in finite time. This is in contrast to infinite impulse response (IIR) filters, which may have internal feedback and may continue to respond indefinitely.

The impulse response of an Nth-order discrete-time FIR filter lasts exactly N+1 samples before it then settles to zero.

For a causal discrete-time FIR filter of order *N*, each value of the output sequence is a weighted sum of the most recent input values**:**

$$\begin{aligned} y[n] &= b_0 x[n] + b_1 x[n-1] + \cdots + b_N x[n-N] \\ &= \sum_{i=0}^{N} b_i \cdot x[n-i], \end{aligned}$$

where**:**

- x[n] is the input signal,
- y[n] is the output signal,
- N is the filter order; an N^{th}-order filter has N+1 terms on the right-hand side

Filter Design

An FIR filter is designed by finding the coefficients and filter order that meet certain specifications.

1. Window design method
2. Frequency sampling method

PROGRAM:

1.LOW PASS FILTER DESIGN USING RECTANGULAR WINDOW

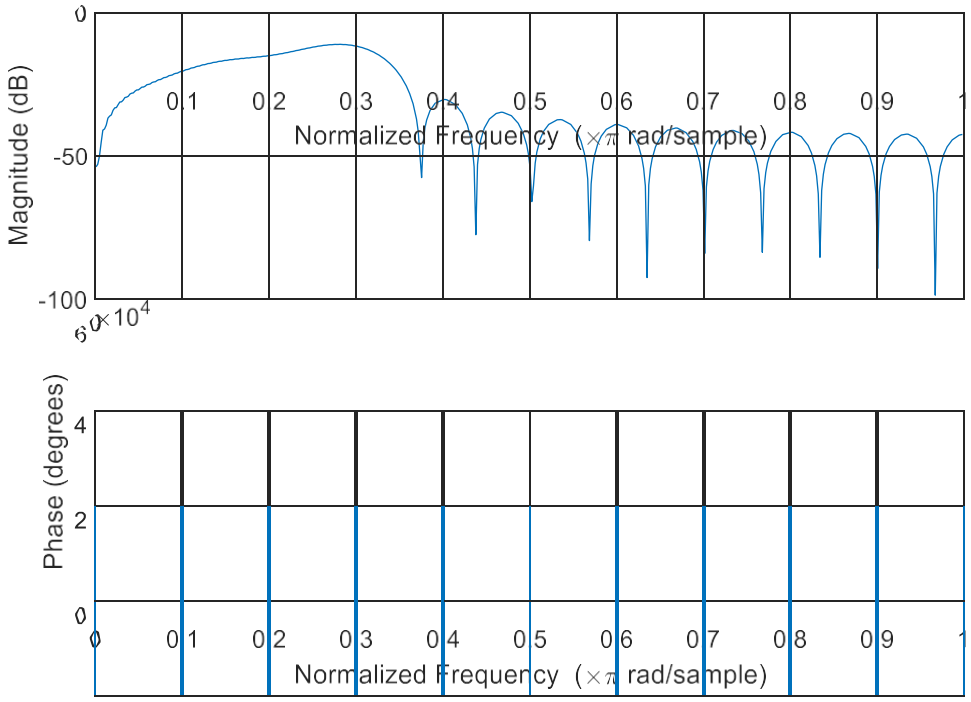
```
fc = input("enter the corner frequency");
fs = input("enter the sampling frequency");
N = input("enter the order of filter");
wc = 2*pi*fc/fs;
b = fir1(N,wc/pi,'low',rectwin(N+1));
w = 0:0.01:pi;
freqz(b,w)
```

OUTPUT:

