SVKM's **Dwarkadas J. Sanghvi College of Engineering**

Department of Electronics and Telecommunication Engineering

Experiment No. 3

Aim: Plotting amplitude and phase response of a simple low pass filter using MATLAB

Software required: MATLAB 7.0

Theory:

A simple low-pass filter circuit is shown in figure 1. This circuit consists of a resistor *R*(in ohms) and capacitor *C* (in farads) in series, and the ratio of the output voltage V_o to the sinusoidal input voltage V_i of frequency *f*, is given by the equation,

$$\frac{V_i}{V_o} = \frac{1}{1+j2\pi fRC} \tag{1}$$

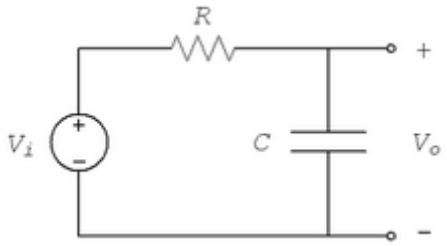

Figure 1: A simple low pass filter

The amplitude response of a filter is the ratio of the amplitude of the output voltage to the amplitude of input voltage, and the phase response of the filter is the difference between the phase of the output voltage and phase of the input voltage. The simplest way to calculate the amplitude and phase response of the filter is to evaluate equation (1) at many different frequencies. Because the phase and amplitude response of a filter can vary over a wide range of frequencies, it is customary to plot both of these values on logarithmic scales. As phase varies over a very limited range, phase response is plotted in linear scales and thus semilogx plot us used and amplitude response is plotted using loglog.

MATLAB commands

1) **abs(X) is the absolute value of the elements of X. When X is complex, abs(X) is the complex modulus (magnitude) of the elements of X**
2) **angle(X) returns the phase angles, in radians, of a matrix X with complex elements**
3) **semilogx(...) is the same as PLOT(...), except a logarithmic (base 10) scale is used for the X-axis**
4) **loglog(...) is the same as PLOT(...), except logarithmic scales are used for both the X- and Y- axes**
5) **grid ON adds major grid lines to the current axes**

Conclusion:-