Experiment 18
Windowing to Truncate the Response

Aim

To use windowing to truncate the response of a signal.

Theory

When FIR filter is designed, we make use of windowing. The ideal filter response is a sync function varying between $-\infty$ to $+\infty$. To design FIR filter, the number of coefficients of the filter must be finite. We need to truncate the response and make it finite. This truncation is justifiable, as the energy in the coefficients of those are truncated is very small as compared to the energy in the retained coefficients. This can be easily seen from the output plot of the experiment.

Experiment

We are directly generating the sync function and truncating it using a rectangular window. The sync function, rectangular window function and the truncated output are plotted (Figure 1). The MATLAB program is as follows.

```
%windowing to truncate the response
clear all;
subplot(3,1,1);
 t=linspace(-10,10);
    y=10*sinc(t);
    stem(t,y);
    xlabel('frequency');ylabel('Amplitude');  title('Impulse
response of the ideal filter')
 subplot(3,1,2);
 for i=1:35,
    x(i)=0;
 end
 for i=36:65,
    x(i)=1;
 end
 for i=66:100,
    x(i)=0;
 end
```
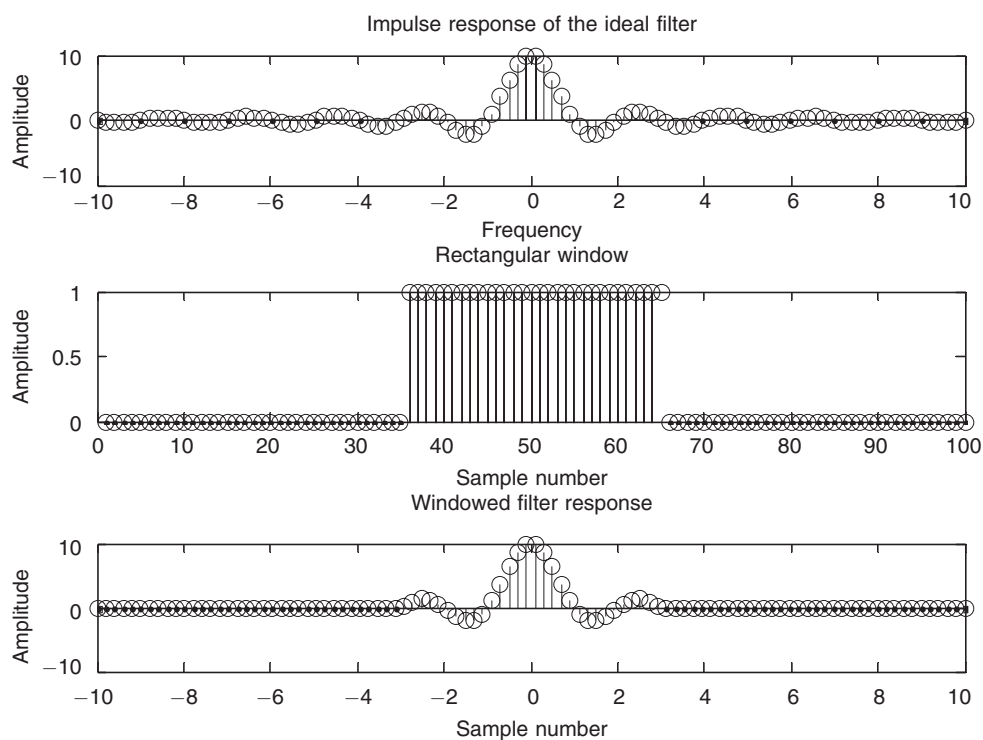
Figure 1 Plot of a sync function, rectangular window function and the truncated response.