enter the corner frequency200

enter the sampling frequency1200

enter the order of filter30



2. HIGH PASS FILTER DESIGN USING HAMMING WINDOW

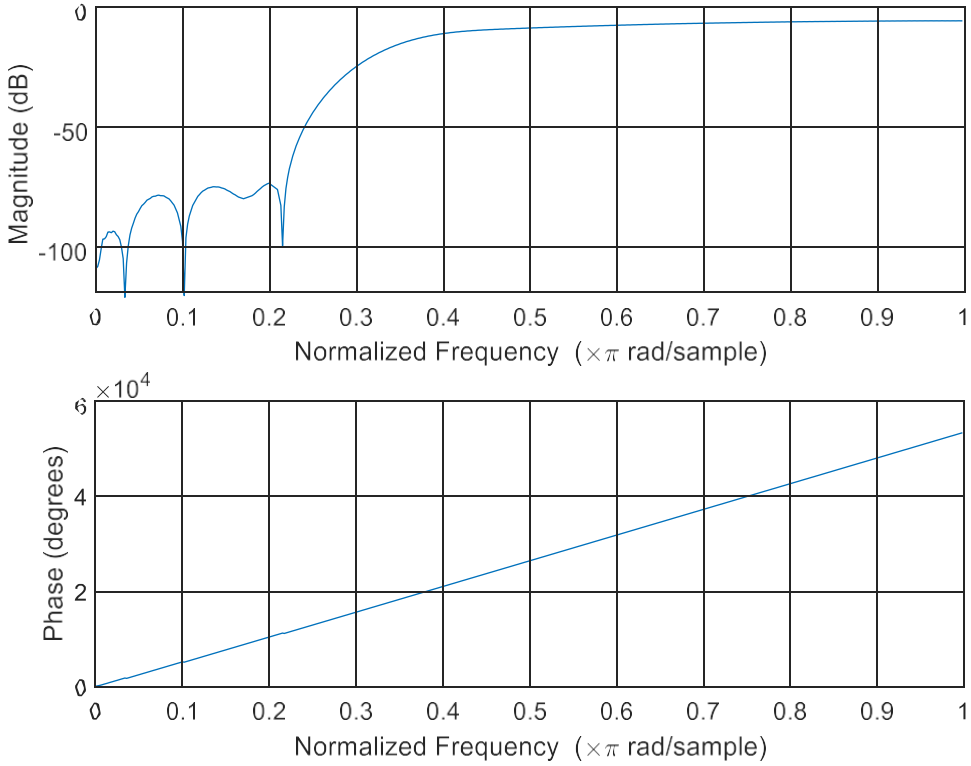
```
fc = input("enter the corner frequency");
fs = input("enter the sampling frequency");
N = input("enter the order of filter");
wc = 2*pi*fc/fs;
b = fir1(N,wc/pi,'high',hamming(N+1));
w = 0:0.01:pi;
freqz(b,w)
```

OUTPUT:

enter the corner frequency200

enter the sampling frequency1200

enter the order of filter30



3. BAND PASS FILTER DESIGN USING HANNING WINDOW

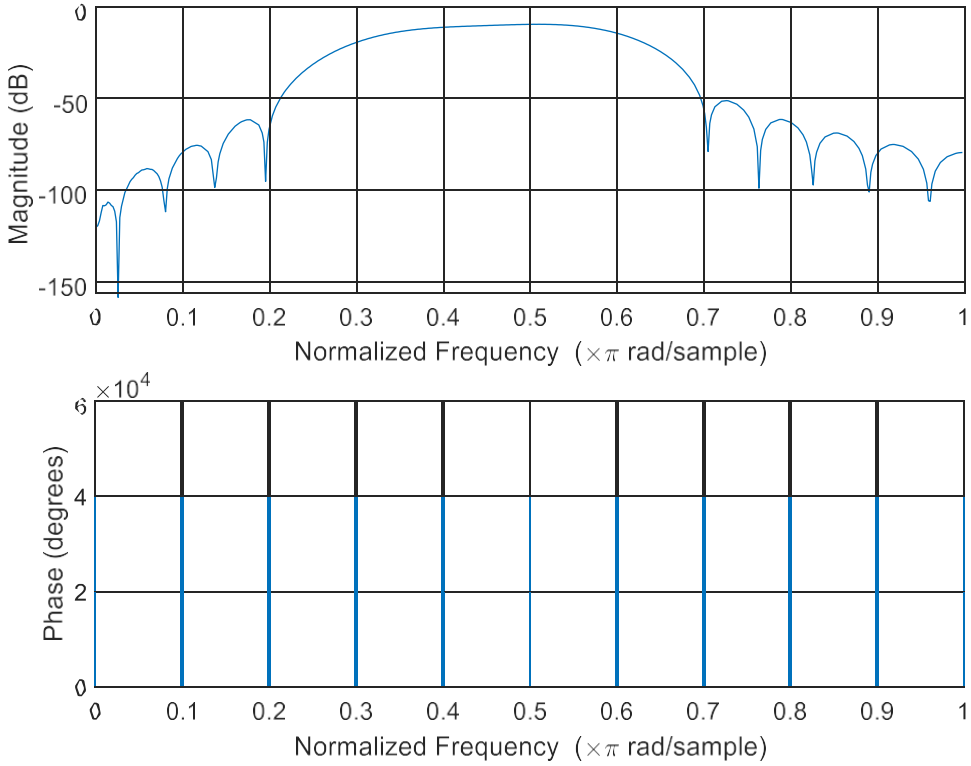
```
fc = input("enter the corner frequency");
fs = input("enter the sampling frequency");
N = input("enter the order of filter");
wc = 2*pi*fc/fs;
b = fir1(N,[0.3 0.6],hanning(N+1));
w = 0:0.01:pi;
freqz(b,w)
```

OUTPUT:

enter the corner frequency200

enter the sampling frequency1200

enter the order of filter30



POST LAB QUESTION:

Q1. Differentiate between FIR & IIR Filters.