19L-1316

lab report 11:

FOURIER TRANSFORM &amp;INVERSE FOURIER TRANSFORM

Objective: -

The main objective of this lab is as follows:

We will learn how to integrate the required signals in MATLAB.

We will also learned to compute Fourier Transform and Inverse Fourier Transform of the signal.

Introduction: -

We learn a new function called as SYMBOLIC FUCTION to do integration on MATLAB.

We declare our variable of integration as a symbolic function with respect to integration is going to be

done.

For example: typing &gt;&gt;x=sym(&#39;x&#39;) creates the symbolic variable with name x.

Note:

The syms function enables you to combine more than one such statement into a single statement. For

example, typing syms x is equivalent to typing x=sym(&#39;x&#39;), and typing syms x y u v creates the four

variables x, y, u and v.

For Integration:

We use int(function) notation to do integration on MATLAB.

For Example:

int(S) returns the indefinite integral of S with respect to its symbolic variable.

int(S,a,b) returns the definite integral from a to b of each element of S with respect to each

element&#39;s default symbolic variable a and b are symbolic or double scalars.

FOURIER TRANSFORM IN MATLAB:

f(t)&lt;-&gt;f(w)

F=fourier(f) is the Fourier transform of the symbolic scalar ��with default independent

variable����. The default return is a function of ��. The Fourier transform is applied to a function of

�� and returns a function of��.

Note:

fourier() function takes in a symbolic variable and cannot plot the function as long as it’s

variable is a symbol

NVERSE FOURIER TRANSFORM:

If you have obtained the frequency domain expression��(����), then you can find the

corresponding time domain expression by finding its inverse Fourier transform. In MATLAB, this

is obtained by the function fourier�� ( ).

��= ��fourier (��)is the inverse Fourier transform of the scalar symbolic object F with default

independent variable ω. The default return is a function of x. The inverse Fourier transform is

applied to a function of ω and returns a function of ����.

��=��fourier (��,,��)takes F to be a function of v and f to be a function of u instead of the default ω

and ��, respectively.

For example:

&gt;&gt;syms w t

&gt;&gt;g= exp(-abs(w))

&gt;&gt;ifourier(g,w,t)

returns

1/(pi\*(t^2 + 1))

Applications: -

Fourier transform is useful in the study of frequency response of a filter , solution of PDE,

discrete Fourier transform and Fast Fourier transform in signal analysis. A Fourier

transform when applied to a partial differential equation reduces the number of independent

variables by one.

The Fourier transform is used to convert the signals from time domain to frequency domain

and the inverse Fourier transform is used to convert the signal back from the frequency

domain to the time domain.

Issues: -

no issue while doing the lab.

Conclusion: -

We learn that we for non-periodic signals we do the Fourier and inverse Fourier

transform.

POST LAB:

syms x f t w

x=exp(-2\*t)\*heaviside(t);

f=1/(2 + w\*1i);

te=int((abs(exp(-2\*t)\*heaviside(t)))^2,-inf,inf)

fe=int((abs(fourier(x)))^2,-inf,inf)/(2\*pi)

:te =1/4

fe =1/4 result: